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The World's Crop Genetic Resources and the Rights of Indigenous Farmers[1]

by David A. Cleveland and Stephen C. Murray

Farmer or folk crop varieties developed over many generations by indigenous farmers are an important component of global crop genetic resources for use by both industrial and indigenous agriculture. Currently there is a debate between advocates of indigenous farmers' rights in their folk varieties and the dominant world system, which vests intellectual property rights to crop genetic resources only in users of those resources for industrial agriculture. While indigenous peoples at the individual and group levels do have a broad range of intellectual property rights in their folk varieties, they define and use them differently than does the industrial world. Therefore, industrial-world intellectual propery rights mechanisms are generally inappropriate for protecting the intellectual property rights of indigenous farmers, but some could be used effectively. To meet indigenous farmers' need for protection, new approaches are being developed that embed indigenous farmers' rights in folk varieties in cultural, human, and environmental rights. More research on the cultural, social, and agronomic roles of folk varieties, ongoing negotiation of the meaning of key concepts such as ''crop genetic resources,'' ''rights,'' and ''indigenous,'' and an emphasis on a common goal of sustainability will help to resolve the debate.

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Our world system is rapidly becoming more interconnected, and no natural, cultural, or technological resources are only ''local'' resources any longer. The ''globalization'' of resources and the problems caused by increasing rates of resource use and degradation have increased conflict over the meaning of, and rights to, resources that have previously enjoyed somewhat separate existences in indigenous and industrial worlds.

Crop genetic resources occupy a key position in this drama. Agricultural crops and their wild and weedy relatives, like other genetic resources, embody very sophisticated information in their genetic structure as a result of the history of selection pressures exerted by the biophysical environment (the soils, climates, plants, and animals). In addition, through human control of crop evolution (domestication and varietal selection) and the crop-growing environment and direct genetic manipulation by humans, these crops reflect the values and social organization of many generations of farmers and, more recently, those of modern plant breeders and molecular biologists.

The value and use of these and other world resources is dominated by the Western industrial system, more than ever since the Soviet Union's collapse and the recent revisions of the General Agreement on Tariffs and Trade (GATT) and the adoption of the North American Free Trade Agreement (NAFTA). A fundamental challenge to this system, however, is the persistence and reemergence of indigenous and traditionally based local communities, many of which have very different views of the value and proper use of resources and do not see their destiny as being totally assimilated into Western society. Awareness that the degree of human impact on the environment threatens human existence and the survival of many other species has also led increasingly to calls for more sustainable human-environment relationships (i.e., those that conserve resources for future generations) and more discussion and research about what ''sustainability'' means in a given situation (e.g., UNCED 1993). This challenges many assumptions about the use and conservation of resources in both the industrial and the indigenous world and may help to bring indigenous and industrial viewpoints together. At the same time there is an increasing willingness in the

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industrial world to hear the voices of indigenous peoples.

The global debate over rights in crop genetic resources centers on how to balance the growing claims of indigenous farmers to rights of control over their folk (or "traditional") crop varieties against those of industrial-world plant breeders, genetic resources conservationists, agronomists, biotechnologists, and the organizations they work for—who generally view farmers' traditional crop varieties as the common heritage of humankind—and against the national interests of the states within whose boundaries they reside. The need for resolution is heightened by the ongoing loss of folk varieties. Folk varieties are extremely important for industrial agriculture because they contain a vast amount of genetic diversity, including traits that will be increasingly valuable in responding to the need to feed a growing population. Their genetic diversity may also be crucial to developing more sustainable forms of agriculture as the world searches for varieties that can adapt to more marginal growing conditions, evolving pests, and changing climates and soils and maintain yields while reducing chemicals and other inputs to control costs and avoid adverse environmental impacts (see Cox, Murphy, and Goodman 1988, Francis and Callaway 1993, Harlan 1992).

Attempts to resolve the crop genetic resources debate have included discussions in which many different views are presented, for example, a series of Keystone conferences (Keystone 1991) and the Crucible Project (Crucible Group 1994). Currently, international diplomatic efforts are concentrated on reconciling the provisions for the rights of indigenous peoples in their knowledge and biodiversity contained in the United Nations Convention on Biological Diversity, the "farmers' rights" provision of the International Undertaking on Plant Genetic Resources of the Food and Agriculture Organization (FAO) of the United Nations (promoted primarily by Third World nations within a nation-state context), and the requirement for private property rights in living organisms and genetic resources agreed on by signatories to the Uruguay round of the GATT (promoted primarily by industrial nations and now a requirement for membership in the World Trade Organization [WTO], created in January 1995).

These issues are key in the FAO's attempt to implement the concept of "farmers' rights" and its Global Plan of Action for crop genetic resources (FAO 1996*a*), including the Fourth International Conference on Plant Genetic Resources in June 1996 in Leipzig, Germany, the ongoing meetings of the Conference of Parties to the UN Convention on Biological Diversity, and discussions by nongovernmental organizations (NGOs), farmers' groups, international agriculture research organizations, governments, and private corporations around the world (e.g., Swaminathan 1996). One focus of discussion is the status of the approximately 40% of the world's crop genetic resources stored in the gene banks of the International Agricultural Research Centers of the Consultative Group on International Agricultural Research (CGIAR) that came under FAO jurisdiction in October 1994 (Crucible Group 1994). These collections, along with all other previously existing ex situ collections, were not included in the Convention on Biological Diversity, thus intensifying conflict over who would control them (Hamilton 1993).

Our purpose in this article is not to produce specific recommendations for the protection of indigenous farmers' rights in their folk varieties, which we believe to be the role of the farmers themselves. Rather, our goal is to point out some neglected theoretical and empirical aspects of the current debate over these rights that we believe need to be more fully understood if the increasing conflict over these resources is to be resolved in a way that balances benefits to all peoples.

We do this by examining both empirical data on indigenous agriculture, plant breeding, and law and the values underlying different views of these data. The investment of human effort in crop varieties, the nonmaterial nature of the genetic code, and the increasing importance of crop genetic diversity for agriculture make the conflict over rights in crop genetic resources especially complex. The points we make may also provide insights into the many other areas of conflict between indigenous and industrial viewpoints over the meaning of and rights to global resources from ocean fisheries and medicinal plants to fresh water and clean air.

We first review the meaning of the term "indigenous." An anthropological understanding of who indigenous peoples are, especially in terms of their relation to crop genetic resources, must emphasize the fluid and contingent nature of "indigenousness." Our goal here is balancing the need to "problematize" the term with the need for practical use of the concepts it represents in different contexts to resolve problems of rights to control and use crop genetic resources.

We also discuss the application of "rights" in crop genetic resources to indigenous groups, including the basis of their claim to rights, the appropriateness of rights for protecting indigenous groups, and the definition of rights within and between indigenous groups. We hope to contribute to an understanding of how rights, conceived of in different ways, might be applicable to protecting the interests of farmers in their crop genetic resources while at the same time facilitating the use of these resources for all humanity.

We begin with intellectual property rights because they have been the focus of much of the discussion up to now. We suggest that advocates of both indigenous and industrial viewpoints have tended to oversimplify the issues and misconstrue indigenous peoples' conceptions of intellectual property rights, in part because of the dominance of industrial notions of intellectual property rights in the discussion. An understanding of the basis of indigenous farmers' intellectual investment in folk varieties also lays the groundwork for discussion of alternative forms of rights that may be more effective bases for resolving disagreements.

Industrial and Indigenous

A simple contrast between industrial and indigenous agriculture will serve as a heuristic device to outline the debate over farmers' rights in crop genetic resources and folk varieties and as a starting point to explore relevant issues. We use the term "industrial agriculture" to refer to agriculture based on inputs of agrochemicals, machinery, large-scale irrigation systems, fossil fuels, and modern crop varieties (cf. Barlett 1987, Todaro 1994). We define "indigenous agriculture" as agriculture that does not rely heavily on industrial inputs, is based to a great extent on local traditions, and uses locally adapted traditional crop varieties.

In contrast to the tendency in conventional agricultural development to contrast the "inefficient and low-productivity agriculture in developing countries" 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" (Todaro 1994:288, 310), we do not see these two varieties of agriculture as more or less advanced according to an evolutionary scheme. Nor do we essentialize and romanticize indigenous agriculture as a "freely chosen (or accepted) way of life that allows self-realization, conserves resources, and provides subsistence" (Blatz 1994:33). Our contrast is not meant to imply that either industrial or indigenous agriculture is monolithic, static, or sharply defined. Their complexity and dynamism may in some ways make global consensus very difficult but also offer important opportunities for resolution.

WHO ARE INDIGENOUS FARMERS?

We use the term "indigenous farmers" or simply "farmers" as a shorthand to refer to farmers who follow primarily "traditional" farming practices as opposed to modern industrial ones. This definition includes farming groups which fall under a narrower definition of the term "indigenous"—those with long temporal continuity predating invasion of their territory by outsiders (Axt et al. 1993:24–26)—but also others who primarily practice nonindustrial agriculture which is based on traditional learning and techniques, includes folk varieties, and is often small-scale and uses few external inputs. Similar definitions of "indigenous" have been used to capture this idea; the Convention on Biological Diversity refers to "indigenous and local communities embodying traditional lifestyles" (Article 8[j]; see also UNEP 1994). Folk crop varieties are the key criterion for this paper, although they are themselves impossible to define unambiguously in time or space (Soleri and Cleveland 1993). Indigenous farmers have some claim to rights in traditional crop genetic resources because of their past and present involvement in the creation and maintenance of these resources and their stake in the conservation of these resources for the future. Although we define "indigenous" in relation to agriculture and crop genetic resources, we recognize that the term is inherently problematic. Nonetheless, keeping this term is better than switching to another or inventing a new one with its own set of problems.

There is growing interest in anthropology and other social sciences in the definition of "indigenous," fueled by the rise of ethnonationalism and the increasing conflict over rights in and control over natural and cultural resources. It is now increasingly accepted that indigenous peoples must be understood in terms of their interaction with the modern world. Three important aspects of indigenousness as established by social science need to be kept constantly in mind when discussing indigenous farmers' rights in crop genetic resources: (1) indigenous groups are dynamic and uncircumscribed in cultural and physical time and space, are defined contextually, and are not static; (2) indigenous knowledge, values, and scientific expertise and experience are unevenly distributed within and between indigenous groups; and (3) indigenous knowledge is the result of a complex interaction between relativist (cultural values-based) and objectivist (scientific) epistemologies (e.g., Cleveland n.d., Clifford 1988, Handler 1985, J. Jackson 1995, Scoones and Thompson 1993).

The first aspect of an anthropological understanding of indigenousness implies that farmers are not isolated from industrial agriculture and modern society or outside the orbit of capitalist agriculture. Thus, in our use of the term, South Asian peasants and traditionally based farmers involved in petty commodity production could be considered indigenous. Nor does our definition restrict the term solely to regions whose colonial history has left a dominant national culture with coexisting autochthonous cultures (see Brush 1996*b*). Indigenous groups may define "indigenous agriculture" in ways that include industrial agricultural technologies such as fertilizers or tractors, in part because it serves their larger goal of maintaining their physical and cultural identity (see, e.g., Bebbington 1993). Zuni indigenous 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 (Cleveland et al. 1995). Most indigenous farmers appear to be more than willing to experiment with modern crop varieties and will adopt them when they fulfill complex criteria that include not only local adaptation and cultural value but increased yield as well (Soleri and Cleveland 1993).

Examples of the contextual dependency of self-identification as "indigenous" and of the current understanding of how such groups actively construct their cultures have proliferated recently. For example, Indian "culture" in Colombia is not a thing but a changing and flexible creation that comes into play when a "we" and a "they" interact (J. Jackson 1995). New institutions such as tribal councils, transtribal federations, and cultural "brokers" are created in this process, sometimes

with considerable conflict. ''Indigenous'' may be a term that can only remain fuzzy and useful heuristically, while the peoples who appropriate it do so on an ad hoc basis that contrasts themselves with others. Thus, local constructions are the ones outsiders must deal with when seeking knowledge or promoting change, and indigenous peoples have claimed the right to define themselves (Hannum 1996, PCRC 1995), a right that has been recognized by the United Nations (Axt et al. 1993). Indeed, it seems increasingly difficult or even impossible for indigenous groups to maintain any sense of uniqueness, group identity, or rights in cultural and natural resources without negotiating their rights as well as their identity with dominant industrial society in ways that inevitably change them and their cultures (see Eriksen 1993).

Second, there is much heterogeneity both within and between indigenous farmer groups. Progress in resolving competing claims to rights in crop genetic and other resources 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 (e.g., Berkhofer 1975, Lohman 1993, Said 1978), and of indigenous cultures by indigenous peoples themselves (J. Jackson 1995).

Third, outsider interpretations of farmers' behavior demands appreciation of their knowledge as the result of a complex interaction between objectivist and relativist epistemologies. Indigenous farmers' knowledge may sometimes be more ad hoc improvisation than the organized body of indigenous scientific theory and data that outsiders often imagine (Richards 1993). Yet there is also evidence that farmers experiment carefully to discover the nature of objective reality and conceive of independent causal variables (Ashby et al. 1995, Richards 1986).

Current social science theory and data suggest that indigenous groups will have to negotiate their identities, rights, and control of resources with dominant state societies and with each other as well. National and even international laws and conventions appear to be lagging far behind in understanding and accepting the fluid ways in which indigenous peoples define themselves.

CROP GENETIC RESOURCES

Folk crop varieties, also known as landraces or farmers' ''traditional'' or ''primitive'' varieties, are ''geographically or ecologically distinctive populations which are conspicuously diverse in their genetic composition both between populations and within them'' (Brown 1978:145) and are the product of local selection by farmer breeders (Harlan 1992, NRC 1993). The wild and weedy relatives of domesticated species are also an important source of genetic diversity via cross-pollination both for predominantly self-pollinating crops such as rice or beans and for cross-pollinating crops such as maize or pearl millet (Harlan 1992, Richards 1995). This diversity forms the basis for the development of new varieties by farmers. We use the term ''farmer breeders'' to refer to indigenous farmers in their role as plant breeders whose breeding work is based primarily on their knowledge of the phenotypes (morphology, phenology, yield) and on the social and cultural roles of crop varieties. In contrast, we use ''formal breeders'' or simply ''breeders'' to refer to plant breeders whose work is based on modern scientific data and theory, including the genetic basis for plant phenotypes in individuals and populations, and on statistical analysis but also on empirical selection in the field based in part on intuition (Duvick 1996). Folk varieties are the basis from which all current crop varieties have been developed, and they remain an important part of the crop genetic resources on which modern industrial agriculture continues to rely (Plucknett et al. 1987).

Despite the lack of a comprehensive data base, there is evidence suggesting that the rate of loss of folk varieties has increased with the modernization and internationalization of agriculture (Cleveland, Soleri, and Smith 1994). The development of modern formal plant breeding after 1920 resulted in modern varieties (crop varieties developed to respond with relatively high yields to optimal growing conditions that often include relatively high levels of inputs), probably leading to an increase in the rate of loss of folk varieties. After World War II, the spread of industrial agriculture in the Third World (the ''green revolution'') greatly increased yields, especially of wheat and rice, and made it possible for world food production to increase in tandem with the human population, while at the same time further increasing the rate at which modern varieties replaced folk varieties (Evans 1993).

The crop genetic resources issue has become prominent within industrial agriculture in recent decades because crop genetic resources professionals see the ongoing loss of folk varieties, the desire to maintain and increase world food production in the face of increasing environmental and social constraints, and recent advances in agricultural biotechnology as justifying increased investment in the collection and characterization of folk varieties to facilitate their use as ''raw material'' for breeding modern varieties (Plucknett et al. 1987). Though most breeders select new crop varieties from material that has already been improved by formal breeding, folk varieties are seen as a very important source of genetic diversity. Their potential importance has increased with growing recognition that future demand for increased food production will force reliance on more marginal growing environments (Ceccarelli et al. 1994) and as the economic and environmental cost of industrial agriculture means that production in the more optimal environments must acknowledge the imperative of ''sustainability'' (NRC 1989, 1993). In addition, recent developments in biotechnology have made genes in folk varieties and their wild and weedy relatives much easier to identify and manipulate (Tanksley and Nelson 1996).

Folk varieties are also important for direct use by

farmers as they adapt to changing social and biophysical environments, producing relatively stable yields with a minimum of external inputs while supporting communities (Cleveland, Soleri, and Smith 1994). Folk varieties contribute to production stability in indigenous agriculture because through local, ongoing natural selection by the environment and artificial selection by farmers they are adapted to often stressful, low-external-input local growing conditions (Evans 1993, Harlan 1992, Weltzien and Fischbeck 1990). The stability-enhancing heterozygosity and/or heterogeneity of many folk varieties may often be reinforced by the greater ecological and social diversity of indigenous farming systems compared with industrial systems (Cleveland, Soleri, and Smith 1994, Souza, Myers, and Scully 1993). Because modern crop varieties are grown under more uniform conditions requiring a higher level of external inputs, their yield variability may be greater because of variability in weather, pest and pathogen evolution, and supply and price of inputs (Anderson and Hazell 1989). Folk varieties are also valued by farmers because of the cultural values with which they are imbued, such as their symbolism in religious ceremonies (e.g., Soleri and Cleveland 1993).

As part of the move toward sustainable agriculture in recent years, there has been increased interest on the part of plant breeders and farmers in collaborating. Some plant breeders see folk varieties as important for use in developing new varieties for farmers (e.g., Ceccarelli et al. 1994). Others see folk varieties as important for direct use by farmers, with possible improvements through collaboration with formal plant breeders to introduce new sources of genetic diversity and to increase the efficiency of selection (e.g., Berg et al. 1991, Eyzaguirre and Iwanaga 1996, Worede 1992).

INTELLECTUAL PROPERTY RIGHTS

Crop genetic resources contain in their genetic structure the information they need to replicate themselves. Farmers, modern plant breeders, and molecular biologists, through their control of growing environments, selection of whole plants or seeds, or direct manipulation of the genetic code, change this information and so create new varieties. Because this mental or intellectual activity is important in the development of folk varieties, many different groups of indigenous farmers have considered their crop varieties "intellectual property" in which they have rights.

Laws and regulations establishing intellectual property rights, rights to the intangible work of the mind considered by society to be property (Sherwood 1990), are the main way in which crop varieties and their genetic traits are legally controlled in the industrial world. While there is no "internationally uniform definition of intellectual property and accruing legal rights" (Axt et al. 1993:36), intellectual property rights in the industrial world are viewed as an extension of commercial monopoly rights for a limited time period to provide an incentive to develop new "inventions." This granting of a monopoly is based on the assumption that a profit motive is required as an incentive and that this suspension of market competition results in greater social benefit (Duvick 1993). Intellectual property rights in the industrial world spring from European philosophical traditions that see individual ownership of property as essential for individual identity and liberty (Hurlbut 1994), and "Western legal concepts do not generally include the notion of collective rights" (Axt et al. 1993: 27).

