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Indigenous Knowledge, Biodiversity Conservation and Development

Keynote Address by

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International Conference on Conservation of Biodiversity in Africa:

Local Initiatives and Institutional Roles

National Museums of Kenya

Nairobi, Kenya

30 August-3 September 1992

Revised Version - September 12, 1992

Introduction

Indigenous knowledge and biodiversity are complementary phenomena essential to human development. Global awareness of the crisis concerning the conservation of biodiversity is assured following the United Nations Conference on Environment and Development held in June 1992 in Rio de Janeiro. Of equal concern to many world citizens is the uncertain status of the indigenous knowledge that reflects many generations of experience and problem-solving by thousands of ethnic groups across the globe. Very little of this knowledge has been recorded, yet it represents an immensely valuable data base that provides humankind with insights on how

numerous communities have interacted with their changing environment including its floral and faunal resources.

This presentation provides an overview of recent studies that clearly portray the active role that rural communities in Africa and other parts of the world have played in (a) generating knowledge based on a sophisticated understanding of their environment, (b) devising mechanisms to conserve and sustain their natural resources, and (c) establishing community-based organizations that serve as forums for identifying problems and dealing with them through local-level experimentation, innovation, and exchange of information with other societies.

Indigenous knowledge, particularly in the African context, has long been ignored and maligned by outsiders. Today, however, a growing number of African governments and international development agencies are recognizing that local-level knowledge and organizations provide the foundation for participatory approaches to development that are both cost-effective and sustainable.

The deliberate maintenance of diversity in domesticated and non-domesticated plants and animals characterizes farming systems across the African continent as well as in most other parts of the world, providing an important opportunity for systematic in situ maintenance of genetic resources. Informal agricultural research and development systems parallel those of national governments, providing another opportunity for national agricultural research and extension services to work with the creative interests and activities of farmers and other rural people.

A growing global network of regional and national indigenous knowledge resource centers is involved in documenting the historical and contemporary indigenous knowledge of numerous ethnic groups around the world. Much of this knowledge is at as much risk of being lost as is the case with biodiversity (Linden 1991). These centers reflect new values that recognize indigenous knowledge as an important national resource. The centers are establishing national indigenous knowledge data bases, giving recognition to their citizens for the knowledge they have created, providing a protective barrier for the intellectual property rights of knowledge that could be exploited economically by the country of discovery, and laying the foundation for development activities that build on and strengthen the existing knowledge and organizational base produced through many generations of creative effort by local communities.

Indigenous Knowledge and Biodiversity

The importance of and global commitment towards the conservation of biodiversity is no longer questioned. The accelerating rates of loss of floral and faunal species and the projected negative impacts of this loss of germplasm on humankind have been eloquently described by a growing number of prominent biological scientists such as Solbrig, Wilson and Peter, Abelson, Ehrlich, Beattie, Bower, Brockelman, Bunting, Hoyt, and Loesch. Numerous international foundations, development agencies, and international agricultural research centers are also adding the power of their collective concern and resolve to deal with the circumstances leading to the loss of species. Among the influential documents now published are those by Abramovitz for the World Resources Institute, The Center for Our Common Future, the Consultative Group on International Agricultural Research, FAO, Hawkes for The World Bank, IUCN/UNEP/WWF,

McNeely et al. for the International Union for Conservation of Nature and Natural Resources, the U.S. National Research Council, Britain's Overseas Development Administration, Sohmer and Knutsen for the U.S. Agency for International Development, and the Global Biodiversity Strategy: Policy-makers' Guide produced by the World Resources Institute, The World Conservation Union, and the United Nations Environment Programme.

Although these publications focus on the immediate and long-term negative biological and economic consequences of the loss of biodiversity, several introduce the complementary importance of cultural diversity that is often reflected in the indigenous knowledge of natural resource management including that of plants and animals. The Global Biodiversity Strategy, for example, includes as one of its ten principles for conserving biodiversity the principle that "Cultural diversity is closely linked to biodiversity. Humanity's collective knowledge of biodiversity and its use and management rests in cultural diversity; conversely, conserving biodiversity often helps strengthen cultural integrity and values" (World Resources Institute et al. 1992: 21).