The United States was likely the first nation-state, in 1930, to provide modern legal intellectual property rights protection for new plant varieties (Greengrass 1993). To date most of the industrialized world has applied quite different standards of protection to folk varieties as compared with improved germplasm and modern varieties: insistence on free access to *folk varieties* and their wild and weedy relatives as common human heritage, with no recognition, control, or compensation to the farmer breeders who developed them when outsiders collect their seeds, when they or their genes are used in the development of modern varieties, or when their seeds, food products, or names are used commercially, in contrast to promotion of maximum legal protection for *modern varieties*, improved germplasm, and their genetic components as private property and monetary compensation for individual scientists and corporations who manipulate folk varieties in their laboratories and experimental plots to create modern varieties or when folk variety seeds, food products, or names are used commercially.

These positions rest on the assumptions that folk varieties are "biological resources" and therefore "the common heritage of all humans, and that the free flow of biological resources is in the best interests of all people" (Brush 1992:1618), while materials "improved" by plant breeders or molecular biologists (Brush 1993) are not "resources" in this sense. These assumptions are often stated as "general principles" or values shared by all people, although there is usually little or no evidence provided in support, especially for nonindustrial societies. From this viewpoint, intellectual property rights as currently defined and used by industrial countries are taken as valid for all peoples and all times. The Western industrial nations, the United States foremost among them, have been exerting pressure on Third World countries, most of which do not recognize patents on living things, to accept industrial notions of intellectual property rights and create and enforce national laws supporting them (Belcher and Hawtin 1991). This is occurring for example in the implementation of the latest round of the GATT through the World Trade Organization and in the Convention on Biological Diversity (Article 16[2]).

There is, however, significant disagreement in industrial nations over the extent to which their intellectual property rights serve intended social purposes, even in narrow terms of increasing economic efficiency. A Brookings Institute study, for example, found that for many industrial sectors in the United States, intellec-

tual property rights are one of the least important ways to secure economic benefits from innovation (cited in Brush 1993). At the same time, conventional economists, agronomists, and intellectual property lawyers often consider intellectual property rights protection of innovation critical for economic growth and the lack of industrial intellectual property rights a major impediment to "development" of Third World economies (e.g., Sherwood 1990).

There are also major disagreements within industrial agriculture between the public sector (government and many agricultural universities) and private corporations over the extent to which more restrictive forms of intellectual property rights, especially utility patents, impede research and development of new crop varieties in return for higher short-term profits for the patent holder (Kloppenburg 1988, Plowman 1993). There is also disagreement within the private sector, as dramatically illustrated by industry challenges to broad-based patents granted in recent years primarily to some large multinational biotechnology companies on the ground that they discourage research by other companies. For example, the patent granted by the U.S. Patent and Trademark Office in 1992 to the W. R. Grace Co. subsidiary Agracetus was based on a technique for transferring genes but confers intellectual property rights on all genetically engineered cotton. The Patent Office rejected the claim in December 1994, but it remains in effect until Grace exhausts its appeals (RAFI 1995). A similar patent granted to Agracetus by the European Patent Office in 1994 applies to all genetically engineered soybeans (Stone 1995).

However, the debate over how well the socially mandated division of costs and benefits between the private and public sectors by means of intellectual property rights serves social welfare in industrial countries is rarely extended by advocates of the industrial system to the larger question of how well global social welfare is served by the division of costs and benefits between industrial and indigenous agriculture as currently determined primarily by industrial-world value systems and intellectual property rights mechanisms. While no one knows how the expansion and extension of industrial-nation concepts of intellectual property rights in plants could ultimately affect farmers and their folk varieties, it is likely that they will "be at a disadvantage without construction of proper safeguards" (Keystone 1991:12) and that "the profound and far-reaching questions raised by this issue will not even be evaluated before the decision is taken" (Belcher and Hawtin 1991:14; see also RAFI 1995). Government agencies of the United States, for example, have not resolved or even seriously examined these issues as they relate to the indigenous Native American groups within its own borders.

The concern of indigenous farmers worldwide for safeguarding their rights in crop genetic resources appears to have grown as plant breeders' rights, patents, trademarks, and other industrial-world forms of intellectual property rights are increasingly perceived to threaten alienating them from control of and denying them compensation for these resources. This includes use of genetic traits desirable for commercial plant breeding and industrial agriculture and of folk variety names and foods without permission, compensation, or apparent recognition that indigenous farmers may have rights to these resources (e.g., Soleri et al. 1994). Beginning in the 1970s, advocates for indigenous farmers in the industrial world have raised awareness of this issue (e.g., Mooney 1983) and have helped to gain a voice for the indigenous viewpoint in international fora such as the FAO and the Keystone dialogue (Fowler 1994). Today the Rural Advancement Fund International (RAFI), based in Canada, and Genetic Resources Action International (GRAIN), based in Spain, are the two leading industrial-world nongovernmental organizations (NGOs) working in behalf of indigenous farmers. In addition, many Third World NGOs and farmers are becoming active in promoting indigenous intellectual property rights in folk varieties (e.g., COICA and UNDP 1994, Kothari 1994, *Mataatua* 1993). The view from industrial agriculture is sometimes that these activities are politicizing for personal gain what should be objectively evaluated scientifically (e.g., Frankel 1988).

In response to industrial-world pressure for the use of its intellectual property rights system as the standard for classifying rights in crop genetic resources, including folk varieties, many indigenous farmers and their supporters see a need to protect the rights of farmers to (1) grow folk varieties and market folk variety seeds and food products, (2) be compensated when folk varieties, folk variety genes, folk variety food products, and folk variety names are used or marketed by others, and (3) have a say in the manipulation and other use of folk varieties by outsiders, which may violate the cultural and religious values with which folk varieties are often deeply imbued.

Indigenous Farmers' Intellectual Property Rights in Folk Varieties

Understanding the possibilities for protecting indigenous farmers' rights in their folk varieties involves viewing the issue of intellectual property rights from a perspective in which industrial-world values and concepts represent only some of a wide range of alternatives (see, e.g., Hurlbut 1994). Data on indigenous peoples' concepts of intellectual property, especially in their crop varieties, do not support either the common view that they have no basis for claims of property rights in their crop genetic resources or the notion that they have no concept of intellectual property rights or that if present these rights are always communal. They do provide a more realistic basis for evaluating the appropriateness of industrial-world intellectual property rights and of alternatives to this system.

INDIGENOUS INTELLECTUAL PROPERTY RIGHTS

Many in the industrial world imply that their concept of intellectual property rights is the only possible mani-

festation of property rights in crop genetic resources, and this view tends to dominate the general discussion of the rights of farmers. Even many of those in the industrial world sympathetic to indigenous peoples seem convinced that "privatization or commoditization" of property by indigenous peoples is "not only foreign, but incomprehensible or even unthinkable" because their property frequently has spiritual manifestations (Posey, Dutfield, and Plenderleith 1995:901) or that knowledge in peasant and tribal societies is "routinely treated as a public good" and notions of proprietary knowledge appear only with the early influence of capitalism from the outside (Brush 1996*a*:151). This is also a common view in the nonindustrial world: "Through much of history, biodiversity has been the common property of local communities and governing authorities, with both resources and knowledge being freely exchanged" (Nijar and Ling 1994), "free exchange of genetic material" being part of "the ancient and constant relation between the people and their land" (Calle 1996:129, 136). Indigenous peoples also sometimes adopt the industrial-world definition, though some promote a general concept of intellectual property rights that moves beyond that view, for example, by stating that "all aspects of the issue of intellectual property (. . . control of the knowledge or cultural heritage of peoples . . .) are aspects of self-determination" (COICA and UNDP 1994).

As far as we know, no comprehensive study of intellectual property in indigenous societies has been carried out. However, examples of intellectual property's being treated by indigenous peoples as if they recognized a range of rights from individual to group abound in the ethnographic literature. Anthropologists have long recognized variation in distribution of cultural knowledge as the result of factors including age, sex, social status and affiliation, kinship, personal experience, and intelligence (Berlin 1992), which forms the basis for indigenous intellectual property rights. Ethnographic examples make it clear that indigenous peoples have notions of intellectual property and that these rights may exist at the level of individuals and/or of groups based on residence, kinship, gender, or ethnicity. Among the Azande, for example, there are magicians from whom "magic must be bought like any other property" by a pupil who receives knowledge about plants "in exchange for a long string of fees" (Evans-Pritchard 1937: 213). In the Pacific island group of Truk (Chuuk), it is traditionally from lineage relatives "that a person learns those technical skills and esoteric types of knowledge which are more carefully guarded as private property," and "all knowledge is susceptible of being treated as property. This is especially likely if it is not widely known or is difficult to learn and has some practical or prestige value" (Goodenough 1951:52).

Hannemann provides a vivid discussion of the concept of *wou*, which he translates as patent rights, within Madang society in New Guinea (Hannemann 1949:33). Some *wou*, like the exclusive right to plant certain species of yam or taro, were disregarded after colonial occupation, but others remained inviolable, including pot making, the fashioning of wooden bowls, and control over the *kangaz* nut. He reports that when a *kangaz* tree was planted in a village where no one had the right to plant the tree, its bark was promptly ringed by a pupil from one of the regions that claimed the *wou*. Lowie, speaking of visionary experiences of Plains Indians, notes that those who did not undertake a vision quest could partake of the success of those who did: "This was rendered possible by the notion that privileges conferred by a spirit are transferable; and this conception became a source of gain to the visionary through the additional conception that they were alienable only through sale" (Lowie 1920:238). Such rights were so highly prized for the status they conferred on the holder "that no one ventures to infringe his patent," and anyone desiring to share the right or buy it outright would "sacrifice property to what we should consider an absurd amount" (pp. 238–39). He makes it clear that many of the rights, such as the right to plant sacred tobacco among the Crow or to join a military club among the Hidatsa, were individual not collective transactions, concluding that "certain incorporeal forms of property thus support beyond cavil the possibility of personal ownership" among tribal peoples (p. 242). "The point is that among the Andaman Islanders, the Kai, the Koryak, and the Plains Indians, regardless of any laws relating to material possessions, there are also patents and reserved rights which are held personally and upon which no one not duly qualified dare encroach" (pp. 242–43). In a similar vein Steward writes, "A Barama Carib shaman carefully 'guards the proprietary interest' in his incantations, which are regarded as peculiar to himself" (Steward 1949, quoting Gillin 1936:171, 175).

A major study by outsiders of the law of one indigenous farming group in North America (the Zunis) pointed out that "there is much evidence that in the ceremonial or religious realm a very clearly formulated notion of property in intangibles obtains. This is exemplified by the 'ownership' possessed by an individual or group in certain esoteric ritual procedures, songs, or dances; or by a curer in certain methods of healing" (Smith and Roberts 1954:65). Some 70 years earlier, in 1881, John Bourke had recorded a conversation with a Zuni (Nayuchi) about a Zuni medicine society that reflects that tribe's tradition of intellectual property rights and the rationale for those rights. Nayuchi said that a Secret Order is for the benefit of the whole world, not for the exclusive benefit of the few members, but that "its privileges are the property of its members and should be preserved with jealous vigilance: since, if they became known to the whole world, they would cease to be secrets and the Order would be destroyed and its benefit to the world would pass away" (Green 1990:188). Contemporary Zunis have a similar perspective; "any object created on the basis of Zuni knowledge" belongs to the Zuni people (Merrill et al. 1993). This extended in one case to masks made by non-Zuni Boy Scouts in imitation of sacred Zuni masks, which Zuni religious leaders successfully demanded be handed over to them. If such definitions of cultural rights were extended to folk varieties, it could mean demands for the return of

folk variety seeds in ex situ collections, including national and international gene banks.

INTELLECTUAL PROPERTY RIGHTS IN BIOLOGICAL RESOURCES AND FOLK VARIETIES

Lack of documentation of indigenous farmers' plant breeding may be a major reason for failure to consider the possibility that farmers have an intellectual investment in their folk varieties. When crop domestication in ancient times is assumed to be a result of selection by the environment and "unconscious" selection by farmers (e.g., Heiser 1990:197–99; Poehlman and Sleper 1995:9), it may be difficult to recognize farmers' active investment. According to this argument, while there could possibly have been some conscious or intentional selection of varieties after domestication, it was not until the 19th century in Europe that conscious selection definitely occurred and not until after the rediscovery of Mendel's "laws of inheritance" in the early 20th century that "modern genetics gave plant and animal breeding a firm scientific basis" and "planning replaced accident" in plant breeding (Heiser 1990:203). Lack of data on early indigenous crop development may make the situation ambiguous. For example, one plant-breeding text cites the development of modern maize varieties by American Indians as "major plant breeding milestones" but also agrees with the suggestion that since this took 4,000 years it was probably achieved "without the realization of what was being done" (Stoskopf, Tomes, and Christie 1993:6,5).

While there has been no comprehensive study of indigenous farmer plant breeding, those who have studied contemporary indigenous farmers' relationship to their crops often observe that the genetic composition of folk varieties is "frequently deliberately manipulated by cultivators" (Harlan 1992:148). Data suggest that farmers use a wide range of sociocultural and environmental criteria to manage the genetic structure of their crops, and this may include the planning, execution, and evaluation of experiments with new varieties (Berg et al. 1991: 10–16). Much of the evidence for this is anecdotal, however, and there is a tendency for some outsiders to romanticize indigenous knowledge as indigenous "science" as defined in Western terms (see Richards 1993: 62)

The limited data so far from Africa (Ferguson and Mkandawire 1993; Longley and Richards 1993; Richards 1986, 1996; Voss 1992:47), the Americas (Bellon 1991, Benz, Sanchez-Velasquez, and Santana Michel 1990, Brush, Taylor, and Bellon 1992, Soleri and Cleveland 1993, Zimmerer 1991), and Asia (Dennis 1987, Vaughan and Chang 1992) suggest that farmer breeders manage existing varieties and create new ones through a variety of techniques. These include collection and domestication of wild plants, hybridization of different folk varieties and of folk varieties and wild species, planting patterns to regulate cross-pollination, removal of unwanted plants in the field, maintenance of varietal mixtures of self-pollinated crops, and selection of seeds for replanting on the basis of desired plant and seed characteristics. They also obtain new varieties from spontaneous mutations in their fields and from neighbors, extension agents, and markets. There are many indications that farmers' repertoires of different crops and crop varieties are consciously manipulated for agronomic, social, and cultural reasons (e.g., Richards 1986, Soleri and Cleveland 1993). There is obviously a need for more empirical data on farmer selection and management of folk varieties before definitive statements can be made.

It is sometimes stated that indigenous farmers have no conscious sense of intellectual property rights either in folk varieties in particular or in biological resources in general. For example, it has been suggested that "uncollected and uncharacterized genetic resources have not been conceived of as intellectual property by farmers or collectors" and that "crop genetic resources in the traditional farming systems of LDCs [less developed countries] are customarily not considered to be property, nor are they treated in any way that suggests an implicit set of restrictive property rights" (Brush 1992: 1618, 1622). Evidence that indigenous farmers and their folk varieties do not fit the assumptions of industrial-world intellectual property rights mechanisms—for example, that Peruvian farmers recognized as creating specific potato varieties do not expect "monopoly rights"—is seen as support for the suggestion that indigenous farmers view their folk varieties as "open access" resources (Brush 1992:1622).

This view is challenged by evidence suggesting that the conscious effort of farmers in selection and maintenance of folk varieties forms the basis for their assertion of intellectual property rights in their folk varieties within their own societies at individual and group levels as well as in relationship to other societies and industrial society in general. The ethnobiological knowledge that has been documented supports the hypothesis that there are "common cultural patterns in the application of names for plants and animals in systems of ethnobiological knowledge" (Berlin 1992:230). Knowledge about folk varieties is often distributed unevenly, with gender and age being a common determinant. For example, Aguaruna women's knowledge of manioc varieties is much greater than that of Aguaruna men (Berlin 1992), and older Hopi farmers have greater knowledge of maize varieties than younger farmers, probably because of loss of traditional knowledge (Soleri and Cleveland 1993). It is this unequal division of knowledge upon which intellectual property rights within a cultural group are based, although it is important to remember that rather than reflecting actual knowledge distribution declarations of socially differentiated knowledge may be used to justify unequal access to resources (Fairhead and Leach 1994).

Richards's description of the development and dissemination of rice varieties by the Mende of Sierra Leone is perhaps the most detailed account of the conscious and extensive management by indigenous farmers of crops and crop varieties on the basis of sophisticated agronomic criteria. While Mende farmers show a strong sense of individual credit for the discov-

ery or introduction of new rice varieties (Richards 1986: 142–43), they tend to believe that rice genetic resources are "manifestations of ancestral blessing (i.e., good fortune not detrimental to healthy community life), as distinct from the kind of sudden private wealth inherent in 'playing the market' " (Richards 1996:227). In Butare, Rwanda, farmers may select new types of common bean occurring in their planting mixtures for trials as pure types, and "pride and secrecy accrue to such experiments," knowledge being shared only with close kin and friends (Pottier 1994). Sharing of this proprietary knowledge in new bean varieties plays an important role in gift exchange, a central component of this society.

Zuni farmers feel that they have group rights in Zuni folk varieties (Soleri et al. 1994). Three groups, the Zuni Tribal Council, the Cultural Resources Advisory Team of Zuni religious leaders, and the Zuni Irrigation Association, responded to a series of four fictitious scenarios depicting different situations involving Zuni folk varieties and outsiders. It was common to find 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, the Advisory Team stated that seeds of older Zuni folk varieties, including corn, beans, squash, melons, gourds, chiles, 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 took this position, believed that it was 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. The Advisory Team also believed that there should be recognition and compensation not only for any plant breeding using Zuni folk varieties occurring now and in the future but also for what had already happened in the past. They stated that these seeds should not be used as a commodity for profit and pointed to an event in Zuni oral narrative and history in which their corn had disappeared and they had been warned that the next time the disappearance would be permanent.

In the Palau Islands of Micronesia, taro is considered the most valuable staple crop. Women farmers readily share the varieties of taro that they grow in their individual plots (*mesei*), and the dissemination of new varieties is a source of prestige in traditional Palauan culture (Hirmina Brel Murray, personal communication, 1995). In the matrilineally based Palauan social system, a woman strives to bring wealth and prestige to her clan through service to her husband, to his matrilineage and clan, and to the greater society. A variety of taro typically takes its name from the *mesei* in which it was developed, and each *mesei* is named in a way that links it directly to a particular clan. Since everyone knows which clan owns a given *mesei*, the spread of a taro variety bearing a certain name brings honor and prestige to the clan of the woman who created and shared it, and her intellectual property right is limited to the name, with no restriction on subsequent sharing of the variety. That is, the compensation the woman receives is of a type distinctively valued by Palauan society. In Pohnpei, another part of Micronesia, cultivation of yam (*Dioscorea* spp.) is very highly regarded and "surrounded by great secrecy," and a person who discovers a new variety can name it with his own name, his title, or any other name (Raynor, Lorens, and Phillip 1992: 26).

Thus when farmers do share seeds with outsiders, it cannot be assumed to be because of lack of a concept of intellectual property rights in their folk varieties but may rather reflect an implicit assumption that those who receive them will treat them with the same respect as the farmers who gave them and not use them for commercial purposes (e.g., Soleri et al. 1994). When plant breeders or molecular biologists manipulate these folk varieties, and when they do it for private and/or corporate or organizational profit by exclusionary methods (such as plant breeders' rights or patents), then any implicit intellectual property rights contract with the farmers may be violated. The common assumption of industrial agriculture is that folk varieties taken from indigenous farmers are used in crop improvement that "potentially benefits all people." This ignores the possibility of damage to the folk varieties in the eyes of indigenous peoples, the inequality of compensation, and the fact that farmers may want to speak for themselves.

Even if agreement were to be reached that indigenous farmers do have intellectual property rights in their folk varieties, the complex, varied, and changing nature of indigenous intellectual property rights would make it difficult to decide at what levels these rights reside. Compensation has been suggested for individual farmers, farm communities, cultural (ethnic) groups, or a number of groups that share varieties (for example, folk variety seeds have often been shared between neighboring cultural groups in southwestern North America [Soleri and Cleveland 1993]). Nation-states and international bodies may claim to be trustees for farmers' intellectual property rights in folk varieties, as is the case with the farmers' rights set out in the International Undertaking of the FAO. Even when certain rights are vested in individuals, however, they are usually embedded in a context of community use rights and management responsibilities in ways quite different from those commonly found in industrial societies (Berkes et al. 1989).

Indigenous farmers appear to have a wide variety of forms of intellectual property. This perspective provides for a more realistic assessment of the appropriateness of industrial-world intellectual property rights to protect farmers' rights and for the exploration of alternatives.

Industrial-World Intellectual Property Rights Mechanisms and Indigenous Farmers

International intellectual property rights law is dominated by industrial-world concepts, and there is no legal "obligation in either existing or proposed international

law to recognize any property rights of indigenous peoples in their traditional scientific knowledge'' (Axt et al. 1993:43). Industrial-world intellectual property rights mechanisms have been created to protect ''readily identifiable, differentiated contributions'' of individuals and corporations, and a vigorous debate exists over the extent to which they can or should be used by indigenous peoples (UNEP 1994:10–11). The use of Western intellectual property rights mechanisms has been advocated for indigenous peoples on the grounds that this will be faster and more economically efficient than trying to create a new regime (Yano 1993).

Another point of view is that indigenous communities have maintained the biodiversity that the world values precisely because they and the resources they manage have been marginalized (Dove 1996). Therefore, attempts to apply intellectual property rights to indigenous communities are impractical, because any compensation will be skimmed off by nation-states that do not share their goals, and if applied are likely to be counterproductive in that compensation will only further draw marginal peoples into the world economy. In addition, it has been argued that industrial-world intellectual property rights concepts and mechanisms, having been created to meet the definitions and needs of Western scientific discovery, are ''worlds apart'' from indigenous knowledge that is the common heritage of humankind (e.g., Patel 1996) or from indigenous peoples' needs or concepts of intellectual property rights and that applying industrial-world notions of intellectual property rights would result in commercialization (Posey 1994:234–35). Applying these industrial-world notions to folk varieties is seen as the introduction of ''a tool of capitalism'' to indigenous farmers who are ''in some ways precapitalistic'' because their rights are valued by nonmarket mechanisms while breeders' rights are valued by market mechanisms (Brush 1992:1622, 1623).

Industrial-world intellectual property rights mechanisms can be divided into two groups with regard to the extent to which their use by indigenous farmers to protect rights in their folk varieties would affect indigenous groups: (1) plant breeders' rights and utility patents and (2) trademarks, contracts, ethical codes, and similar mechanisms.

PLANT BREEDERS' RIGHTS AND UTILITY PATENTS

Plant breeders' rights and utility patents are the primary means by which industrial-world plant breeders, public institutions, and private corporations protect their rights in crop genetic resources. These are the legal mechanisms being used and adapted most forcefully by the private seed and biotechnology industry worldwide, and they are changing rapidly, at the present time, mostly in response to pressure from these interests rather than concerns of indigenous farmers. Because they are relatively expensive to obtain in terms of monetary and technical data costs and because they confer short-term rights in specific crop varieties defined phenotypically and genotypically or in their genetic components, these mechanisms will probably not be useful to indigenous farmers. The importance for indigenous peoples of plant breeders' rights and utility patents may be primarily in understanding enough about them to protect themselves from the negative effects of their use by others.

What are generally referred to as plant breeders' rights are provided in the United States by the Plant Patent Act (PPA) of 1930 for asexually reproduced crops for a period of 17 years and the Plant Variety Protection Act (PVPA) of 1970 for seed and plants of sexually reproduced crops for a period of 18 years (Jondle 1989, Seay 1993). Fees in 1989 for Plant Patent Act protection, a plant variety protection certificate, and a utility patent were US$405, $2,400, and $3,540 respectively (Knudson and Hansen 1991). This, however, may be a minor expense compared with the legal work required to prepare a patent application (US$10,000–$20,000) and defend it over its 18–20-year lifetime (US$250,000) (RAFI 1995). (This does not include the laboratory work.) By 1995 almost 9,000 plant patents and 3,453 plant variety protection certificates had been issued (RAFI 1995).

In the United States utility patent protection (granted for 17 years) was extended in 1985 to plants and is replacing PPA and PVPA protection for commercial purposes, since the utility patents offer the patent holder much greater control (Williams and Weber 1989, J. T. Williams 1991). The breeders' rights granted by the PVPA, for example, have been subject to two important exclusions: researchers may use the protected variety to develop another new variety without paying a fee to the creator of the first, and until recently farmers purchasing and planting a protected variety could save seed to plant a future crop. Neither exemption is allowed under utility patent coverage.

The most important international agreement concerning intellectual property rights in crop genetic resources is the Union Internationale pour la Protection des Obtention Végétales, or International Convention for the Protection of New Varieties of Plants (UPOV). Signed by representatives of six European nations in 1961, it went into effect in 1968, promoted sui generis plant protection independent of regular patent law, and served as a stimulus to the seed industry in the United States in pressing for intellectual property rights in crop varieties (Fowler 1994:104). The 1991 Act of the UPOV Convention strengthens the interests of industrial agriculture. It sanctions double protection (UPOV plant breeders' rights and regular patents), extends UPOV to all plant species, and extends rights of protected varieties to harvested material (Fowler 1994:152). It also introduces the principle of ''essential derivation,'' which extends the protection offered by plant breeders' rights to a degree more similar to utility patents (Greengrass 1993:51). The signing into law of an amended PVPA in the United States in October 1994, including the removal of the right of farmers to sell saved seed and the extension of protection to potatoes and other tuber crops, makes that country the first to ratify the 1991 UPOV amendment (Congressional passage 1994).

In 1991 a statement like the following seemed alarm-

ist to some: ''The patenting of useful genes found in nature'' could mean that Third World farmers would have to ''pay royalties on biotechnology products which are based on their own knowledge and experience'' (Shand 1991:137). Yet in 1995 decisions by the U.S. Patent and Trademark Office relaxing the ''not obvious'' criteria for granting patents mean that a naturally occurring gene can be patented (Dickson 1995), and relaxing the ''utility'' criterion extends the control of patent holders over research even further (Gavaghan 1995). In addition, broad-based patents granted in the United States and Europe mean not only that legal protection provided to a patented gene can extend to the plant in which it occurs but that biotechnology processes can confer patent rights on entire crop species (Stone 1995).

The recent increase in the assertion of intellectual property rights in crop genetic resources by industrial nations has also been evident in international negotiations. The lack of what they felt was adequate intellectual property rights protection in the Convention on Biological Diversity is said to have impelled many U.S. biotechnology corporations to pressure the U.S. government not to sign that convention (Strauss and Worthington 1994). In trade negotiations, intellectual property rights became a significant part of GATT for the first time during its Uruguay Round with the inclusion, as a result of pressure from the United States, of Trade-Related Aspects of Intellectual Property Rights (TRIPS) provisions (Fowler 1994:172–79). GATT requires all parties either to adopt a system of patents for plant varieties or to develop an ''effective sui generis system'' to protect them (GATT Section 5, Article 27.3[b]). To many advocates of indigenous farmers' rights it seems likely that the outcome will be to force the plant breeders' rights provisions of the 1991 version of UPOV on Third World countries, since few of them will be able to write their own ''acceptable'' sui generis code (Hamilton 1993, Shiva 1994).

Given the push to globalize industrial-world intellectual property rights, especially plant breeders' rights and patents, what are the prospects for indigenous farmers? On balance, the objections to using plant breeders' rights or patents to protect indigenous intellectual property rights seem to outweigh the advantages. Use of these mechanisms would place indigenous peoples in an arena dominated by industrial-country governments, corporations, and legal systems. For example, while the official position in industrial agriculture now seems to be shifting to one that accommodates farmers' rights, for example, in recognition of communities as eligible for protection under UPOV, it still sees this process as one of farmers' conforming to industrial standards, for example, as long as varieties to be protected meet criteria of distinctness, stability, and uniformity (Greengrass 1996).

As noted above, indigenous peoples seem to have a wide range of intellectual property rights concepts, often with an emphasis on community rights or individual rights nested within community ones (Daes 1993). Industrial-world patents, said to have ''developed under Western reductionist thinking'' (GRAIN 1994), assume an identifiable individual or corporate creator. Their purpose is to promote innovation by encouraging commercial activity in the national and international marketplace, which may run counter to what many indigenous farmers see as the proper use of folk varieties and traditional knowledge. The high costs entailed in either applying for or challenging a patent and the difficulties in meeting the stringent technical requirements would probably prove overwhelming to most indigenous groups. The novelty, utility, and nonobviousness requirements of patent law and analogous plant breeders' rights requirements, as commonly interpreted by the dominant society, make these intellectual property rights mechanisms inappropriate for folk varieties (Axt et al. 1993).

In addition, the limited duration of plant breeders' rights and patent coverage would likely be unsatisfactory to peoples who have passed down and protected their knowledge across many generations. Indigenous peoples are often opposed to patenting or other forms of industrial-style ''ownership'' of living organisms (e.g., *Mataatua* 1993). One meeting of indigenous peoples in the Pacific called for the establishment of a treaty declaring the Pacific Region a ''lifeforms patent-free zone'' (PCRC 1995). Rather than being beneficial tools for indigenous farmers, plant breeders' rights and utility patents are more likely to be applied in ways which conflict with farmers' concepts of their own rights in their crop genetic resources, from which farmers may want to defend themselves. Suggestions have been made to modify the plant breeders' rights and patent system to protect the interests of indigenous peoples, such as requiring full recognition of the source of all gene bank accessions and establishing an ombudsperson in each industrial-world intellectual property rights body to investigate complaints from indigenous peoples (RAFI 1994:43–44). Other industrial-world intellectual property rights mechanisms may offer a partial counter to plant breeders' rights and patents as well as a positive way of promoting farmers' own concept of rights.

TRADEMARKS, CONTRACTS, AND ETHICAL CODES

Trademarks, contracts, ethical codes, and other mechanisms are relatively long-term and inexpensive and are not specifically related to crop varieties or their genetic components. These may be of use to indigenous farmers and their communities under some circumstances to regulate the collection of folk variety seeds and indigenous knowledge and their subsequent use. However, they too can also be used by outsiders in ways that infringe on indigenous farmers' rights. For example, trademarks and copyrights in indigenous names, symbols, or ideas are often granted to nonindigenous applicants because they are considered, like the folk varieties themselves, to be free-access property. The tendency in the industrial world has been to broaden the definition of this type of intellectual property, as in the extension of trademark rights in generic names, for example, the registration of the generic term ''taxol'' in 70 countries by Bristol-Myers Squibb (White and Cohen 1995).

When outsiders use or legally control an indigenous group's folk variety names, it may restrict that group's marketing of seeds or food products. In the United States, for example, there is increasing consumer interest in Native American folk varieties and food products, and indigenous names are frequently used on commercial products. 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 says on the package that they are "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." The 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 failure to consider intellectual property rights of indigenous peoples in their symbols or folk varieties (Soleri et al. 1994).

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, who implicitly contributed the "authentic" blue parent in the cross and who continue to produce their own blue corn folk varieties in large amounts (e.g., Soleri and Cleveland 1993). 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 (Marsh 1992; see also Berkhofer 1975; cf. Darian-Smith 1993 on Australian Aborigines). Blue corn meal is sold as an ingredient in "Native American" religious paraphernalia by "new age" mail order companies and has been marketed internationally as an ingredient in soaps and cosmetics.

There are a number of actions that indigenous groups can take to block the use of their names and symbols following legal guidelines and to alert appropriate government officials to their intellectual property claims (McGowan 1995). However, trademarks can also provide a way for indigenous peoples to use industrial-world intellectual property rights in ways that are more flexible than those provided by plant breeders' rights and patents. As opposed to specifically controlling genetic information, control of local names applied to folk varieties and their food products should be relatively easy to accomplish by trademarking, especially in industrial countries like the United States, where such intellectual property rights mechanisms have a firm legal basis (McGowan 1995).

Contracts can provide an even more flexible way of protecting indigenous farmers' intellectual property rights. Contracts between indigenous peoples and outsiders regulating access to biological resources have to date covered primarily activities outside of agriculture and have resulted from the interest of industrial-country pharmaceutical companies in medicinal plants in Third World countries (Reid et al. 1993). However, they can provide examples useful to farmers. One widely publicized arrangement is the "Letter of Collection" used by the U.S. National Cancer Institute (NCI). The Letter makes a commitment to provide "royalties and other forms of compensation" to the "source country organization and to individuals of that country, as appropriate," when a drug isolated from an organism collected in the country is commercialized (Cragg et al. 1994:89). While agreements have been mostly with source-country professional organizations, there is one agreement with an indigenous federation in Ecuador, and the NCI regards the Letter as the basis for further agreements with indigenous peoples. Contracts based on indigenous peoples' rights in religious objects and the human remains of their ancestors are being created in the United States to implement the Native American Graves Protection and Repatriation Act (NAGPRA) of 1990.

A number of professional and government bodies have written protocols and ethical codes to regulate outsiders' collection of indigenous farmers' folk varieties and traditional farming knowledge. These are significant steps by these bodies toward recognizing an interest on the part of indigenous farmers in their crop genetic resources but from the farmers' point of view may not adequately recognize the legitimacy of their rights. The Society for Economic Botany has produced a code of ethics to guide members in dealings with indigenous peoples regarding biological resources (SEB 1994*a*, *b*). However, this code still grants indigenous people rights as "those studied" and not as colleagues having their own concepts of rights to be negotiated with. The FAO's Code of Conduct for Plant Germplasm Collecting and Transfer assumes that the sovereignty of nation-states takes precedence over that of indigenous groups (FAO 1993). It states that access to crop genetic resources "should not be unduly restricted" and envisions implementation of its provisions by governments, professional societies, and collectors—not mentioning the indigenous peoples whose resources are the objects sought by outside parties. Similarly, the U.S. Department of Agriculture's guidelines for collecting folk varieties state only that collectors should "respect the local farmers" for their knowledge and encourage them to share it, with no mention of requesting permission to collect seed or of any formal recognition or compensation (USDA 1992). Indigenous peoples are also writing their own codes, one of the best-known being the guide for scientific researchers by the Kuna of Panama (Chapin 1991, PEMASKY and AEK 1988). Several model covenants have also been published that advocate an indigenous viewpoint (e.g., Posey 1994, Shelton 1994).

The use of trademarks, contracts, and codes by and for some indigenous peoples to protect indigenous rights, including rights in folk varieties, is an attempt to use industrial-world instruments to protect indigenous intellectual and material property. In some cases this

has worked to place control over use of knowledge and other resources in the hands of indigenous peoples. These instruments nonetheless contain several limitations: each community would have to produce its own version and ensure that its provisions covered every outside party that sought access, which might bring it into conflict with other communities; like all contracts they would be subject to disagreements over interpretation within groups and between the contracting parties; and national governments, eager to develop natural resources, might not lend their support to minority peoples attempting to restrict powerful development interests. Ultimately, of course, contracts or covenants have to be enforceable at some level, and this will often subject them, like trademarks, to adjudication by industrial-style legal systems, in which indigenous peoples inevitably operate at a disadvantage.

Still, discussions of trademarks and covenants and their applicability to indigenous groups are underlain by a sea change in public values within significant portions of the industrial world in the direction of recognition of indigenous peoples' claims to all of their cultural products. This awareness coincides with a rapidly growing consciousness among many of the indigenous peoples themselves that outsiders do not have an automatic right to redefine and use their intellectual property.

Alternative Approaches to Indigenous Farmers' Rights in Folk Varieties

The preceding discussion suggests that indigenous farmers will not be well served by the application of industrial-world intellectual property rights standards. Alternative approaches ultimately challenge the dominance of industrial-world values regarding crop genetic resources and attempt to establish the basis for a discussion of rights at a more general level. Yet at the same time any alternative must deal squarely with the facts of globalization and of increasing scarcity and decreasing quality of natural resources that exert pressure for a global consensus on and action to implement a ''sustainable'' agriculture. While definitions of sustainable agriculture vary widely and while industrial agriculture may acknowledge the legitimacy of indigenous agriculture in superficial ways (e.g., Blatz 1994), the idea of sustainability implies the possibility of defining a substantive area of common interest. Any assertion of rights in crop genetic resources by industrial agriculture and the many groups of indigenous farmers must be set in the context of our understanding of the importance of these resources for all present and future generations. Both industrial and indigenous agriculture will change, but neither is likely to disappear. They will continue to share crop genetic resources and will probably be increasingly influenced by each other. Can a way be found of sharing crop genetic resources that respects the range of concepts of rights in them while facilitating the sustainable production of food?

One way to begin is with a melding of indigenous and industrial mechanisms. For example, one group of indigenous peoples has advocated modifying the Western regime to create one that incorporates collective as well as individual ownership, a cooperative rather than competitive framework, and multigenerational coverage (*Mataatua* 1993). Beyond this, it will also require extended negotiations over the meaning of ''rights'' and ''resources'' that move the discussion of rights in folk varieties beyond the confines of intellectual property, both indigenous and industrial, and into the arena of cultural, human, and environmental rights. Zuni religious leaders, for example, have shown much more sophistication about this process than many nonindigenous experts. They see the necessity for developing hybrid, syncretic forms of rights in their folk varieties based on the primacy of traditional Zuni values while acknowledging the reality of the inclusion of Zuni culture within that of a dominant and alien society (Soleri et al. 1994).

A central difficulty in the development of any alternative is the ontological status of rights. Are they intrinsic, or are they socially constructed as a result of values shared by members of a local cultural group or through negotiation among a number of such groups (see Sober 1993:202–8)? If rights are intrinsic, then defining indigenous farmers' rights is a process of discovering common elements among diverse cultural groups, often on the assumption that their empirical universality implies inherent value. If rights are socially constructed, then defining indigenous farmers' rights is a matter of building consensus based on values held in common by different groups and on empirical data. Conventional economic theory emphasizes construction of rights through negotiations in the marketplace (see Hurlbut 1994:398–99).While the UN ''international bill of human rights'' is based on the assumption that these rights are inherent, the process of establishing these rights could also be viewed as one of social negotiation at the global level. In either case, the results for indigenous farmers may be the same. The ontological status of rights is more than an academic question, however, because it can influence the way in which the immense economic, cultural, and military power of the industrial nations is exercised in terms of the recognition of indigenous peoples' rights. However, it is almost certain that negotiations over rights and their ontological status will be strongly influenced by beliefs and data linking rights to sustainable use of crop genetic and other resources because of what many believe to be unprecedented threats to the viability of global ecosystems posed by human activity (Cleveland n.d.).