During the past decade progress has been made in understanding the complementarity of cultural diversity and biodiversity. The ex situ conservation of germplasm has been well-established through the Plant Introduction Stations in the United States, the Consultative Group on International Agricultural Research, and the International Board for Plant Genetic Resources. A parallel set of institutions documenting local knowledge about the environment is now being established, indigenous knowledge resource centers that could play a future role in in situ conservation. Understanding the indigenous management strategies of farmers and other rural persons that foster diversity in domesticated and wild species can help in the establishment of national programs for in situ conservation of germplasm that complement the ex situ programs already in existence (Wilkes; Altieri and Merrick; Juma). "To acquire a comprehensive base of knowledge for genetic resource conservation, the genetic establishment must accept a mandate to be concerned not only with germplasm but also the knowledge systems that produce it" (Brush 1989: 22).

The role of nineteenth century colonialism and social science in ignoring and sometimes maligning indigenous knowledge has been well documented (Warren 1989; Slikkerveer 1989; Jackson 1987). Studies that depicted local communities and their knowledge as primitive, simple and static are now countered by a rapidly expanding data base generated by both biological and social scientists that describes the complexity and sophistication of many indigenous natural resource management systems. Studies by Berlin et al., Brush et al., Alcorn, Altieri and Merrick, Hunn, Chandler, Colchester, Everett, McKiernan, Dasmann, Oldfield and Alcorn, Messerschmidt, Montecinos and Altieri, Mooney, Nabham et al., Leakey and Slikkerveer, Johannes, Andrews, Aumeeruddy, Balee, Fairhead, Feit, Gadgil, Gunn et al., Juma, Kiambi and Opole, Lansing and Kremer, Liebman, Mathias-Mundy et al., McCall, Marks, Posey, Niamir, Thurston, Wamalwa, Price, Farnsworth and Soejarto, Rajasekaran et al., Rhoades, Reij, Richards, Sharp and Kone, Warren, Sims, Pawluk et al., Tanglely, Riley and Brokensha, and Rusten and Gold explore indigenous knowledge related to wild and domesticated plants and animals and the soils and water upon which they depend. The authors represent the academic fields of agriculture, horticulture, botany, zoology, forestry, agroforestry, fisheries, ecology,

agroecology, economic botany, wildlife management, aquaculture, animal science, soil science, and hydrology.

The fact that so much effort is now being invested in understanding the basis for indigenous natural resource management indicates that the negative attitudes commonly held about indigenous knowledge during the colonial era have begun to change. A review of the published literature during the colonial era does reveal enlightened individuals who understood the value of the indigenous knowledge. Louis Leakey, for example, described in eloquent detail Kikuyu agricultural knowledge and how it provided the basis for many Kikuyu farmers to reject European farming techniques being promoted in Kenya at the turn of this century by British agricultural officers.

Indigenous Knowledge and Development

International and national development agencies have recognized the value of participatory approaches to decision-making for sustainable approaches to development. During the past decade a rapidly growing set of evidence indicates a strong relationship between indigenous knowledge and sustainable development. "Serious investigation of indigenous ethnobiological/ethnoecological knowledge is rare, but recent studies...show that indigenous knowledge of ecological zones, natural resources, agriculture, aquaculture, forest and game management, to be far more sophisticated than previously assumed. Furthermore, this knowledge offers new models for development that are both ecologically and socially sound" (Posey 1985:139-140).

Development activities that work with and through indigenous knowledge and organizational structures have several important advantages over projects that operate outside them. Indigenous knowledge provides the basis for grassroots decision-making, much of which takes place at the community level through indigenous organizations and associations where problems are identified and solutions to them are determined. Solution-seeking behavior is based on indigenous creativity leading to experimentation and innovations as well as the appraisal of knowledge and technologies introduced from other societies.