FREE ACCESS AND COMMON HERITAGE

Free access to all crop genetic resources was the original position of the 1983 FAO International Undertaking on Plant Genetic Resources, ''based on the universally accepted principle that plant genetic resources are a heritage of mankind and consequently should be available

without restriction'' (FAO 1987). But the definition of ''plant genetic resources'' was much different from that used by the industrial world, because it specifically included not only folk varieties and their wild and weedy relatives but existing and new crop varieties and ''special genetic stocks (including elite and current breeders' lines and mutants).'' This was vigorously opposed by Western industrial governments as antithetical to private property values (Fowler 1994:189–91). Meanwhile, the Seed Savers' Exchange of Iowa, a grassroots network for heirloom seed conservancy in the United States, has systematically published descriptions of its heirloom varieties (Whealy 1993, cited in Soleri et al. 1994) in the belief, based on information from the U.S. Plant Variety Protection Office in Beltsville, Maryland, that published documentation should protect described varieties from subsequent plant breeders' rights protection by placing them in the public domain. However, the strategy of publishing descriptions of folk varieties may actually increase the chance of patenting folk varieties or their genes if it alerts outsiders to desirable traits for the development of modern varieties.

The idea that crop genetic resources are always treated by both industrial-world scientists and indigenous farmers under a ''common heritage principle'' has been promoted as supporting an argument against the use of industrial-world intellectual property concepts to protect crop genetic resources (e.g., Brush 1996*a*, Frankel 1988). Yet such rights are often interpreted in ways that privilege the industrial viewpoint. For example, when it is stated that common heritage implies reciprocity, the fact that the terms of ''reciprocity'' have usually been determined by the industrial-world users of those resources is often ignored. Thus, an argument made by supporters of the industrial view is that indigenous farmers are repaid for the use of their crop genetic resources by the development of modern crop varieties that eventually make their way back to farmers. This is based on the assumption that industrial-world development experts and plant breeders always know what is best for indigenous farmers, an idea that has been frequently challenged in recent years (e.g., Ceccarelli et al. 1994, Hardon 1996, Simmonds 1991).

FARMERS' RIGHTS

The emergence of farmers' rights internationally as a political idea in the mid-1980s marked a radical departure from industrial-world conventions and an assertion of the importance of folk varieties and indigenous farmers (Fowler 1994). The ''free-access'' basis of farmers' rights in the FAO Undertaking was later modified as a concession to the dominance of the industrial-world system of private property, making farmers' rights more palatable to industrial-country FAO members. Since 1987 the promotion of farmers' rights has been the major international effort regarding intellectual property rights and folk varieties and was endorsed in 1989 and 1991 as part of the FAO Undertaking (see Fowler 1994). The FAO defines farmers' rights as ''rights arising from the past, present and future contribution of farmers in conserving, improving and making available plant genetic resources, particularly those in the centres of origin/diversity. These rights are vested in the International Community, as trustees for present and future generations of farmers, for the purpose of ensuring full benefits of farmers and supporting the continuation of their contributions'' (Esquinas-Alcázar 1994). There appears to be growing agreement internationally that farmers' rights are human as well as intellectual rights. For example, the Crucible Group states that the idea of farmers' rights ''has come to describe the whole spectrum of requirements'' that makes crop genetic resources a ''true resource,'' including rights to control over folk varieties, knowledge of folk varieties, financial, technical, and educational resources to develop folk varieties, and the right to control their own farming systems including land and access to markets (Crucible Group 1994:46).

Such broad statements of farmers' rights with values reflecting an indigenous viewpoint have been strongly resisted by many industrial-country governments and private seed and biotechnology companies. However, the mechanism that has been emphasized so far is a general fund for Third World agriculture, which would likely be similar to existing agricultural research and development organizations and would result in little if any change in recognition of the rights of indigenous farmers as defined by them. The 1994 agreement transferring jurisdiction over the large collections of folk varieties and other crop genetic resources in the gene banks of the CGIAR's International Agricultural Research Centers to the FAO means that the FAO's determination of what constitute farmers' rights and its negotiations with the CGIAR centers (whose gene banks continue to house the collections) take on much greater significance.

A farmers' rights fund has been established at the FAO into which industrial countries and seed companies could contribute a fraction of a percent of the profit from sales of modern varieties, but few contributions have been made (Posey 1994). The Keystone dialogue proposed that the money be used at the national or regional level for ''genetic conservation and utilization programs particularly, but not exclusively, in the Third World,'' which might also involve some sort of ''technology transfer'' to Third World countries (Keystone 1991). Keystone did not propose to reward or compensate ''individual farmers, farm communities, Third World countries or governments'' (Keystone 1990:25). It did, however, recommend that the breeder's exemption for the purpose of breeding included in plant breeders' rights protection be extended to farmer breeders (Keystone 1991).

Several objections can be raised to the farmers' rights approach as most commonly advocated. First, it leaves out local communities and indigenous groups by imposing a solution to indigenous farmers' intellectual property rights claims without their active participation. Thus it violates the principles of self-determination ar-

ticulated in a number of recent documents in which indigenous peoples have had a significant role, for example, the UN Draft Declaration on the Rights of Indigenous Peoples (UN 1993) and the Mataatua Declaration (*Mataatua* 1993). Second, it implies that the main value of folk varieties is as a resource for industrial agriculture and that free flow of crop genetic resources and money is the major goal. Third, it ignores the widespread conflicts between local indigenous groups and nation-states, placing sovereignty over crop genetic resources within their borders in the hands of national governments.

However, discussions of farmers' rights can move beyond a standoff between industrial and indigenous positions by exploring areas of possible common interest. For example, it may be in the long-term best interest of national governments to recognize indigenous farmers' rights to crop genetic resources when there is international consensus in defining and guaranteeing indigenous peoples' human rights or when indigenous peoples are clearly the "best" managers of the natural resources in their territory (see Cleveland n.d., Shelton 1994). The idea of farmers' rights has been extremely influential in establishing the possibility of alternatives to dominance of industrial-agriculture values. New ideas for defining and implementing farmers' rights via the FAO and the Convention on Biological Diversity are emerging, although they appear to continue to be dominated by the concept of farmers' rights as being held in trust by nation-states and respected through sharing of industrial agricultural innovations (FAO 1996*a*).

CULTURAL RIGHTS

Another approach is to establish folk varieties as the cultural heritage of local communities, thus removing them from the same playing field as the modern varieties of plant breeders. A 1971 amendment to the Berne Convention enables state parties to designate "competent authorities" to control licensing, use, and protection of national "folklore" (Daes 1993:32). Daes notes that a nation state could delegate the definition of folklore to indigenous peoples themselves, but apparently none has done so, and only a few states (e.g., Chile and Bolivia) have adopted laws on national folklore (Daes 1993:32). Few indigenous peoples are likely to want the state to manage their folklore in the way envisioned by the Convention.

The UNESCO/World Intellectual Property Organization Model Provisions for National Laws on the Protection of Expressions of Folklore Against Illicit Exploitation and Other Prejudicial Actions (UNESCO/WIPO 1982) recognizes the legal rights of communities to intellectual property in the form of folklore, defined as "traditional manifestations of the culture which are the expression of their national identity." It has been proposed that folk varieties could also be protected under the model law (Shand 1991), and it is for this reason that some advocate referring to indigenous crop varieties as "folk varieties" rather than landraces or traditional varieties (Keystone 1990:26; Fowler and Mooney 1990: xvi). The model law recognizes a right of folklore to protection on the same basis as other intellectual creations (Chapman 1994). If intellectual property of indigenous peoples is defined to include folklore, biodiversity, and indigenous knowledge as proposed by the UN secretary general (cited in Suagee 1994:200–201), then folk varieties might easily be covered. In 1989 UNESCO adopted a recommendation that the model law become a legally binding international convention, but it has not been ratified and is not receiving much attention from the world community (Posey 1994), though it continues to be promoted for protecting indigenous knowledge (RAFI 1994).

An even greater departure from industrial-world intellectual property rights concepts is the Study of the Chairperson of the Working Group on Indigenous Peoples of the UN (Daes 1993). It advocates a broad conception of the collective heritage of indigenous peoples, defined to include created products of the mind recognized in international law but also inheritances from the past and from nature, such as the natural landscape and the species of plants and animals used historically. The study suggests that most indigenous peoples regard their heritage not as property but as a skein of responsibilities obligating individuals and community alike. Heritage is therefore something that can be shared but never alienated from its culture and "should be managed and protected as a single, interrelated whole" (Suagee 1994:202–3). The assertion that indigenous peoples do not regard their heritage as property runs counter to many examples we have offered above. But these different views and the study's provocative interpretation of heritage demonstrate the great complexity of indigenous intellectual property rights. This strongly suggests that any single approach to dealing with indigenous farmers' rights in crop genetic resources is unlikely to be applicable in all indigenous groups or to all forms of knowledge within a group.

Indigenous peoples themselves stated in 1993 that the assumptions of industrial countries should be considered only one possible interpretation and that indigenous views should be treated as equally valid. The First International Conference on the Cultural and Intellectual Property of Indigenous Peoples, held in Aotearoa (New Zealand) in 1993, produced the Mataatua Declaration, affirming indigenous peoples as the exclusive owners of their intellectual property (*Mataatua* 1993). It states that indigenous peoples are capable of managing their own traditional knowledge, including any commercialization of traditional plants and medicines, and have the right to protect that knowledge.

Certain indigenous groups and federations have been successful in obtaining recognition from their national governments, and a few, such as the Kuna of Panama and Amazonian tribes such as the Kayapo, now have lands or reserves whose protection is guaranteed by those governments (see Turner 1995, Varese 1996). In the United States, government regulations published in 1978 provide the opportunity for Native American

groups to petition for recognition as an ''Indian tribe'' and thus acquire standing to press for restitution of lands taken from them or rights to fishing grounds, coal, oil, water, or other valuable resources and eligibility for the wide array of assistance in housing, health, education, and business development provided tribes by the government (Sider 1993:17–18). But as Sider notes, the regulations impose the dominant culture's notions of Indianness on any claimants and require multiple forms of continuity in identity, residence, and political authority that few ''tribes'' in North America, whether formally recognized or not, could hope to meet (Sider 1993:20–21). The Mashpee of Massachusetts suffered a notable failure to achieve official recognition as a tribe when a court ruled that they did not meet the standards of tribal continuity, in this case going back to the 1790s, as required by the law (Clifford 1988).

Another law recently passed in the United States, the National Historic Preservation Act (NHPA), radically expands in its ''traditional cultural properties'' provision what qualifies as a historic site, with a criterion explicitly recognizing the cultural values it may embody (Haley 1994). However, it enshrines popular conceptions of cultures that are very different from those of social scientists and many indigenous peoples themselves (Haley and Wilcoxon 1996). It assumes that culture is an inherent property of a group and that cultural groups have ancient origins and persist over time. The National Register of Historic Places (NRHP) guidelines for evaluating properties of traditional cultural significance currently implement the NHPA. These guidelines require such properties to be associated with cultural practices or beliefs rooted in a community's history and assume that ethnicity is an intrinsic property of a group, derived from persistence over time of its unique cultural content, and of ancient origin (Haley and Wilcoxon 1996). They also assume that the group itself has either persisted continuously over time or been assimilated. A possible third pattern—in which people actively create and claim an ethnic identity in the present while making selective use of their past—is overlooked (Haley and Wilcoxon 1996). To paraphrase John Maynard Keynes, the practical people who are drafting these regulations appear to be the slaves of some defunct anthropological notions.

What are the likely results of applying the notion of cultural rights to crop genetic resources? The U.S. experience with the NHPA and NRHP regulations indicates that well-intentioned administrators and government bureaucracies can get lost in the thorny issues of cultural understandings and definitions. The implications for folk varieties are similar, since questions arise over how a variety is defined and who should do the defining (e.g., modern plant breeders, corporate lawyers, or indigenous farmers) (Soleri and Cleveland 1993). Current anthropological understanding of the nature of culture makes clear that indigenous peoples themselves must be centrally involved in the process of defining crop genetic resources and their rights as cultural groups in them at both the international and the local level if the solutions formulated are to have a claim to legitimacy.

HUMAN RIGHTS

The concept of human rights has been proposed as a possible means for indigenous peoples to protect their rights in crop genetic and other resources (e.g., Posey 1996). There is opposition to this approach based on the premise that ''human rights'' is a Western concept. Even if human rights concepts were shown to be shared or desired by many different indigenous groups, the problem of negotiating such rights with the dominant group and between groups would remain. In recent decades various non-Western nation-state governments have made common cause with certain writers in international law and anthropology to argue that the concept of universal human rights is merely a Western construct with limited applicability (see, e.g., Howard 1995). Universal rights are said to be untenable because they are not an ideal that is universal to every culture; for example, the belief that women are entitled to equal status as citizens is not shared by all societies. It is also argued that universalism is untenable because indigenous cultures supersede human rights as a social good; that is, local customs and traditions determine the scope of the civil and political rights enjoyed by members of a given society. As compelling as such arguments may be, this cultural relativist position has been accused of being elitist because it ''holds that human rights are good for the West, but not for much of the non-Western world,'' and results in ''well-intentioned proposals that are deferential to tyrannical governments and insufficiently concerned with human suffering'' (Fernando Teson, quoted in Howard 1995:57). Also, romanticizing indigenous cultures fails to recognize that modern states in which elites wield enormous economic and political power against their fellow citizens dominate the globe (Howard 1995). It is argued that all citizens need and deserve protections against such states and self-serving social structures, and in fact many indigenous groups are on record as requesting assistance in the face of state oppression and abuses of power by appeals to their human rights.

Many international human rights documents that are already binding on state signatories explicitly or implicitly offer potential protection for indigenous peoples' intellectual property rights in folk varieties (see Shelton 1994). However, many indigenous peoples are unaware of the rights guaranteed in these documents, and many nation-states and multinational corporations are likely to resist any attempts to exercise them. Nevertheless, indigenous peoples have met some success by appealing to human rights, for example, to oppose the logging of rain forests in Borneo (World Rainforest Movement and Sahabat Alam Malaysia 1990). Moral suasion grounded in human rights agreements could, especially perhaps when such rights are defined as intrinsic, be an important tool for indigenous groups that want to assert con-

trol over the rights they claim in folk varieties independently of the industrial-world intellectual property rights mechanisms.

The 1948 Universal Declaration of Human Rights (UDHR) provides equal protection under the law (Article 7), the right to own collective property (Article 17), the right to fair compensation for work (Article 23), and the right to benefit from the protection of "the moral and material interests resulting from any scientific, literary or artistic production of which he is the author" (Article 27 [Braham 1980: appendix A]). While "work" could be interpreted as work related to traditional knowledge (Posey 1994), the assumption of individual authorship of a "production" may not often be appropriate for protecting most rights in folk varieties or traditional knowledge about them.

After the UDHR was written, the UN Human Rights Commission drafted two covenants "under whose provisions the principles of the Declaration were to become legal obligations for the ratifying states" (Braham 1980:6). The International Covenant on Civil and Political Rights and the International Covenant on Economic, Social, and Cultural Rights recognize self-determination of people's political status as well as their social, economic, and cultural development (Braham 1980:appendices C and D). Both covenants declare that people may freely dispose of their natural wealth and resources and that a people may not be "deprived of its own means of subsistence." None of these UN documents specifically addresses indigenous peoples as a separate category. The International Covenant on Economic, Social, and Cultural Rights contains the same language as the UDHR on an individual's right "to benefit from the protection of the moral and material interests resulting from any scientific, literary or artistic production of which he is the author." These two covenants went into effect in 1976 after ratification by the required 35 states and along with the UDHR became known as the "international bill of human rights" (Braham 1980:6). Under the Optional Protocol of the Covenant on Civil and Political Rights, in contrast to the other covenant and most other human rights documents, individuals may bring claims before the UN Human Rights Committee (Chapman 1994). However, a state would have to be a party to both the covenant and the protocol. These three UN documents assume all human rights to be inherent. The UDHR preamble speaks of the "inherent dignity and . . . equal and inalienable rights of all" as the "foundation of freedom, justice and peace in the world." The two covenants both state "that these rights derive from the inherent dignity of the human person."

The International Labor Organization (ILO) Convention 107 of 1957 was the first UN treaty to recognize indigenous peoples' distinctive rights. The revised Convention 169 of 1991 alters the previous assumption of eventual assimilation of indigenous peoples into nation-state cultures and instead assumes that indigenous peoples may want to remain distinct though not sovereign within nation-state borders (Chapman 1994). Although not a human rights document per se, it contains provisions of practical importance for indigenous intellectual property rights (Barsh 1994, Chapman 1994, Shelton 1994). Article 7 declares that indigenous peoples have the right to control their own economic, social, and cultural development; signatory national states are obligated to promote indigenous social and cultural identity and customs and by Article 15 must safeguard their peoples' rights to natural resources. Article 13(1) requires governments to respect the "collective aspects" of indigenous peoples' relationship to their lands. Although in recent years the ILO has criticized a number of nation-states in response to complaints filed by grassroots organizations, Convention 169 has relatively few signatories (Barsh 1994) and at any rate is nonbinding.

Perhaps the most significant recent international document relating to indigenous peoples' rights in folk varieties is the UN Draft Declaration on the Rights of Indigenous Peoples of 1993 (UN 1993). It is the first UN document on indigenous peoples to recognize indigenous peoples (in the plural) with rights to self-determination—that is, as cultural groups with rights as opposed to only individuals as in most previous human rights documents. Unlike almost all other UN statements of principle, the Draft Declaration was written with large contributions from indigenous peoples and groups that were not official state representatives. It asserts indigenous peoples' rights to self-determination, ownership of and control over their lands, and the maintenance of spiritual as well as material relationships with their traditional lands. Article 12 specifies the right to revitalize cultural traditions and customs and to protect such cultural manifestations, and Article 29 states that "indigenous peoples are entitled to the recognition of the full ownership, control and protection of their cultural and intellectual property" including "genetic resources, seeds, medicines, knowledge of the properties of fauna and flora, oral traditions, literatures, designs."

The Draft Declaration also asserts in Article 8 the right of indigenous peoples to define themselves. It does not attempt to define the term "indigenous," although the many non-Western peoples that participated in its drafting and the approximately 180 groups that have participated since 1982 in the UN Working Group on Indigenous Populations apparently found the term acceptable as a working description. Hannum observes that among the various UN fora and working groups it "proved impossible to arrive at a commonly accepted definition of 'indigenousness,' " just as in the past agreement could not be reached on precise meanings of "minority" and "people" in earlier human rights documents (Hannum 1996:88). Indigenous groups have also used the term "indigenous" without specifically defining it, as in the Mataatua Declaration. If the UN General Assembly eventually adopts a version of the Draft Declaration that contains the principle that indigenous

peoples have the right to self-government (see Suagee 1994) this will be an important base from which to exercise rights in folk varieties as human rights. UN member nation-states have, however, been very reluctant to acknowledge distinct indigenous groups within their borders, much less grant them rights (Chapman 1994).