Farmers can be excellent conservators of biodiversity. Small-scale farming systems in Sierra Leone, for example, are characterized by diversity, which is valued for its own sake (Richards 1985). "Small-scale, resource-poor farmers in developing countries breed local crop varieties for improved production using informal innovation systems based on indigenous knowledge...They often employ their own taxonomy, encourage introgression, select, hybridize, field test, record data and name their varieties" (Lamola 1992: 3). In Niger, a USAID-funded project has discovered a farmer-based agricultural research and extension system that parallels that of the national government (McCorkle and McClure 1992). Investigating the nature of farmers' experiments that augment biodiversity could be of considerable use to national agricultural development programs (Haverkort).

In Rwanda it was found that farmers "recognise several dozen different potato varieties, which they distinguish according to plant and tuber traits, as well as agronomic and culinary characteristics" (Haugerud and Collinson 1991: 5). East African farmers "recognise in maize, as

in potato cultivars, important differences in taste, texture, storability, marketability, disease and pest resistance, and response to moisture stress. At least nine possible end uses, many of them simultaneously relevant on a single farm, help to determine the maize genotypes east African farmers prefer" (Haugerud and Collinson 1991: 6). "Sustainable agriculture in all nations will require greater scientific respect for, and more effective collaboration with, those who possess the wisdom of generations of 'nonscientific' farming" (Haugerud and Collinson 1991: 14).

"The characteristics of polycultures that make them desirable were generally ignored by agricultural researchers. But recently research concerning polycultures has blossomed and some of their benefits are becoming clear" (Liebman 1987: 115). Polyculture is the norm in farming systems in Africa and other parts of the world, "a traditional strategy to promote diet diversity, income generation, production stability, minimization of risk, reduced insect and disease incidence, efficient use of labor, intensification of production with limited resources and maximization of returns under low levels of technology" (Altieri 1987: 73).

"Much of the world's biological diversity is in the custody of farmers who follow age-old farming and land use practices. These ecologically complex agricultural systems associated with centers of crop genetic diversity include not only the traditional cultivars or 'landraces' that constitute an essential part of our world crop genetic heritage, but also wild plant and animal species that serve humanity as biological resources" (Oldfield and Alcorn 1991b: 37). Prain et al. have found that farmers evaluate cultivars using a wide variety of criteria that can be of immense interest and value to crop breeders. In Zambia, the farmers' evaluation of a high-yielding hybrid maize variety and description of the positive and negative characteristics of locally-adapted open-pollinated varieties led to a more effective national maize breeding program (Warren 1989b). Taking the time and effort to record the indigenous agricultural knowledge for a given ethnic group can provide important guidance for the research agenda for both national and international agricultural research centers (Cashman; Warren 1992c; Richards 1989; Titilola et al. 1989).

Development agencies are beginning to review the role of indigenous knowledge in the development process at the policy level. Titilola has demonstrated the cost-effectiveness of adding indigenous knowledge components into development projects (1990). Lalonde has completed two reports on this topic for the Canadian International Development Agency. The World Bank held a seminar on the role of indigenous knowledge for agricultural development (Warren 1991). Two influential policy documents have recently been prepared by the U.S. National Research Council, one focused on the conservation of biodiversity, the other on sustainability issues in agriculture and natural resource management. "Development agencies should place greater emphasis on, and assume a stronger role in, systematizing the local knowledge base--indigenous knowledge, 'gray literature,' anecdotal information. A vast heritage of knowledge about species, ecosystems, and their use exists, but it does not appear in the world literature, being either insufficiently 'scientific' or not 'developmental.' Much of this information can be interpreted only by local scientists" (National Research Council 1992: 10). "If indigenous knowledge has not been documented and compiled, doing so should be a research priority of the highest order. Indigenous knowledge is being lost at an unprecedented rate, and its preservation, preferably in data base form, must take place as quickly as possible" (National Research Council 1992: 45).

The document outlining USAID's newest Collaborative Research Support Program for Sustainable Agriculture and Natural Resource Management (SANREM) recognizes that indigenous knowledge must play an important role in sustainable approaches to development (National Research Council 1991). In Brazil, for example, "the long-term management strategies of the Kayapo, which actually increase biological diversity, offer many fundamental principles that should guide development throughout the humid tropics along a path that is both ecologically and socially sound" (Posey 1985: 140). "The lessons they have learned through millenia of accumulated experience and survival are invaluable to a modern world in much need of rediscovering its ecological and humanistic roots" (Posey 1985: 156).

The International Society of Ethnobiology has played a key role in formulating the inextricable link between cultural and biological diversity. The Declaration of Belem was adopted at the First International Congress of Ethnobiology and the Kunming Action Plan was produced at the Second Congress (see the texts in International Traditional Medicine Newsletter, vol. 4, no. 2, Winter 1992). UNESCO Canada/Man and the Biosphere Program sponsored a workshop on Indigenous Knowledge and Community-Based Resource Management (Streather 1991), while the International Indigenous Commission has submitted a report on indigenous knowledge to the United Nations Conference on Environment and Development in 1991.

The most cost-effective way in which indigenous knowledge can be systematically recorded and stored so it can be used to facilitate national development efforts may be through the growing global network of indigenous knowledge resource centers. There are now ten formally established centers, three with global functions (CIKARD, LEAD, and CIRAN), two with regional roles (ARCIK, REPPIKA), and five with national roles (GhaRCIK, INRIK, RIDSCA, KENRIK, PhiRCIKSD). Seventeen other regional and national centers are in the process of becoming established (see appendix).

The important issue of intellectual property rights has been thoroughly discussed by Juma, Posey (1989), McNeil and McNeil, Gray, and the International Board for Plant Genetic Resources. National indigenous knowledge resource centers are organizational structures through which indigenous knowledge is recorded, stored, screened for potential economic uses at the national level, and distributed to other centers in appropriate ways.

Innovative technologies discovered and used in one part of the world can often work equally well in similar ecozones in other parts of the world. National centers are in a position to facilitate and control the sharing of indigenous knowledge. This type of information exchange has already begun through multilateral and bilateral donor efforts. Two examples are based on indigenous knowledge from South Asia. The World Bank has disseminated information at the global level on the traditional use of vetiver grass in India for soil and moisture conservation (Greenfield). The use of neem tree seeds to produce non-toxic biopesticides has also spread from India to other parts of the world through development agencies such as USAID and GTZ (Radcliffe et al.).

National centers can serve as vehicles to introduce indigenous knowledge components into the formal curricula from primary school through the university as well as in extension training institutes. This can help to augment the declining capacity of the traditional means of

transmission of this knowledge due to universal primary education now operating in most newly-independent nations (Ruddle; Ruddle and Chesterfield).

National indigenous knowledge resource centers are beginning to conduct inventories of knowledge that can be of primary utility in development programs. Examples include indigenous crop pest management systems, farmers perceptions of positive and negative characteristics of crop varieties, and indigenous approaches to the management of soil, water, and biodiversity resources. National centers can also identify and delineate the structure and functions of indigenous organizations that exist in every rural community. Virtually every grassroots organization plays a developmental function within the community. Strengthening the capacity of these existing organizations can greatly facilitate sustainable approaches to development (Warren 1992b; Atte 1992). As Africa and the rest of the world move into the twenty-first century, it is critical that these issues be addressed at the global, regional, national, and local levels (Seidman; Seidman and Anang).