Experience with laws recently enacted in the United States is relevant for understanding the possible effect of conceiving indigenous rights in crop genetic resources as human rights. Passage of the Native American Graves Protection and Repatriation Act (NAGPRA) in 1990 was significant for its recognition of the rights of Native Americans to the remains of their ancestors and their burial goods on a human rights basis (Trope and Echo-Hawk 1992). It also established legal precedent in granting priority to Native Americans' own historical and cultural traditions in the development of standards for the return of cultural objects, that is, the identification of their own values. "NAGPRA requires that ownership and alienability follow the definition of an object's historic Native creators, not the categorization of anthropologists, commercial art consumers, or museum educators" (Strickland and Supernaw 1993: 163).

Implementation of NAGPRA has illustrated two difficulties with conceiving of farmers' rights as human rights. First, because cultural groups are neither internally homogeneous nor neatly demarcated in time or social space, there is likely to be a great deal of conflict in sorting out rights within and between groups, involving questions of how to decide when a culture is "legitimate," what rights indigenous farmers have to create their own contemporary, syncretic cultural traditions concerning folk varieties, and how cultural boundaries define groups internally and externally in space and time. A major problem with NAGPRA has been intra- and intertribal conflict over these issues (e.g., Kight and Redmond 1995). Second, because of different conceptions of human rights in industrial and indigenous views, there will be disagreements over what human rights in crop genetic resources mean. Therefore, it is quite probable that human rights will be treated by the world community as contingent rights, regardless of assertions as to their inherentness, with successful conservation of genetic resources by an indigenous people becoming a key determinant of the world's willingness to grant it human rights.

NAGPRA has polarized archaeologists in the United States. On one side are those who see scientists' responsibility to science as justification for free access to Native American remains and a dismissal of contemporary Native Americans' desire to reinvigorate their cultural values, including religious beliefs. For this group, the challenge of NAGPRA is seen as convincing indigenous people of the value of scientific research (Morell 1995). On the other side are those who see the reconstruction of the past as arbitrary and contingent on current theory, techniques, and politics and consider the native view of history equally valid (Zimmerman 1994). Adoption of this view allows for cooperation with Native Americans who see value in objective data (Deloria 1992), but balancing positivist and relativist epistemologies may be difficult in practice because the use of resources under the two approaches (e.g., reburial vs. laboratory analysis) may conflict.

Crop genetic resources are often viewed in similar terms, with public-sector plant breeders and genetic resource professionals believing that they "clearly have the responsibility of guaranteeing the continued availability of those germplasm resources . . . for the common welfare of humanity" (Cox, Murphy, and Goodman 1988:136) while advocates for the rights of indigenous peoples see guaranteeing the rights of farmers as essential for maintaining crop genetic resources for humanity. These views may be compatible only within the framework of sustainable world food production based on a range of approaches to the use and conservation of crop genetic resources.

ENVIRONMENTAL RIGHTS

If human rights are defined as including environmental rights, for example, to a certain land base, this may imply rights to the biological resources on this land base. In practice recognition of indigenous rights by the dominant industrial society may often not include rights of indigenous peoples to manage resources in their own way, because resource management is considered to be based on scientific principles that are not culturally relative (e.g., Cleveland et al. 1995). However, this connection might be achieved by demonstrating indigenous peoples' knowledge and sustainable management of their environments and showing that their conservation of local environments and biological diversity is a vital part of a global effort on behalf of all humanity (Shelton 1994:46–65). Whether this will serve to protect indigenous peoples' rights in folk varieties depends in part on whether indigenous peoples are perceived by those who are politically most powerful (industrial nations and Third World national governments) as conserving the genetic diversity in their folk varieties and wild and weedy crop relatives and the natural or seminatural environments where they grow.

Agenda 21 of the UN Conference on Environment and Development assumes that indigenous farmers conserve biodiversity and crop genetic diversity and calls for programs and policies supporting in situ conservation of crop genetic resources in farmers' fields and local ex situ conservation in community seedbanks (UNCED 1993). Article 8(j) of the Convention on Biological Diversity on in situ conservation calls for signatories to "respect, preserve and maintain knowledge, innovations and practices of indigenous and local communities embodying traditional lifestyles relevant for the conservation and sustainable use of biological diversity" and to "encourage the equitable sharing of benefits" arising from the use of same. The FAO's Global Plan of Action for crop genetic resources calls for more emphasis on in situ conservation on the basis of evidence that "the rich diversity that exists today offers

ample testimony of what has already been achieved'' through farmers' management and development of their crop genetic resources (FAO 1996*b*:para. 26).

The extent to which indigenous peoples and biodiversity are interdependent is, however, an empirical question that has not yet been resolved, and the answer would seem to depend on the particular cultural group and its environment, the degree of disruption and assimilation by dominant societies, and the resources in question (Cleveland n.d.). Claims for indigenous farmers' rights to resources are often based on assumptions that indigenous farming is environmentally sustainable and that farmers' conservation of resources is based on accurate ecological knowledge and/or ethical principles of natural resource conservation (e.g., Calle 1996, GRAIN 1995). Examples exist of indigenous peoples' conserving (NRC 1992) and destroying (e.g., Lewis 1992) biodiversity. There appears to be variation within communities, between communities, and through time in the extent to which indigenous peoples use resources sustainably. While there are very few data for folk varieties, it is likely that the situation is similar.

Arguments for indigenous peoples' human rights to land and biological resources that rest on an assertion that indigenous peoples are inherently conservationist often mix value judgments about human rights with empirically testable hypotheses about the extent and efficacy of indigenous peoples' conservation of biodiversity, including crop genetic diversity (Cleveland n.d.). Indigenous rights and environmental conservation advocates may try to portray indigenous peoples in terms of Western environmentalist stereotypes (see J. Jackson 1995), an essentialization that has been referred to as ''green Orientalism'' (Lohman 1993). This is similar to the claims for women as natural conservators that ecofeminists have made (C. Jackson 1994). This lack of anthropological understanding of the dynamic nature of indigenous (and all) cultures is not a sound basis for advocacy; for example, supporters of rain-forest peoples who had ''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 (Turner 1995). It is extremely important to be clear about the basis for statements linking indigenous rights in folk varieties (and other natural resources) with indigenous peoples' conservation of those resources. If empirical data call for rejection of the hypotheses about resource conservation in a given instance, then those who do not share the values to which they are linked may deem this justification for not recognizing indigenous human rights (Cleveland 1994).

Nation-state sovereignty over resources is widely accepted in the Third World as well, and the Convention on Biological Diversity, for example, while providing groundbreaking international recognition of indigenous rights (Shelton 1994), also recognizes the sovereignty of nation-states over natural resources, including access to genetic resources, and defers to industrial-world intellectual property rights mechanisms in Article 16(2). Because of their vastly greater political power, the industrial nations are likely to have a controlling position in judging the adequacy of indigenous farmers' conservation, even if it has been the promotion of industrial agriculture that has resulted in the largest losses of folk varieties and their wild and weedy relatives. However, increasing acceptance of the need for more sustainable agriculture and for reducing the impact of other human activities on the environment is challenging not only assumptions about the sustainability of industrial and indigenous resource management but the concept of national sovereignty over natural resources.

Nation-states may be beginning to see that it is in their own best interest to pursue more environmentally sustainable policies regarding logging, fishing, or pollutants such as chlorofluorocarbons. This can mean conceding absolute national control of certain resources in order to maintain sustainable levels of exploitation of these resources (Caldwell 1993). A major difficulty common to all of the alternatives to the Western intellectual property rights regime that we are considering is that the dominant powers have heretofore defined the scope and terms of the debate. But consistent with a future in which governments accept some diminution of their sovereignty or impose restrictions, however tentative, on levels of human impact on resources is a future in which powerful states acknowledge the legitimacy of indigenous forms of knowledge and claims to its protection and use. Ultimately, intellectual property rights of any kind are meaningful only if the world's nation-states and indigenous peoples recognize that continuation of our species requires a healthy biophysical system in which the planet's crop genetic resources can produce food sustainably.

Conclusion

Three important conclusions can be drawn from our analysis of the debate over the world's crop genetic resources and the rights of indigenous farmers. First, the data suggest that indigenous peoples have concepts of intellectual property in folk varieties and take an active and conscious role in their creation, maintenance, and dissemination. Folk varieties have in the past had important cultural, social, and agronomic roles in indigenous agriculture, and these roles are evolving along with the ongoing development of indigenous agriculture that includes integration with some aspects of industrial agriculture. Holders of intellectual property rights in indigenous society include individuals and groups based on residence, kinship, gender, or ethnicity. Farmers' intellectual investment in folk varieties and the cultural, social, and agronomic role of folk varieties in indigenously based, syncretic, sustainable farming systems needs to be better understood through expanded scientific research rather than obfuscated with essentializing assumptions from both indigenous and industrial viewpoints. It is important to avoid defining indigenous farmers' rights in their crop genetic re-

sources in agreements, including major international ones, in ways that freeze farmers and their folk varieties in fantasies that never existed.

Second, resolving the dispute over rights, including intellectual property rights, in the world's crop genetic resources will be facilitated by considering indigenous farmers' values in a broad perspective and on an equal footing with the values of industrial agriculture. Industrial-world legal mechanisms that guarantee rights in crop genetic resources are generally not appropriate for indigenous farmers, and indigenous peoples may increasingly have to defend themselves against their use by others—although to some extent they can at the same time use them to protect their own rights. Currently there is a high level of international consensus, although mostly at the policy rather than the applied level, that indigenous peoples have at least some rights in their biological and cultural resources, but these rights are usually defined from an industrial-world perspective. Indigenous peoples could take advantage of this situation by adopting statements of principle based on the major international human, cultural, and environmental rights documents and engaging in discussion with national governments, international bodies, and multinational corporations that promote recognition of indigenous alternatives to the industrial system of values, rights, and laws. Creating workable solutions will require negotiating the meaning of such key concepts as "human rights," "intellectual property," "crop genetic resources," "social benefit," and, of course, "indigenous" and "industrial."

Third, the conflict between industrial agriculture and indigenous farmers over rights in crop genetic resources may be easier to resolve if placed in the context of a common goal of sustainable agriculture. While definitions of sustainable agriculture from industrial and indigenous viewpoints are still often far apart, there is hope that increasing evidence for global environmental degradation and the importance of folk varieties as crop genetic resources for sustainable world agriculture in general will encourage movement toward common ground. This will require flexibility from all viewpoints in response to increasing understanding of how agriculture can be made more sustainable. This is especially important because indigenous farmers' rights, as well as those of plant breeders and molecular biologists, will probably be increasingly viewed not as intrinsic but as contingent on the extent to which they support sustainability, including conservation and use of crop genetic resources to ensure the future world food supply. At the same time, movement toward a consensus on balancing rights in crop genetic resources between indigenous and industrial agriculture could provide an impetus for the future collaboration between indigenous farmers and industrial-world plant breeders to create improved crop varieties that are a key to increased sustainability for both industrial and indigenous agriculture and a future agriculture that moves beyond the limits of these categories.

Comments

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17 II 97

Cleveland and Murray have attempted to summarize and analyze the broad range of issues surrounding the current, contentious debate around "farmers' rights." Maintenance of world crop genetic resources is a very serious concern that generally receives insufficient attention from social scientists. This article should bring more attention to an understudied area.

Although the article covers what one might want to learn about intellectual property rights for crop genetic resources, it fails to capture the very real conflicts between the different perspectives active in this debate. The authors have tried to bring everything together and then find areas of overlap rather than recognize and focus on the strong lines defining differences. This approach is often successful in overviews of research, but the intellectual property rights debate is not found in journals and research articles. It is understudied, fast-moving, and often confined behind closed doors. Overall, the authors' generalizations from research reports seem a fast-forward, blurred conclusion to current debates that should be allowed to be played out in real time within the rich and diverse political scenes where they are now found.

Intellectual property rights are not the real driver in these debates; rather, they are an active side issue among people with other major concerns ranging from profit margins to subsistence to human rights. For example, India has been the site of vigorous debates and volatile popular uprisings related to intellectual property rights, and nongovernmental organizations have become active in related campaigns. These debates reflect Indians' political reactions to rapid economic and cultural changes associated with globalization (see Shiva and Ramprasad 1993, Sperling and Loevinsohn 1996, and Swaminathan 1995).

It is disappointing that Cleveland and Murray have chosen the term "indigenous farmers" to cover all farmers who follow traditional farming practices rather than recognizing the meanings of "indigenous people" as laid out by the ILO and followed by Axt et al.'s excellent analysis (1993). By failing to acknowledge the validity of the issues related to being "indigenous," they have lost an opportunity to give readers a glimpse of the different conclusions that may be possible over the next decade as well as the different scenarios that may unfold en route. Conflating the concept of "people who do indigenous agriculture" with the concept of "indigenous people" in the term "indigenous farmers" seems to serve no purpose except to make it easier to write about the subject in a general way. By using the term this way, although they may not intend to have this

rhetorical effect, Cleveland and Murray neglect the ILO definition of indigenous people and fail to acknowledge that intellectual property rights may be different for indigenous people (under the ILO definition) and for "local people" because the political situations and claims of the two are often different.

After the authors' critical review of fantasies about farmers, I am nonplussed by the concluding vision of what some might call a "fantastic" world commitment to global sustainable agriculture that in turn leads to what seems to be their ideal solution—"balancing rights" in utopian collaboration to create a new kind of agriculture on a world scale.

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Cleveland and Murray's wide-ranging article reaffirms several points that are well established in the literature: the role of indigenous farmers in creating knowledge and resources, the difference between industrial and indigenous management of these resources, property over immaterial goods among indigenous people, and the international discourse over the rights of indigenous people. The article reflects the ambiguities and possible confusion entailed in defining "indigenous" and "rights" which might protect a certain class of people.

The emphasis on international fora and treaties signals weakness in the effort to implement rights-based compensation for farmers for crop genetic resources. The nation-state retains a preeminent role in granting and implementing those rights, especially intellectual property rights. The failure of the farmers' rights initiative of the FAO Undertaking and the recent failure of talks on the Draft Declaration on the Rights of Indigenous Peoples evidence the wide gulf between international rhetoric and states' willingness or ability to act. Anthropological research on law and rights has consistently reconfirmed Hoebel's (1942) observation that rights are socially mediated. The farmers' rights movement has made little progress because the social benefit of bestowing a new class of rights has not been negotiated in the appropriate political arena.

Three topics warrant anthropological discussion and touch on anthropological theory in profound ways: (1) the problem of essentialism in defining culture and authorship, (2) the nature of the public domain, and (3) the valuation of knowledge and resources. Compensation for and commercialization of biological resources and indigenous knowledge are key elements in the discourse on crop genetic resources, and indigenous rights advocates have looked on intellectual property as a vehicle for compensation. The notion of intellectual property is a primary mechanism for capturing rents from creativity, but it depends on monopoly and exclusion of others. As the value of knowledge and biological resources increases, the pressure to claim them as exclusive cultural property will also increase. Cultural property is recognized at present, but it is currently not alienable as a commercial good. Moreover, exclusive cultural property implies an essentialist quality and type of authorship which have been disputed in anthropology (Coombe 1993, Strathern 1996). Research on the ecology of crop genetic resources indicates that crop germplasm flows, and perhaps must flow, between different farming systems (Brush et al. 1995, Louette and Smale 1996, Zimmerer 1996). In the Mexican state of Oaxaca, for instance, different farming cultures (Amuzgo, Chatino, Zapotec, Chinantec, Chocho, Ixcatec, Mazatec, Popoloco, Cuicatec, Mixtec, Trique, Mixe, Zoque, Chontal, Hahuantl, Huave, and mestizo) share races of maize whose provenience and filiation are obscure. The flow of germplasm and knowledge between social groups undermines assertions of ownership, just as one farmer cannot rightfully claim ownership of knowledge and germplasm to which others have contributed.

The appropriation of biological resources which are held as common property is part of a larger debate on the nature of public goods and the public domain. The idea that the public domain is bereft of rules and economically inefficient is refuted by anthropological research on common property management (Acheson 1989). There is no doubt that farmers "own" their knowledge and seeds, because these cannot be taken without consent. Nevertheless, farmers cannot benefit economically from crop germplasm or knowledge of seeds, because, once shared, these goods belong to the public domain. Removing goods from the public domain is possible but must be socially negotiated. There is no inherent reason that rights cannot be developed for farmers as they have for breeders. The question is whether this should be done. The essentialism required in granting exclusive rights to a particular group is one of many reasons to question whether farmers' rights should be pursued.

Whether to grant a new class of rights and whether farmers will benefit depend on the value of genetic resources. The heavy transaction costs of creating and running a system to generate economic benefit for farmers' knowledge and crop resources will be weighed against their imputed value. Valuation of nonmarket goods is notoriously difficult, and the simple supply/demand logic behind the purported increase in value of biological resources is inadequate. Simpson, Sedjo, and Reid (1996) find that the value of biological resources for pharmaceuticals has been inflated, and the same is likely to be true for agricultural germplasm (Brush 1996*c*).

Thus, sound reasons exist for questioning the wisdom of granting rights to farmers to commoditize their knowledge and the crop germplasm in their fields. An alternative is to look for nonexclusive and perhaps nonmarket compensation (Brush 1996*c*). Anthropologists who have worked with farming cultures where

these biological resources are abundant should have a major voice in discussions on the topic. The appropriation of culture, the nature of authorship, the social negotiation of rights, and the value of biological resources and knowledge all deserve more attention than they have been given to date.

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2 III 97

This article is a welcome, authoritative review of the major theoretical and policy-related issues involving the rights of indigenous peoples to crop genetic resources. It brings needed attention to bear on the issue of indigenous creation and maintenance of crop genetic diversity. The belief—contested by Cleveland and Murray—that indigenous communities do not create and maintain biodiversity is based, in part, on a view of traditional agriculture as static, unchanging, and very much "out of history." The perception of stasis is crucial to the idea that indigenous peoples are not actively contributing to crop genetic diversity and, therefore, have no claim to compensation when this resource is appropriated by outsiders. This perception bears little resemblance to what actually takes place in most systems of indigenous or traditional agriculture.

Among the Kantu' Dayak of West Kalimantan, Indonesia, for example, each year each household plants an average of 17 different varieties of rice, divided among two to three separate swiddens (Dove 1985). Whereas the ideal is to plant each variety discretely, in a separate stand within the swidden, in any given year one-half of the average household's rice varieties may be planted *in a mixture.* The Kantu' plant mixtures of rice varieties when (1) a given variety starts to perform poorly and is therefore planted with a variety that is performing better, (2) a new variety is introduced, either purposively or accidentally, and (3) a shortage of seed of one variety must be made up with seed of another variety. These mixtures are thus the result of the ebb and flow of agricultural fortunes, and they are not permanent. The Kantu' say that they monitor the performance of mixed stands and when one rice variety becomes "more numerous" than the others they reap it *separately* from the others and then plant it *separately,* in its own stand, the following year. Thus they consciously select for rice varieties that perform the best in the competitive environment of mixed varietal stands in what amounts to an indigenous, *self-conscious,* on-farm experimental breeding program.

The role of human effort in this process is culturally reflected in an elaborate proprietary system governing rice seed, in particular the seed of the ritually preeminent *padi pun* (stem rice). Stem rice cannot be bought, sold, or exchanged. It can be obtained only by the endogamously marrying partner from his or her natal household. (The endogamous kinship group is thus said to be *sebenih* [of one seed].) The donor household is given nothing in exchange (but the recipient household must sacrifice ten pigs to Pulang Gana, the spirit "Rajah" of the rice). The seed of rices other than stem rice can be obtained by one household from another by means of delayed exchange, when one household has a shortage and another has a surplus. As Cleveland and Murray suggest, therefore, the Kantu' (and other Dayak) view their rights to rice varieties "not as property but as a skein of responsibilities obligating individuals and communities alike." Given the ubiquity of indigenous systems of this sort, it is impressive how much of the current discussion of crop genetic resources is dominated (as Cleveland and Murray point out) by the question whether indigenous proprietary rights to such resources even exist.

This debate about indigenous rights to indigenous resources did not commence *de novo* with crop genetic resources; it is part of a wider and older discourse of development. Anthropologists have pioneered the analysis of the way in which this discourse does not so much "develop" as create new mechanisms for the extension of political and economic control into developing areas (e.g., Ferguson 1990). A past example, analogous to what is happening now with crop genetic resources, involves land resources; nonrecognition by the wider world of the existence of indigenous systems of land rights has facilitated land appropriation by nonlocal interests. When growing public awareness of the existence of indigenous land rights made it impossible to continue to ignore them, the insistence upon recognizing these rights only in exogenous terms, through programs of Western-style land certification, for example, led to *further* appropriation as privileged elites used their positions to dominate these programs.

Experiences such as this suggest that proposals to extend Western concepts of intellectual property rights to indigenous groups may privilege national elites but only continue the *de*-privileging of local communities (Dove 1996). For this reason, among others, it is important for anthropologists to contest the notion that indigenous resource rights should have to meet a test of similarity to an exogenous concept such as intellectual property rights. The problem, as Cleveland and Murray point out, is that "the dominant powers have heretofore defined the scope and terms of the debate."

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The biodiversity found in the diverse varieties of food crops and their wild relatives—often termed plant genetic resources—is critically important for global food security. It supports the continued productivity of the crops that provide most of the food supply for the plan-

et's five-and-a-half billion people. International controversy continues over the control of genetic resources and the distribution of the benefits from their use. Of major concern are the recent expansion of intellectual property rights held by industrial firms over crop varieties they have developed and the inadequacy of mechanisms for providing benefits to the farming communities and developing countries where genetic resources essential for developing such new varieties were created and conserved.

Anthropology can move this discussion forward by providing empirical evidence that cuts through the rhetoric and creates a base for developing practical alternatives to the dominant "industrial" model of intellectual property rights. For example, a number of commentators insist that no indigenous culture has a concept of intellectual property or, alternatively, that indigenous concepts of intellectual property are always purely collective and recognize no individual owners. Cleveland and Murray helpfully provide a list of examples to the contrary culled from the anthropological literature, illustrating the diversity and creativity of indigenous solutions to intellectual property rights issues.

In considering claims that indigenous farmers have rights to intellectual property relating to traditional crop varieties or "folk varieties," the authors rightly recognize two possible theories for defining and judging claims of legal right. One theory views legal rights as defined by the outcome of power struggles between various interest groups competing for the same resources. This power-struggle theory of rights is, however, purely descriptive and does not help society determine how to respond to indigenous claims regarding intellectual property rights. A second theory defines a legal right as based on society's decision about how to strike the best balance between various, possibly competing claims. Thus, a legal right may embody a social judgment about inherent moral values (e.g., the prohibition of slavery, which reflects the inherent human right to personal liberty), or it may be based on a utilitarian decision that it is a useful legal mechanism for advancing net social welfare (e.g., the legal right of an individual to bring a class action in U.S. courts, which does not reflect any inherent right belonging to the individual but is thought to encourage efficient resolution of disputes).

Unfortunately, the authors do not consider what the moral or utilitarian basis might be for changing existing intellectual property rights systems or creating indigenous intellectual property rights. Rather, they seem to assume as a given that prevailing "industrial" models of such rights interfere with indigenous peoples' rights regarding genetic resources. This reflects some activists' charges that industrial firms in the pharmaceutical and seed industries patent and thus monopolize knowledge or genetic resources that in fact were created by indigenous people.

The reality is much more complicated than such charges of "biopiracy" suggest. Not even the notorious Agracetus cotton patent, which asserts exclusive rights over all genetically engineered cotton regardless of the biotechnological method used (Hamilton 1994), infringes on traditional farmers' rights to use folk varieties. Other factors, such as government subsidies for high-input agriculture using modern varieties, probably have a greater impact. The real problem with such excessively broad patents is that they threaten to stifle innovation among industrial researchers and block exchange of information within the scientific community. This is a serious problem that is part of a dismaying broader trend whereby corporations holding intellectual property in industries ranging from electronic publishing to biotechnology are seeking to expand market dominance by broadening all kinds of intellectual property rights (Boyle 1996*a*) in what has been called an "information land grab" (Boyle 1996*b*).

Yet the typical claim of indigenous "intellectual property" relating to folk varieties seeks even more expansive monopoly control. A plant breeder's right gives the breeder limited rights to control the use of a distinct variety for a limited period of time; at the end of that time, all others are completely free to use the variety. At no time does the community or the country in which the variety was developed have any proprietary rights. Similarly, a patent gives the inventor an exclusive right to use a specific invention for a limited time, typically 20 years. For instance, the patent on the incandescent light bulb, invented by Thomas Edison in 1879, expired long ago. This innovation continues to enrich the lives of billions of people and serves as a basis for continuing incremental innovations, many of which are patented, but Edison's descendants make no claim for a share of today's profits from sales of light bulbs or related inventions. Nor does the United States ask other countries to pay a share of the profits from light bulbs manufactured in their jurisdictions. In contrast, a number of advocates of "farmers' rights" hold that communities in which useful folk varieties or indigenous knowledge have originated should maintain the exclusive right to control their use in perpetuity, whether they were developed 10 years ago or 1,000 (e.g., Nijar 1995). They do not explain why such a community should be entitled to a special right not available to others whose inventive predecessors gave the world comparable benefits. Because it is difficult to establish a moral basis for such a distinction, the human-rights-based rationales for indigenous intellectual property rights are unlikely to succeed.

More persuasive are arguments that indigenous farmers using traditional varieties should receive payments or other assistance in recognition of the great value that their folk varieties confer on world agriculture. These proposals are based on the utilitarian rationale that such farmers should have incentives to encourage them to continue to conserve and develop important plant genetic resources and associated knowledge and practices. Further analysis is needed to determine whether intellectual property is the appropriate incentive mechanism. The basic framework of intellectual property rights is unlikely to change. The minimum require-

ments of the 1994 Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPs) now bind the growing membership (currently 125) of the World Trade Organization. However, this framework allows for flexibility in several respects and does not preclude creation of new "sui generis" intellectual property rights systems or systems of alternative incentives. One flexible feature of the TRIPs Agreement is the discretion it gives to WTO members as to whether to provide for patenting of genetically modified plants (or animals). When the WTO reviews the relevant clause in 1999, U.S. industries will push to make plant and animal patenting mandatory. Given the expansionist trend of recent life patents—and the consequent risks to market competition and scientific openness—governments should be extremely hesitant to strengthen life patenting requirements under TRIPs.

More generally, the world needs to identify practical mechanisms to reward indigenous farmers for creating and conserving folk varieties. As Cleveland and Murray emphasize, concepts of intellectual property rights found in diverse indigenous cultures could provide alternatives to the industrial model that better serve indigenous interests. The first step, however, is to identify specific flaws in the current system. This will require cutting through the rhetoric of "biopiracy" by analyzing specific cases in which particular bodies of indigenous knowledge or genetic resources have been commercialized for private gain. Consistent with this, the 150-plus governments that have ratified the Convention on Biological Diversity recently called for case studies on intellectual property rights issues relating to biodiversity (UNEP 1996*a*).

Cleveland and Murray rightly identify trademarks as one existing mechanism that indigenous groups might use or adapt to their own purposes. Equally promising, if not more so, are appellations of origin, or geographic indications. "Marks of geographic origin allow producers to identify their products as coming from a specific region [and produced through certain traditional methods] . . . identified with quality and authenticity" (UNEP 1996*b*). In France, for example, sellers may apply the term "champagne" only to sparkling wine produced by a specified method in the Champagne region (Bérard and Marchenay 1996). The TRIPs Agreement requires WTO members to establish minimum levels of protection for geographic indications as well as trademarks. Indigenous producers could use appellations of origin to market products created using their folk varieties or associated knowledge to consumers seeking to support conservation or indigenous autonomy. Through properly designed and enforced systems of geographic indications, indigenous groups could reap economic rewards from the conservation of genetic resources and knowledge and could also protect cultural and moral values against commercial intrusion (UNEP 1996*b*). Both the analysis of existing intellectual property rights regimes and the development of workable proposals for adapting such mechanisms to indigenous needs will combine work in different disciplines, especially anthropology and law.

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"For what shall it profit a man, if he shall gain the whole world, and lose his own soul?" This often quoted passage (Mark 8:36) describes the dilemma explored in detail by Cleveland and Murray. They wrestle with problems posed by the movement to enable Third World farmers or Third World nations to profit from use by others of the plant genetic resources that they hold or that were once held by their ancestors. This struggle is 20 years old, more or less (FAO 1983, Mooney 1979), and seems no nearer to resolution today than at its beginning.

The vexatious fundamental problem is that when "indigenous" (usually interpreted as more or less isolated and nonindustrialized) farming communities try to commercialize their plant genetic resources they are forced to adopt at least some of the rules of the industrialized world, thereby changing the nature and goals of their indigenous societies. Not only does this mean they are in danger of "losing their soul" but also it places them at a clear disadvantage in striking bargains. The indigenous communities for the most part are small, lack financial resources or political power, and are divided among themselves in regard to goals and means of achieving them.

Cleveland and Murray show that the goals of the farmers' rights movement have changed continuously over the years. They describe the relatively recent activity of representatives of indigenous communities as opposed to the 20-year-old involvement of Third World (mostly) national governments. They note that indigenous communities and their national governments may differ sharply over who controls and should profit from local plant genetic resources.

They further point up the global dilemma—should one treat plant genetic resources as a vital source of germplasm to support sustainable food production long-term, or is one bound to consider that they are the private (or communal) property of those who hold them at the present time or whose ancestors once held them?

Finally, Cleveland and Murray show in numbing detail that every question relating to indigenous farmers' rights is characterized by an almost total lack of agreement on the definition of terms and the virtual absence of empirical data to confirm or deny strongly held beliefs about how indigenous communities or individuals hold, conserve, and profit from their plant genetic resources. Further, the data at hand, mostly anecdotal, show great variability from community to community in regard to concepts of property rights for plant genetic resources and how to profit from them. Because the concepts vary sharply (even though individually they may be clear), one cannot put together a continuing thread of expectations as has been done, for example, for plant variety protection laws.

In the end the authors make sensible recommendations that take into consideration the fluid nature of the question and the dearth of pertinent data. They note

that although the concept of intellectual property is not foreign to indigenous peoples, until more solid data about how they use and value plant genetic resources are at hand one should not "freeze farmers and their folk varieties in fantasies that never existed." In other words, one should not be too quick to codify rules and regulations in international treaties or similar documents that, once signed, are difficult to change.

They further note that one should consider indigenous farmers' values "in a broad perspective, and on an equal footing with the values of industrial agriculture." It may be necessary for indigenous peoples to use intellectual property rights mechanisms to protect their own rights. As a minimum, they will need to work with representatives of the industrialized world to define terms such as "human rights," "intellectual property," "crop genetic resources," "social benefit," "indigenous," and "industrial." To some extent, indigenous people will have to "sell their souls" if they wish to gain at least a part of the world.

In the end, however, they say that the collective rights of all inhabitants of the globe should take precedence over the rights of either indigenous peoples or practitioners of industrialized agriculture. They hope that "increasing evidence for . . . the importance of folk varieties as crop genetic resources for sustainable world agriculture . . . will encourage movement toward common ground." Rights to plant genetic resources should be viewed "not as intrinsic but as contingent on the extent to which they support sustainability, including conservation and use of crop genetic resources to ensure the future world food supply." This could then encourage "future collaboration between indigenous farmers and industrial world plant breeders to create improved crop varieties that are a key to increased sustainability for both 'industrial' and 'indigenous' agriculture and a future agriculture that moves beyond the limits of these categories."

I concur with these conclusions, in particular with the hint that a future agriculture will no longer be hampered by unreal divisions into "industrial" and "indigenous" but rather will take account of the continuum, the interrelatedness, of a complex web of many kinds of complementary food production systems, continually changing in evolutionary fashion.

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One billion people live in farm families which are largely, though often not exclusively, self-provisioning in terms of seeds and other planting materials. These are the peasant farmers of Asia, Latin America, and Africa.[1] Acknowledging the importance both of their efforts and of their plant genetic resources, the FAO International Undertaking on Plant Genetic Resources introduced the idea of farmers' rights, which, despite years of debate, it has succeeded in defining only in epistemological terms—as "rights arising from the past, present and future contribution of farmers in conserving, improving and making available plant genetic resources, particularly those in the centres of origin/diversity."[2] With the coming into force of the Convention on Biological Diversity, which mandates the conservation, sustainable utilization, and equitable sharing of benefits of biodiversity, the political struggle over agricultural biodiversity has centered on how these incompletely defined rights might be realized. Proponents have proposed various schemes and mechanisms for "sharing the benefits." Intellectual property rights regimes are one possible means for compensating farmers for their contributions and, Cleveland and Murray argue, a poor one. I agree.

Cleveland and Murray contribute significantly to the debate by pointing out that indigenous peoples view rights to intellectual and other property in diverse and sometimes strikingly contradictory ways. Internationally formulated rules, they argue, cannot possibly accommodate all such traditions and views. But even if they could, the chances of an individual farmer's (or community's) developing or discovering genetic material of significant economic value to a modern commercial plant-breeding effort are less than those of winning the national lottery. The costs of legally protecting farmers' plant genetic resources for such a payoff day would likely exceed income from royalties. The world's formally trained plant breeders already have basically unrestricted access to more than 6 million accessions stored in some 1,300 genebanks dotted around the globe, and a single accession—be it from a genebank or a farmer's field—is likely to be only one of dozens of distant "parents" in the pedigree of a modern crop variety. Determining the economic value of such contributions and assigning appropriate benefits to a particular individual or community would keep legions of geneticists, lawyers, and accountants busy for years.

Constituting farmers' rights more formally has become a matter of simple justice and political necessity, debated in several intergovernmental fora as well as in academic circles. Cleveland and Murray deftly describe many alternatives and the pitfalls of each. Unfortunately, they fail to mention one of the most interesting, the only proposal specifically requested by the FAO Commission on Genetic Resources for its negotiations on the matter. At its Sixth Session in June 1995, dele-

1. Cleveland and Murray use the term "indigenous farmers" to describe those who do not rely heavily on industrial inputs and whose agriculture is largely based on local traditions and locally adapted traditional crop varieties. Their evidence regarding property rights, however, is drawn almost exclusively from a smaller subset—rather more conventionally defined indigenous peoples (e.g., the Azande, Madang, Crow, Hidatsa, Zuni, Hopi, Mende). This prompts one to ask how representative the subset is of the total population of farmers engaged in on-farm management of plant genetic resources.

2. The concept of "farmers' rights" originated in juxtaposition to plant breeders' rights and was used in debates at FAO in the 1980s to highlight the lack of recognition and reward granted to farmers for their plant improvement efforts.

gates heard the director-general of the International Plant Genetic Resources Institute (IPGRI) outline a proposal whereby genetic materials would be made freely available to researchers and breeders but would be subject to contractual negotiations on benefit sharing at the point of commercialization. Revenues might accrue to an international fund in some cases or to specific countries or communities in others, depending on the type of crop, when it was collected (pre- or post-Convention on Biological Diversity), and how certain one could be about its precise origin. By facilitating access to and giving breeders the chance to see and evaluate genetic resources, this plan would aim to increase the odds that providers of germplasm would win the lottery and, indeed, that there would be something to win.[3]

Various alternatives, such as that offered by IPGRI, are linked to specific negotiating fora, actors, and interests, a phenomenon one must examine if one is to understand current global biopolitics. Different fora provide actors different opportunities and constraints. Delegations to the Conference of Parties to the Convention on Biological Diversity are dominated by environment ministry personnel who seem to favour bilateral deals for biodiversity. This approach may work for rare, geographically contained plants with known and valuable characteristics, such as a species with pharmaceutical properties. At FAO, however, agriculture- and development-oriented representatives grapple with a different kind of biological resource. It is one of immense and widely dispersed intraspecies diversity, much of it already collected. To be persuaded to pay, a buyer would have to believe that the specific resource was of real practical value and unavailable elsewhere (either from another farmer, community, genebank, or country or, as in the case of characteristics such as pest resistance, from an economically competitive natural or chemical control). To gain access to the *ex situ* collection of rice at the International Rice Research Institute, which was acquired in 111 countries, each country would have to conclude 110 bilateral contracts. According to IPGRI, for all countries represented in the collection to have access to this material, a total of more than 12,000 bilateral agreements would be necessary (IPGRI 1996:31). Dealing with individual communities would obviously increase the number and complexity of relationships. The attraction of a multilateral arrangement becomes obvious, and not simply as a way to avoid granting communities or countries of origin their due.

Plant genetic resources are, according to Cleveland and Murray, essential to agricultural sustainability and the future world food supply. They may be the world's most valuable resource, but no country has made money selling them—or been prevented from trying. Not surprisingly, the discussion at FAO has centered on approaches with a strong multilateral element—on systems of reward for the efforts of farmers in general as opposed to specific achievements of specific farmers.

The chief value of genetic resources to indigenous farmers will continue to be derived from the use of those resources.[4] In the field, genetic resources provide adaptation to the particular environment with its unique assemblage of soil types, climate, pests, and diseases. Logically, assistance in developing and utilizing plant genetic resources could be one concrete way to "compensate" farmers for their historical and ongoing efforts. The Global Plan of Action for the Conservation and Sustainable Utilization of Plant Genetic Resources, adopted by 150 governments in 1996, may offer a framework for such assistance. In negotiations at FAO, African countries have suggested that implementation of the plan would meet the criteria for "the sharing of benefits" as mandated by the Convention on Biological Diversity.

The efforts and achievements of farmers should probably be recognized at multiple levels through different fora. If legal rights, as distinct from benefits or compensation, are to be assigned to farmers or associated with their plant breeding or conservation activities, then those rights must be negotiated in the proper fora.[5] Governments are demonstrably more interested in vesting internationally granted rights (and associated benefits) in the nation-state. For example, the December 1996 intergovernmental negotiations of the FAO Commission on Genetic Resources were organized into two related discussions—one on farmers' rights and the other on access and scope of access to plant genetic resources. In the absence of an agreed-upon legal and operational definition of "farmers' rights," it is not hard to imagine that rights and associated benefits could become contingent on access and vice versa in this negotiating process. (We have already essentially arrived at that point in the Convention on Biological Diversity.) Farmers are not automatic losers in a multilateral agreement, especially if we cannot come up with a better (practical) idea. Indeed, such an agreement may provide greater benefits to them than the market-driven biodiversity bazaar envisaged by proponents of bilateral contracts between governments.