The growing number of newsletters focusing on indigenous knowledge and conservation of biodiversity indicates the global interest in cultural and biological diversity (see list at the end of the bibliography). "The formal sector is only starting to open its eyes to the fact that farmers innovate and that local communities do and can contribute to conservation and breeding. If the world is properly to conserve and use genetic resources for both present and future generations, the informal sector of the Third World, that is, the farmers, herbalists, gardeners and pastoralists, must lead us into the next agricultural revolution" (Mooney 1992: 125).

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Appendix

ESTABLISHED INDIGENOUS KNOWLEDGE RESOURCE CENTERS

1. Center for International Research and Advisory Networks (CIRAN): Drs. G. W. von Liebenstein, Director; Nuffic/CIRAN, P.O. Box 90734, 2509 LS The Hague, The Netherlands (telephone 31-70-3510577; FAX 31-70-3510513).
2. Center for Indigenous Knowledge for Agriculture Development (CIRARD): Dr. D. Michael Warren, Director: Curtis Hall, Iowa State University, Ames, Iowa 50011 (telephone 515-294-0938; FAX 515-294-1708).

3. Leiden Ethnosystems and Development Program (LEAD): Dr. L. Jan Slikkerveer. Director: LEAD. Institute of Cultural and Social Studies, University of Leiden, P.O. Box 9555, 2300 RB Leiden, The Netherlands (telephone 31-71-273469; FAX 31-71-273619).
4. African Resource Centre for Indigenous Knowledge (ARCIK): Prof. Adedotun Phillips, Director, and Dr. Tunji Titilola, Research Coordinator; ARCIK, Nigerian Institute of Social and Economic Research (NISER), PMB 5 - UI Post Office, Ibadan, Nigeria (FAZ 022-416129 or 01-614397).
5. Regional Program for the Promotion of Indigenous Knowledge in Asia (REPPIKA): Dr. Evelyn Mathias-Mundy, Coordinator: REPPIKA, International Institute of Rural Reconstruction (IIRR), Silang, Cavite, Philippines (telephone 0969-9451; FAX 632-522-24-94).
6. Ghana Resource Centre for Indigenous Knowledge (GHARCIK): Mr. Charles Annor-Frempong, Director: GHARCIK, School of Agriculture, University of Cape Coast, Cape Coast, Ghana (Telex 2552 UCC GH).
7. Indonesian Resource Center for Indigenous Knowledge (INRIK): Prof. Dr. Kusnaka Adimihardja, Director: INRIK, Dept. of Anthropology, University of Padjadjaran, Bandung 40132, Indonesia (FAX 022-431938).
8. Mexican Research, Teaching and Service Network on Indigenous Knowledge (RIDSCA - Red de Investigacion, Docencia y Servicio en Conocimientos Autoctonos): Dr. Antonio Macias-Lopez, Director; Colegio de Postgraduados, CEICADAR, Apartado Postal 1-12, C.P. 72130, Col. La Libertad, Puebla, Pue., Mexico. (Tel. 48-00-88, 48-09-78, 48-05-42).
9. Philippines Resource Center for Indigenous Knowledge and Sustainable Development (PhiRCIKSD): Dr. Rogelio C. Serrano, National Coordinator; Philippine Council for Agriculture, Forestry and Natural Resources Research and Development (PCAARD), Los Banos, Laguna, Philippines (FAX 63-094-50016; Telex 40860 PARRS PM).
10. Kenya Resource Centre for Indigenous Knowledge (KENRIK): Dr. Mohamed Isahakia, Acting Director; National Museums of Kenya, P.O. Box 40658, Nairobi, Kenya (Tel. 254-2-742-161; FAX 254-2-741-424).

INDIGENOUS KNOWLEDGE RESOURCE CENTERS BEING ESTABLISHED

1. Regional/Sub-Regional Centers: European Resource Center for Indigenous Knowledge, Trans-Andean Resource Center for Indigenous Knowledge.
2. National Centers: Benin, Namibia, Zimbabwe, Burkina Faso, South Africa, Tanzania, Costa Rica, Venezuela, Colombia, Peru, Bolivia, Nepal, India, Australia.