Cleveland and Murray sense that we are missing a larger point and theorize that the conflict would be easier to resolve "if placed in the context of a common goal of sustainable agriculture." Future work by them might focus on elaborating proposals imbedded in such a context. Plant genetic resources may no longer be considered the common heritage of mankind. Equally, sus-

3. The IPGRI study was subsequently submitted formally to the FAO Commission on Genetic Resources for Food and Agriculture (IPGRI 1996).

4. Cleveland and Murray also point out that value can be placed by indigenous farmers (the "originators" of the material) on the control of their plant genetic resources—on restricting or regulating how they are used, developed, named, described, marketed, etc.

5. A few countries are considering national legislation, for example. It is unrealistic, as Cleveland and Murray note, for international negotiations to produce solutions tailored to multiple and conflicting perceptions of rights among indigenous peoples. Locally enforceable rights and benefit-sharing agreements cannot easily be negotiated in international fora.

tainable agriculture is not yet considered our common future. Concrete proposals will eventually have to find their way into negotiating text on the desks of delegates. Only then will this article's central thesis be tested.

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The debate on the appropriateness or otherwise of intellectual property rights as they have evolved in the West for protecting the rights of indigenous communities has often revolved around the following issues (Gupta 1990, 1991*a–c;* 1995*a;* 1996*a–d*):

1. All knowledge about the use of biodiversity for treating various ailments of human and animals, producing vegetable dyes, developing local landraces, etc., is held in common by the local communities and has presumably been transmitted from one generation to another over a very long period of time with or without some value addition by successive generations.

2. This knowledge must be held in common and should not be allowed to be monopolized by multinational corporations (although the behaviour of the public sector and private but national drug and seed companies is no different).

3. The intellectual property rights regime evolved for protecting industrial designs and processes and is unsuitable for biological processes and products.

4. Since knowledge of various plants has been developed over several generations, why should the present generation be entitled to reap all the rewards if any?

5. Why should governments be entitled to any benefits from the commercialization of patented products when the resource and the knowledge were actually provided by individuals or communities?

6. While process patents can be provided, product patents impede research, confer a monopoly on one or a few inventors, make the technology or products out of reach for ordinary people because of their cost, and discourage expertise in reverse engineering in the Third World.

There are many other arguments on ethical and efficiency grounds against the patenting of life forms and against the creation of products derived from common knowledge without any compensation for the generators or providers of that knowledge.

Cleveland and Murray's argument that the basic heuristics of industrial and indigenous agriculture are contrastive is itself problematic. For example, our work in the Honey Bee Network (one of the largest networks on local creativity and innovation, with contacts in more than 75 countries) demonstrates that not only may local farmer innovators use the same heuristic as modern breeders but in some cases they may even develop new heuristics hitherto unacknowledged by modern science. The *Honey Bee Newsletter* and the Society for Research and Initiatives for Sustainable Technologies and Institutions have been campaigning for the intellectual property rights of grassroots innovators for over eight years. The classical distinctions among heuristics need not be confused with differences in the sociocultural contexts of the innovator or community using those heuristics (Gupta 1991*a;* 1993*a, b;* 1994*a;* 1996*b, c*).

For instance, a local or indigenous community may use a modern variety in one season (for example, wheat in winter) and grow local landraces (such as paddy varieties in eastern India) in another (Gupta 1989, 1990). Such farmers combine traditional and modern elements all the time and therefore may not very much appreciate the academic debates which try to dichotomize these subsets of human ecology. In the context of Latin America and tribal communities in Asia and Africa, the term "indigenous" does make sense, but even here the management practices of many European-descended communities may not vary a great deal from the local or traditional practices in a given mountainous region. Thus, racial identity need not always capture the distinctiveness of resource management practices except in countries like South Africa, where the divide was very precise and persistent. Cleveland and Murray's example of the use of GPS by Zuni farmers well illustrates the problems inherent in the dichotomy. I have seen Jim Enote and his colleagues using this as well as other modern technologies along with their traditional values to restore landraces and their modern counterparts.

What is more important, however, is the cultural meaning of rights—both intellectual and material—which are considered contentious by both academic and populist writers on the subject. Here again the distinctions are unclear. The right to exclude should be distinguished from the right to impute, the former being a property right and the latter a cultural right. A community may not want someone else to use the same label as it uses for its crafts or genetic material, but it may not exclude others from learning or using them, whereas in the former case it may object to others' unauthorized use of them. The problem arises when communities that did not object to sharing of their material resources and knowledge about them are "forced" to adopt modern institutions of property rights because they would suffer otherwise. To some, this intrusion is unwarranted and uncalled for; instead, they argue, the state and the market that have failed to protect the resource rights of these communities in the past must come to their rescue without resorting to modern mechanisms such as intellectual property rights. Cleveland and Murray rightly suggest that in dealing with modern institutions of exploitation, recourse to modern institutions of exclusion, attribution, and discourse may be inevitable. The argument suffers, however, when those who defend the rights of indigenous farmers as conservators only are not distinguished from those who defend their rights as innovators. This point calls for separate discussion. It will suffice here to suggest that many local farmers practicing modern agriculture make selections of off-type plants and through recurrent selection develop high-yielding/disease- or pest-

resistant varieties. These innovations may deserve the same protection as is available to any plant breeder, whether in the private or the public sector. For example, Thakarshibhai of Gujarat developed the *morla* variety of groundnut and defended his innovation before an international audience of crop scientists at the International Crop Science Congress (Gupta 1996*b*).

Cleveland and Murray are right in suggesting that many local/indigenous communities have had some kind of intellectual property rights. However, even in communities lacking restrictions on the production and dissemination of knowledge only a few individuals (medicine men and women) reproduced the knowledge and thereby practiced the art. Their contribution should not be subsumed under the overall rubric of community knowledge. Mere awareness of a practice or a technology by a community does not amount to ownership of this knowledge. Thus the individual practitioner still has rights. Similarly, many people may know about local landraces, but only a few resource-constrained or poor farmers may actually grow them. The rights of practitioners need to be distinguished from the rights of those who know about the practice (Gupta 1990*a*, *b*).

Recent studies on the impact of plant breeders' rights and plant varieties protection laws have shown that in the developing countries where these have been implemented, the impact on the local seed industry and farmers' choice in favourable regions has been generally positive (van Wijk and Jaffe 1995, Jaffe and van Wijk 1996). However, the impact on farmers growing traditional varieties has been minimal, and if anything it may have been negative because of the reduced allocation of public-sector research resources to the improvement of crops grown by local communities in marginal environments. However, this does not mean that a modified system of plant varieties protection and intellectual property rights cannot be devised to favour the conservators of biodiversity and grassroots innovators of local varieties. Cleveland and Murray's suggestions about introducing contractual arrangements in accessing local varieties are useful, as is the idea of generating new kinds of protection.

The argument that biodiversity is a global common heritage is no longer relevant, because the Convention on Biological Diversity recognizes national sovereignty over genetic resources.

The major limitation of the paper is in the last part, where in the discussion of farmers' rights the focus shifts to "indigenous people" to the exclusion of "local communities" and other such terms. Excessive reliance on the 1993 UN Draft Declaration on the Rights of Indigenous Peoples seems to underestimate the tensions that such a framework would generate in an Asian context. Considering intellectual property rights as a subset of human rights may help in some cases and do harm in others. The Western definition of human rights, for example, still does not legally recognize taking something from someone who is not aware of its full worth without due compensation as fraud. Thus, not only the principle of informed consent but also investment in creating the capacity for such consent have to be brought into the discussion (Gupta 1996*d*). Given the global scale of dialogue and discourse on the subject, the creation of a knowledge network (Gupta 1995*b*) would allow communities conserving biodiversity and producing contemporary innovations to learn from and inform each other across the barriers of language, culture, and literacy. Developing a multimedia, multinode, and multilevel network of communities, creative individuals, and others concerned about the conservation of diversity and the associated ethics will require identifying the boundaries of academic responsibility.

This implies a need for regulations in developed countries requiring full disclosure by any corporation or individual seeking patent protection on a plant-based drug or any other natural product or variety. The disclosure should provide that the source material has been rightfully and lawfully acquired (Gupta 1994*a*, *b*; 1996*d*). "Rightful" acquisition will involve moral and ethical issues in access to biodiversity. For instance, even if a local community has not asked for compensation for sharing the material or knowledge about it, is the corporation ethically bound to set up trust funds and other forms of reciprocity for it? Is it incumbent upon the corporation to ensure that the superior ethics of local communities that remain poor despite conserving biological diversity and the knowledge surrounding it does not become a reason for perpetuating their poverty and thus endangering the survival of diversity itself?

An international network for sustainable technology registration might constitute a system for adapting the intellectual property rights regime to the needs of small farmers. Such a registry would prevent any firm or individual from seeking patents on community knowledge as well as knowledge and innovations produced by individuals without some kind of cross-licensing. It would permit the acknowledgement of individual and collective creativity, grant entitlements to grassroots innovators to a share of any returns that may arise from commercial applications of their knowledge, innovations, or practices, with or without value addition, and link investment, enterprise, and innovation in a golden triangle of entrepreneurship. The register would help small-scale investors seek opportunities for communication with communities and individual innovators and explore the possibilities for investment. Competition among potential investors, tempered by competition among potential suppliers of various kinds of knowledge and diversity, would moderate expectations on both sides (Gupta 1996*d*).

An autonomous authority of which local community representatives were the majority members could be charged with the responsibility of overseeing all contracts to prevent communities from being shortchanged and to ensure that the management plans for sustainable extraction of biodiversity were drawn up in a scientifically appropriate manner. Penalties might have to be imposed for nonsustainable extraction. Copies of contracts might have to be deposited with this authority.

Each entry in the register would be coded according to a universal system such as the ISBN. The postal code of the habitat of the community or individuals registering innovations would be incorporated into the indexing system to facilitate geo-referencing of innovations. In due course contextual information could also be incorporated into the system to help cross-connect communities in similar ecological situations or facing similar constraints or challenges.

Entry in the register would at first be a mere acknowledgement of creativity and innovation at the grassroots level, but later some innovations might be considered deserving of an investors' certificate or petty patent for limited-purpose and temporary protection. The award of such a certificate would increase entitlement to concessional credit and risk cover so that transition from collector or producer to developer and marketer of value-added products could take place where innovators considered it appropriate. The registration system would be part of the knowledge network mentioned earlier. Apart from the registration system a large number of specific incentives would need to be developed for different categories of knowledge, innovation, and practice and for the preservation of sustainable lifestyles in indigenous communities.

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Cleveland and Murray have provided a useful survey of the current debate on intellectual property rights and farmers, especially in providing correctives to the simplistic rhetoric that often pervades that debate. Their plea for consideration of the complexity of the situation in further refinements of farmers' rights, intellectual property rights, and other related concepts is critical. So is their conclusion that one arena where indigenous/local farmers and "industrial" farmers may find common ground is that of sustainable agriculture. However, there remain elements of the debate which they leave undeveloped or unresolved.

One of these is the legitimacy of the notion of monopoly. Industrial intellectual property rights are instruments of monopoly, and this is one basic reason that they are inappropriate for much (though not all) of traditional knowledge. Society is moving along paradoxical lines as far as knowledge and information are concerned; while the motivation for profit drives the industrial economy towards greater private monopolies, the motivation for democracy and individual/collective dignity simultaneously fuels the demand for greater access to and freedom of information. The history of the world's use of biodiversity has until recently been characterised more by sharing and openness than by monopoly and secrecy. The agricultural might of the northern world would have been impossible to build in the absence of this sharing, given that it is overwhelmingly based on genes taken from the tropics. But even within the tropics, farmers have benefited from very extensive exchange between and within nations. This, of course, was the motivation for the FAO's International Undertaking on Plant Genetic Resources, which unfortunately was almost a non-starter because it dared to equate the value of farmers' varieties with that of varieties bred in laboratories.

Connected to the above is the question of incentives. As Cleveland and Murray point out, industrial intellectual property rights are based on the assumption that private profit is an essential incentive to innovation. They do not, however, develop this theme further. In India, farmers have developed, through deliberate selection and breeding, over 50,000 varieties of rice (often more than a couple of dozen in a single village), with motivations ranging from survival in harsh conditions to cultural preferences and ritual requirements (Kothari 1994). Even the public-sector seed-development bodies in this country have performed impressively (within the confines of the conventional model of agriculture, the Green Revolution), with the prime motivation of benefiting the country's farmers and producing enough food for a growing population. Revivals of biologically diverse agriculture in many parts of the world are similarly based on a diverse set of motives. Incentives, in other words, can be of many more kinds than private profit.

What kind of intellectual protection system would allow for a diverse set of incentives to operate and simultaneously permit as much sharing of information and knowledge as possible? Several alternative intellectual property rights systems to protect the "collective" knowledge of indigenous/local communities have been suggested; a detailed one surprisingly not commented on by the authors is that of Nijar (1995). Such models make the important point that intellectual property rights for indigenous/local communities have to be located within a bundle of rights including rights to natural resources and decision-making processes. However, even in such models the issue of monopoly is not resolved; should, for instance, a village have the right to refuse access to information to an outsider?

I would argue against monopolisation of knowledge, whether it is by a multinational corporation or by an indigenous faith healer. But recognising the real world, in which "common heritage" is misused by the powerful, I would propose a system of individual and community intellectual rights which makes sharing of knowledge compulsory but also confers upon the recipient of that knowledge the obligation not to (1) unfairly appropriate it or its essential derivatives by monopolising them, (2) violate the original holder's right to share knowledge with others, or (3) violate the cultural and environmental integrity of the original holder. I confess that I do not yet have a blueprint for such a system, nor can I at the moment say how readily one might be introduced. Clearly the private profiteers of the world would vehemently oppose it, but the global demand for decentralisation down to community levels of decision

making may make it more feasible than would currently seem to be the case.

The ultimate test of a system of genetic/biological resource rights is whether it would satisfy the imperatives of conservation, livelihood security for farmers, and the world's food security. Perhaps the global diversity of ecological, political, cultural, and economic situations requires a diversity of such systems. Space does not allow me to develop these ideas further here, but I would be gratified if the authors and other readers would react to these preliminary ideas.

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24 II 97

The term "sociobiology" having already been claimed for a style of analysis that reduces the social to the biological, perhaps we should now seek to designate analysis that takes as its starting point the inseparability of biological and social elements in human life as "biosociology." Cleveland and Murray's review is an important contribution to this emergent field. Ingold (1993) argues the case in relation to evolutionary theory. Descola and Palsson (1996) make the coupling of "culture" and "environment" the starting point for a revived ecological anthropology. In the interest of effective management and use of plant genetic resources, Cleveland and Murray now ask us to take seriously the idea that concepts such as "plant genetic resources" are not biological givens but products of molecular reality and human social negotiation.

In effect Cleveland and Murray suggest that where courts of law become arenas for claims to intellectual property in molecular resources basic notions such as "gene" have already become bio-sociological "hybrids"—defined as much by lawyers' arguments as by laboratory investigation (Richards and Ruivenkamp 1996). They go farther: If, in property law, "genes" are ideas as well as molecules, then we have to pay attention to the history of ideas brought into focus in asserting and opposing property claims in plant genetic resources. Property notions developed in only one part of the world to meet a rather restricted range of agrarian contingencies are unlikely to prove acceptable or sustainable instruments for shaping the destiny of a global genetic heritage. Custodians marginalised by enforcement of such property claims might take their resources with them. A less risky approach is needed. Mediation, in which attempts are made to gain "space" and recognition for different experiences of custodianship of plant genetic resources, would be one way forward.

However, I surmise that Cleveland and Murray are "realists" in regard to the raw material of such claims. Proposals concerning patterns of gene flow and the role of human agency in shaping and managing those patterns are "candidates for existence" (Harré 1972) awaiting confirmation or rejection through future careful scientific research. Cleveland and Murray are firm in warning the various emergent coalitions for the protection of "indigenous" property rights in plant genetic resources that molecules matter. They write that "the role of folk varieties . . . needs to be better understood through expanded scientific research and not obfuscated with essentializing assumptions." I thoroughly concur, and would add that science funding agencies urgently need to support some of the initiatives beginning to emerge.

One such piece of relevant research is currently being undertaken by the Sierra Leonean rice breeder Malcolm Sellu Jusu (1995). He has provided breeder colleagues and farmers with a large number of crosses of known parentage. His research design is to track the stabilising selections of both breeders and farmers in closely monitored on-station and on-farm conditions. Do farmers and breeders make different selections when the environment is held constant, and if so why? He aims to develop answers to the second question "intersubjectively" (by organising on-going debate between farmers and breeders about the selection process). In effect biologists and "traditional" farmers are being asked to "compete" in the management of plant genetic resources in order to enable each group to comprehend and ask questions about the agency of the other. The result Jusu aims for is not just stronger plants but also better practices of plant management, invigorated by hybridization of institutional cultures.

Reply

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The comments on our article reflect the wide range of values and data used in the continuing global and local discussions of indigenous farmers' rights to crop genetic resources and of the rights of indigenous peoples to natural resources in general. We have organized our response under several key points.

1. *The purpose of our paper.* As we stated in the introduction, our purpose was to "point out some neglected theoretical and empirical aspects of the current debate" over intellectual property rights, among them the deeper issues of rights to and use of resources in an increasingly crowded and "globalized" world and, in particular, who has the right to define such rights. It was not, as Alcorn supposes, to give an up-to-date report on the struggle itself, which is well covered by Fowler (1994), by many newsletters (e.g., *Diversity, RAFI Communiqué, Seedling*), and from many different perspectives by the web sites of indigenous organizations, NGOs, and international agencies (e.g., those of the Indigenous Peoples' Biodiversity Information Network [http://www.ibin.org], the International Institute for Sustainable Development [http://www.iisd.ca/linkages/], the International Indian Treaty Coun-

cil [http://www.aloha.net/nation/iitc/index.html], the Working Group on Traditional Resource Rights [http://users.ox.ac.uk/~wgtrr], the UN Food and Agriculture Organization's Plant Genetic Resources Information [http://web.icpgr.fac], and the World Intellectual Property Organization [http://www.wipo.org]).

2. *The term "indigenous."* The meaning of "indigenous" in current global discourse is shifting and contested, but recognition of intellectual property rights for indigenous groups will undoubtedly depend to some extent on the unique characteristics of each group, including, as Alcorn suggests, how "indigenous" it is. Of course, this will depend on the perspective of the definer. Our intent was to problematize the concept of "indigenous" and show that no uncontested line can ever be drawn between it and "industrial." We framed our discussion in terms of the broad differences between the two extremes of the industrial-indigenous continuum because this dichotomy reflects much of the current debate. Rather than reinforce these categories, we hoped to lay the groundwork for moving beyond them. We did not have room to elaborate on the distinctions at the indigenous end, the subject of a vast literature in anthropology of which we cited some salient examples. Indigenous peoples themselves "have generally not accepted the definitions put forth by others," and Axt et al. (1993:25, 26) conclude that "it is not yet entirely clear who is deemed to be included." They increasingly insist on the right to define themselves, as they did in the UN Draft Declaration on the Rights of Indigenous Peoples and in the Mataatua Declaration (in which they decided not to define the term), and Hannum (1996) notes that UN discussants could not agree on its meaning. While the ILO does offer a lengthy definition, it recognizes self-identification as a "fundamental criterion." We did not mean to imply, as Gupta thinks, that the epistemologies of indigenous and industrial agricultures are always contrastive. We used the contrast between industrial and nonindustrial agricultures as a heuristic device, a beginning point for our discussion. We then pointed out that the epistemology of both farmer breeders and modern formal breeders is likely a complex blend of theory, empiricism, and intuition and that (as Richards also says) values must be the basis for defining rights, utility, sustainability, and other such concepts. We emphasized the danger of essentializing both indigenous and industrial agriculture. We conceive of the term "indigenous" as denoting peoples along a continuum whose agricultures range from less to more industrial. A key characteristic of "indigenous farmers," as we explained, is their use of folk varieties. This definition would definitely include "local communities," contrary to Gupta's assertion, and we specifically included peasants and petty commodity producers. We continue to use this broad definition in this response.

As Fowler notes, however, our examples seem biased because we did not include peasants, mestizos, or others from the less indigenous end of the continuum. A reasonable hypothesis that could be tested is that the greater the extent of modern and industrial influences in a farming system, the less the farmers will retain a sense of intellectual property rights in their crops. The flow of folk varieties between households and communities is probably common, but the extent of flow and its relationship to the extent to which farmers maintain their own evolving varieties as distinct varieties in which they may vest cultural and intellectual rights are not well documented.

3. *Indigenous farmers' intellectual property rights.* We showed that the dominant viewpoints of advocates of both the industrial and the indigenous view tend to essentialize indigenous farmers' intellectual property rights. Indigenous peoples do in fact have their own concepts of intellectual property, it may be both collectively and individually held, and they actively create and maintain genetic diversity in their folk varieties. Further, their conceptions of intellectual property may be vastly different from those that the industrial West considers "logical" and "natural" and presumes must apply worldwide. The purpose of our review was to bring these facts into the debate. Though they may be well established in the literature, as Brush suggests, they have been generally ignored, sometimes even by indigenous peoples themselves, in favor of stereotypes. In fact, some anthropologists continue to advocate abandoning the idea of farmers' rights for a unilateral system of conventional development aid to Third World farmers, on the assumption that indigenous farmers do not claim intellectual property rights for their germplasm and that these resources are "public goods."

Some of the phrases used by commentators demonstrate how difficult it is for us to transcend the notions that rights are "granted," usually by Western institutions, that folk crop varieties have value only when they are commercialized, and that the nation-state dominates the international system and may not be held accountable to any standard higher than its perceived self-interest. We supported opening up space for a wider discussion of intellectual property rights and crop genetic resources acknowledging that neither Western nor indigenous definitions of intellectual property rights have ontological primacy and that any alternative system will have to be syncretic. For example, privileging Western legal concepts will make it difficult to envisage how indigenous farmer advocates might justify rights in perpetuity to their resources (see Downes's comment). From the perspective of indigenous peoples whose resources have been diminished and degraded by several centuries of aggressive expansion by dominant societies, the alternative of cultural or human rights may make more sense.

The assertion that both modern scientists and indigenous farmers conceive of indigenous farmers' crop genetic resources as public goods rests on the assumption that there is a widely agreed-upon classification of the world's resources. However, whether a resource is to be classified as a "public," "private," "open access," or "common-pool" resource is to some extent arbitrary (Ostrum 1992, Becker and Ostrum 1995) and depends on the context. What matters is the "structure of incentives and the efficiency and distributional implications

of the various feasible structures'' (Cornes and Sandler 1996:10). A public good as often defined by economists, political scientists, and anthropologists is one which is nonsubtractable, can be jointly used, and has high exclusion costs. Thus, like any definition, the definition of crop genetic resources as public goods depends on contexts and values. They are nonsubtractable from the viewpoint of the outsider who considers only their physical aspects, but in intellectual property terms they may be considered subtractable. Computer programs are subtractable in this sense, and it is not always accepted by their authors that once a program has been received or purchased it automatically becomes a public good. Thus, Brush's comment that once a farmer gives seeds away they become a public good is valid only from one particular viewpoint. As common-pool resources, however, crop genetic resources could be managed as common property, as government or private property, or as nonproperty (open-access resources).

Recently there have been several reports of research suggesting that local seed systems are ''open,'' in constant flux through space and time, as a counter to claims that indigenous communities maintain ''pure'' folk varieties isolated from outside influence. For example, Cuzalapa, a largely mestizo community in central Mexico, has been under strong Spanish influence since the 16th century, and most of its inhabitants are mestizos even though it is officially recognized by the Mexican government as a *comunidad indígena.* While most of the land is planted to folk varieties, one study found that farmers tend to classify a maize variety in one of their folk-variety categories if the seed resembles that variety, regardless of origin (Louette and Smale 1996). A study of Hopi seed systems by Soleri and Cleveland (1993) makes a similar point: folk varieties are difficult to identify in space and time, and their definition will always be subjective, that is, based on values and in that sense arbitrary. The Zuni also recognize that their seed system is not closed but still have a strong sense of intellectual and cultural rights in their folk varieties (Soleri et al. 1994). Brush's comment that ''openness'' of a crop variety's gene pool ''undermines assertions of ownership'' implies a false contrast with industrial systems, in which the flow of genetic resources is also great but obviously does not abrogate claims of property rights on the basis of priority or specific value added. Nor does the openness of indigenous farmers' crop gene pools mean that establishing farmers' rights independently from the Western industrial system necessarily involves essentializing indigenous farmers, as Brush suggests. The situation is similar to that of recognizing the rights of formal breeders and other scientists, where establishing boundaries between the work of an individual or a research group and that of the larger community of scientists is also contested. This is evidenced by the frequent battles over priority and level of contribution to research discoveries and publications well documented, for example, in the pages of the journal *Science.*

We presented the moral and utilitarian basis for recognizing farmers' rights in international negotiations and discourse. Downes says that we failed to do this and lumps us disparagingly with the indigenous-rights advocates who confront the industrial world with simplistic charges of ''biopiracy.'' Part of the reason for our disagreement may be that Downes conceptualizes the problem within the legal and moral framework of the industrial world. Thus, he implies that a violation of rights occurs only when there is ''monopoly control'' of knowledge or genetic resources or when they have been ''commercialized for private gain.'' This position makes it difficult to recognize that indigenous farmers might choose to define rights in their crop genetic resources differently from industrial scientists. We discussed this at some length in our section on cultural rights.

Downes suggests that there is no evidence that industrial intellectual property rights systems have taken away indigenous peoples' rights because there is no documentation of commercialization for ''private gain.'' In fact, there are many examples of the use of indigenous peoples' knowledge by outsiders for private profit, among them the marketing of blue corn products that we mentioned (McGowan 1995, Soleri et al. 1994). On a larger scale, industrial countries have received huge economic returns on the development of modern crop varieties based on farmers' varieties, including the development of crop varieties for the nonindustrial world (e.g., Pardey et al. 1996). Currently modern plant breeding is seeking to increase the genetic diversity of crop varieties, a main source of this diversity being farmers' folk varieties (see, e.g., Smale 1996). Our point is not that this global use of crop genetic resources inherently violates the rights of indigenous farmers but that it is ubiquitous and must be recognized by all parties in the discussion of rights. Indeed, the development of sustainable agriculture on both the local and the global scale is likely to require the widespread exchange and use of germplasm.

4. *Alternatives to industrial-world intellectual property rights.* Our paper focused on different ways of framing the debate so as to allow indigenous peoples to participate in it as equals rather than on alternatives to industrial-world mechanisms for establishing rights in crop genetic resources, but several commentators do suggest such alternatives. We agree with Fowler that the International Plant Genetic Resources Institute (IPGRI) proposal for sharing benefits at the point of commercialization—the Multilateral System for Exchange, or MUSE—represents a step forward. We note that IPGRI was asked by the FAO to study both possible systems of exchange of crop genetic resources and the equitable sharing of benefits and that the study recognized that maintaining the diversity of plant genetic resources was necessary for plant breeding for sustainable agriculture. Our misgivings about the MUSE proposal include that (1) it seems to be another case of alternatives formulated in the absence of indigenous peoples themselves; (2) it focuses primarily on access that MUSE members would enjoy to ''an enormous range of germplasm,'' still valuing indigenous farmers chiefly as providers of germplasm; and (3) conditions for membership for ''farming and indigenous communities'' would

apparently be set by their host country, and therefore the state is granted final authority over its indigenous peoples as regards their participation in genetic exchange and the receipt of benefits in the event of commercialization (IPGRI 1996:3, 6–7, 49). We wonder if the MUSE process could be modified to bring indigenous peoples into its deliberations and whether it could explore mechanisms by which they might be able to appeal for access and fair treatment if denied them by their national governments.

The suggestion that debates over rights in crop genetic resources be allowed to play themselves out at the local level (Alcorn) overlooks the fact that in the vast majority of cases contenders do not face each other on anything like a level playing field. The authoritarian treatment by many nation-states of the indigenous peoples living within their boundaries is one reason we explored such approaches as intrinsic human rights. Even in more democratic nations like India, where indigenous peoples may have more of a voice through the political process, there is little cause to be sanguine about the ultimate recognition of their rights under the present system (Kothari and Parajuli 1993, Kothari 1995). And the situation in many countries may be worse; for example, in Indonesia indigenous peoples usually retain control of their resources and lands only until the state discovers that they have resources that it and its elites can turn to a profit—timber, gold, or land for cattle raising (see Dove 1993).

The appellations of origin suggested by Downes appear to be based on a number of assumptions that have to be examined, including that indigenous farmers would necessarily want to commercialize their crop and that recognition of their rights would depend on their doing so, that they would have the means to produce the crop sustainably and market it, and that the national government would provide legal protection. As Kothari states, there are many incentives for innovation among farmer breeders other than private profit. Further, appellations would be of no benefit to a farmer who had a traditional variety with a unique resistance to disease, for example, when it is only the genes coding for this trait that are sought by industrial seed companies. Gupta offers several specific suggestions for alternatives that contribute usefully to the ongoing debate. We particularly like his call for informed consent and full disclosure by any person or entity seeking to obtain a patent "on a plant-based drug or any other natural product or variety." International conceptions of fraud, however, are more an issue of tort law and (when intentional) criminal law than of human rights.

5. *The role of indigenous farmers in defining and negotiating their rights.* As Fowler and Dove point out, much of the current debate is missing the larger point by continuing to privilege the industrial viewpoint even when indigenous values, practices, knowledge, and rights are acknowledged. Indigenous farmers do not have to choose between being corrupted by capitalism through the use of industrial intellectual property rights and being benignly protected by the dominant society from this corruption through some sort of generic compensation system, as many commentators imply. Although all indigenous farming communities are part of the global system that is dominated by capitalist values and market power, the only lasting solution to questions of rights in and uses of resources may be the creation of hybrid forms of rights, perhaps based on the conception of crop genetic and other natural resources as common-pool resources to be managed by the global community. Such an evolution will depend on imaginative and integrative thinking at the global level (Daly and Cobb 1989), but this in turn will probably depend, as Richards suggests, on fine-grained research by anthropologists, other social scientists, and biological scientists in partnership with farmers. The survival of indigenous peoples is a matter of creating entirely new forms based on the reality that indigenous peoples cannot exist outside of the modern world.

Resolution of the debates over intellectual property rights must include consideration of empirical data on indigenous systems and involve indigenous peoples themselves in defining, shaping, and resolving the issues. We doubt the validity of even the most carefully considered system that is wrought on behalf of these farmers without giving them a voice in its creation and implementation.

Our Zuni example shows the care and realism with which tribal elders and other farmers have considered the use of their crop genetic resources by outsiders. As for the ability of indigenous peoples to negotiate for themselves, the actions of their representatives at the 1996 talks on the Draft Declaration on the Rights of Indigenous Peoples, referred to as a "failure" by Brush, can be viewed in another light: the representatives met their governmental counterparts on equal terms, strongly objected to what they perceived as a failure to consult them on matters relating to the agenda for discussions, and refused to consider negotiation of changes to the draft declaration at that session. We hope that the tone of the third meeting, probably in the fall of 1997, will be the cooperative one established at the first session in 1995. But certainly these unprecedented meetings at the international level should make clear to observers that indigenous peoples are well able to speak for themselves and are beyond participating in discussions that fail to consult them in all particulars. This declaration is especially significant because it is the first statement drafted under the auspices of the UN by indigenous peoples themselves, who achieved consensus with their counterparts from all over the world on a very broad array of issues.

6. *Sustainable agriculture as a possible framework for resolution.* We reiterate our view that sustainable agriculture is a crucial component of the international debates over rights in crop genetic resources and agricultural development in general. Though a difficult and contentious concept, the notion of sustainable agriculture is based on the realization that human impact on the Earth is reaching a limit and that global cultural, social, economic, biological, and geophysical systems are increasingly connected. Sustainable agriculture requires that economic activity be governed by society

rather than the reverse, and this turns the ruling economic paradigm on its head (Daly and Cobb1989). This in turn may necessitate considering our planet a common-pool resource that must be managed in common.

Sustainability is not just the catchword du jour. As Goodland (1995:14) writes, ''The world will in the end become sustainable, one way or another. We can select the timing and nature of that transition and the levels of sustainability to be sought, or we can let depletion and pollution dictate the abruptness of the final inevitable transition. The former will be painful, the latter deadly.'' Therefore, the difficulty of achieving sustainability is not sufficient reason to dismiss it. Many thoughtful scholars have suggested the need for ''political will and institutional capacity'' (Goodland 1995:20), a ''combination of institutions that restrain shortsighted and selfish behavior'' (Becker and Ostrum 1995: 129), perhaps in the form of ''stakeholder panels'' to mediate between free marketeers and environmentalists (Collins and Barkdull 1995). While such ideas sound utopian (see Alcorn's comments), they reflect the need for a major rethinking of the way we value and manage our resources. This involves reexamining ''the myth of primitive ecological wisdom''—the idea that all indigenous peoples do, or did, maintain sustainable patterns of subsistence (Milton 1996)—as well as the myth that industrial agriculture and values, including intellectual property rights, are the only alternative for the future. The deconstruction of myths about both indigenous and industrial agriculture to which we hoped to contribute is a vital part of the process of finding sustainable agriculture alternatives.

But more practical actions are also possible. Collaborative plant breeding is an exciting development here, as we mentioned, although it must not privilege industrial or indigenous viewpoints. Richards's description of the work of M. S. Jusu is an example of the kind of research that needs to be done in this area. Under collaborative breeding farmers themselves may be in charge of the improvement of their own crop varieties with the help of formal breeders whose assistance includes providing access to crop genetic resources from around the world. Thus, farmers' incentives for maintaining crop genetic resources become those of socially, economically, and environmentally sustainable food production rather than agricultural development programs designed by outsiders or direct payments (Cleveland, Soleri, and Smith 1994).

Sustainable agriculture provides the scope for future agreement because it questions both industrial and indigenous agricultures (and all points in between). No existing agriculture or crop genetic resource management system may be sustainable into the future at the scale necessary to feed the human population, and surely no such system will be sustainable for all farmers. Conceiving of sustainable agriculture, then, is conceiving of a new, untried agricultural regime that also alters the existing power relationships in research, agronomy, commerce, and claims to rights in resources. A sustainable agriculture is likely to be a complex, constantly evolving system for which, as Duvick states, the ''indigenous-industrial'' distinction is irrelevant. Thus, the ultimate test of a system of rights is, as Kothari observes, whether it serves the goal of sustainable agriculture in promoting both livelihood security for farmers at the local level and the world's food security.

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Calendar

1997

October 9–12. Society for Psychological Anthropology, 5th Biennial Meeting, San Diego, Calif., U.S.A. Write: Robert Munroe, Anthropology, Pitzer College, Claremont, Calif. 91711, U.S.A. (rmunroe@pitzer.edu).

November 3–8. Juan Comas International Physical Anthropology Colloquium, Mexico City, Mexico. Write: Instituto de Investigaciones Antropológicas, Universidad Nacional Autónoma de México, Coyoacán, D.F., 04510 Mexico (inantrop@servidor.-unam.mx).

November 13–16. American Society for Ethnohistory, Annual Meeting, Mexico City, Mexico. Write: William O. Autry, 1997 ASE Program Co-Chair, P.O. Box 917, Goshen, Ind. 46527-0917, U.S.A. (billoa@ goshen.edu), or Jesús Monjarás, Director de Etnohistoria, INAH, Paseo de la Reforma y Calz. Gandhi, Col. Polanco, CP 11560, México, D.F., Mexico.

November 19–23. American Anthropological Association, 96th Annual Meeting, Washington, D.C., U.S.A. Theme: Toward an Anthropology of the 21st Century. Write: AAA Meetings Department, 4350 N. Fairfax Dr., Ste. 640, Arlington, Va. 22203, U.S.A. (liz@aaa.mhs.compuserve.com).

December 1–5. Fifth World Academic Conference on Human Ecology, Adelaide, S.A., Australia. Theme: Is Human Evolution a Closed Chapter? Write: Australian Society for Human Biology/5th WACHE, Department of Anatomy and Histology, University of Adelaide Medical School, Adelaide, S.A. 5005, Australia, or M. Henneberg, convenor (mhennebe@medicine.adelaide.edu.au) or K. M. Lambert, programme organiser (klambert@medicine.adelaide.edu.au).

December 5–10. Science Policy: Cultural Aspects of Innovation and Development, European Research Conference, Castelvecchio Pascoli, Italy. Write: J. Hendekovic, European Science Foundation, 1 quai Lezay-Marnésia, 67080 Strasbourg Cedex, France (euresco@esf.org; http://www.esf.org/euresco).

1998

March 14–17. American Association for Applied Linguistics, Annual Conference, Seattle, Wash., U.S.A. Write: AAAL 1998 Program Committee, P.O. Box 21686, Eagen, Minn. 55121-0686, U.S.A. (aaaloffice@aaal.org; http://www.oise.utoronto.ca/AAAL98).

April 16–18. Delta Studies Symposium IV: Creative Expressions Beyond the Blues, Jonesboro, Ark., U.S.A. Deadline for abstracts December 15. Write: Delta Symposium Committee, Department of English and Philosophy, P.O. Box 1890, Arkansas State University (Jonesboro), State University, Ark. 72467, U.S.A. (DELTA@TOLTEC.astate.edu; http://csm.astate.edu/~dean/blues.html).

July 26–August 2. International Union of Anthropological and Ethnological Sciences, 14th Congress, Williamsburg, Va., U.S.A. Theme: The 21st Century: The Century of Anthropology. Write: Tomoko Hamada, Executive Secretary, 14th Congress IUAES, Department of Anthropology, College of William and Mary, Williamsburg, Va. 23187-8795, U.S.A. (thamad@facstaff.wm.edu).

August 23–29. International Council for Archaeozoology, 8th International Congress, Victoria, B.C., Canada. Deadline for abstracts January 30, 1998. Write: Conference Management, Continuing Studies, University of Victoria, Box 3030, Victoria, B.C., Canada V8W 3N6 (icaz98@uvcs.uvic.ca).

September 3–6. Alta Conference on Rock Art 2, Alta, North Norway. Themes: theory of interpretation of rock art, curation. Write: Knut Helskog, Tromsø Museum (knut@imv.uit.no) or Bjørnar Olsen, Institute of Social Science (bjornaro@isv.uit.no), University of Tromsø, Tromsø, Norway.