MANAGEMENT AND ECONOMICS OF PLANT RESOURCES

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Summary

The relationship between humans and their botanical resources is reciprocal. Practitioners of all primary subsistence strategies purposefully alter their environments. Foragers and horticulturalists protect edible fruit-bearing species when clearing home sites or cutting timber. Pastoralist burned grasslands to improve forage quality for their animals. Agriculturalists replace natural ecosystems with high yielding but low diversity agroecosystems.

Protection, planting, and collection represent three broad categories of plant resource management. This chapter focuses on collecting of wild plant resources, sometimes referred to as non-timber forest products. While their economic value may vary significantly, both on temporal and spatial scales, these resources provide many of life's necessities for cultures throughout the world. Perhaps more significantly, they can provide crucial reserves during times of scarcity. Much remains to be learned about the plant resources for most non-urban populations.

1. Introduction

In its early history, economic botany took a static view of plant resources. Plants, like other natural resources, were exploited to meet human needs. Early economic botanists ignored the ecological interactions and cognitive aspects of plant-people interactions. More recently researchers have begun to unravel the dynamic, often coevolutionary relationship between plants and people. Humans modify populations of individual species as well as entire ecosystems. In turn, human populations are strongly affected by these biological systems.

Ethnobotany and the related discipline of ethnoecology have begun to focus more on the reciprocal ecological interactions. The term ethnoecology, coined by Harold Conklin in 1954 (Figure 1), focuses on local peoples' perception and management of complex and co-evolved relationships between the cultural, ecological and economic components of anthropogenic and natural ecosystems.

Current use of the term has evolved to encompass human management of resources and traditional knowledge of ecological systems. Schmink, Redford, and Padoch present two consensus definitions of human ecological management:

1. A set of customary practices designed to modify an ecosystem with specific goals in mind
2. Human intervention and or manipulation of the environment utilizing ideas or customs perceived as historically associated with group identity

Figure1. Harold Conklin in the field

Indigenous peoples' understanding of their environments is often referred to as Traditional Ecological Knowledge (TEK). Indigenous Knowledge (IK) is sometimes considered to be a synonymous term, though some consider it be broader than TEK. TEK encompasses local knowledge of plant and animal species and the physical environment, especially as they relate to subsistence activities. As Conklin demonstrated, TEK also may include peoples' perceptions of their environments. TEK is a cumulative system of knowledge, practices and beliefs within a cultural about the relationships between humans, animals, plants, and the environment.

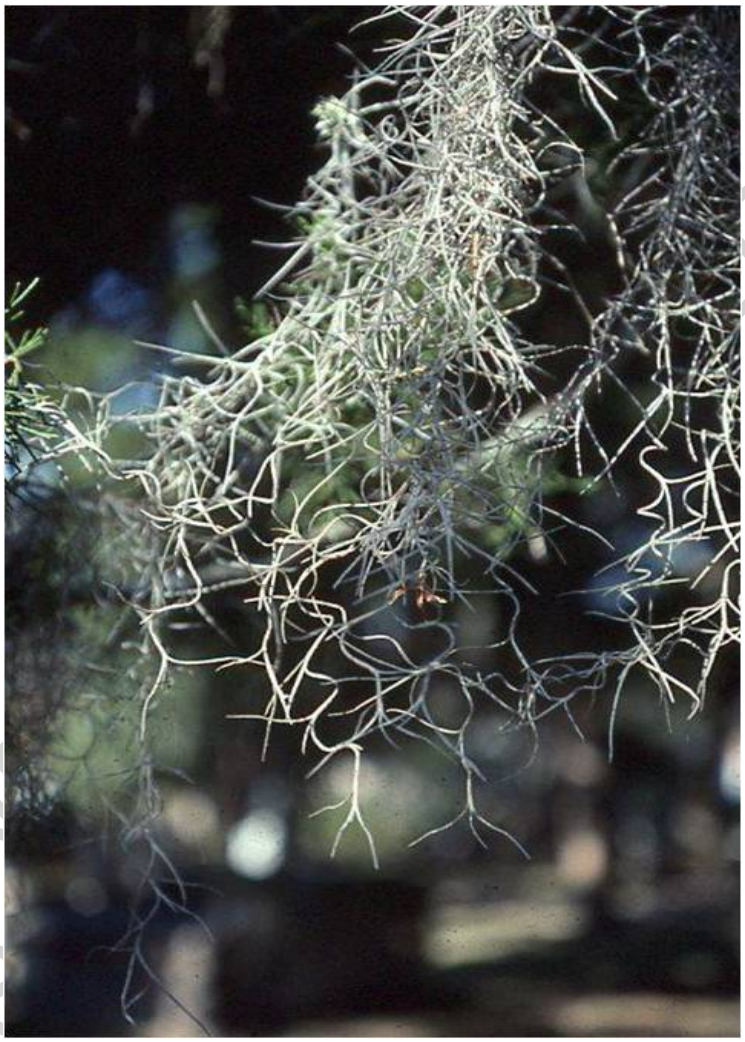

Figure 2. *Tillandsia usneoides* (Bromeliaceae) is known as ashome in one of the Seminole languages (Florida, USA). It sometimes grows with a related species *Tillandsia utriculata*, which is morphologically very different. The Seminole name for the latter is ashome chobee, which means large ashome. The Seminole taxonomy indicates the close taxonomic relationship between the two species, unlike the common English names – Spanish moss and giant wild pine

Neither TEK nor so-called "Western Knowledge" is exhaustive, nor are they mutually exclusive. Traditional knowledge is often experiential, holistic, integrative, pragmatic, and unifying. While some scientist continue to dismiss TEK, it is pertinent to remember

that average 10-year old rainforest dweller has spent more time in his environment and knows more about it than all but a handful of senior researchers. TEK tends to be less analytical than western knowledge. The Everglades of southern Florida (USA) has experienced rapid deterioration since drainage began in the early 1900s. Scientists from around the world have spent millions of dollars investigating these changes and looking for ways to ameliorate them. When a Miccosukee elder was asked how he knew the environment had changed, he replied simply, "I had a look around." The methodological and epistemological differences between TEK and science might be summarized as experience versus experiment. There, are however, many similarities between the two systems. These similarities are particularly evident in knowledge of plant-animal interactions. Studies of traditional agriculture have provided a framework for the development of modern agroforestry systems. Scientific taxonomy and folk taxonomy often show significant overlap (Figure 2). Author citations and families for plant species cited in the text appear in Appendix 1.

Figure 3. Sweet potato (*Ipomoea batatas*), ginger (*Zingiber officinale*), yuca (*Manihot esculenta*), and pineapple (*Ananas comosus*) in a Shuar garden (Ecuador).

Figure 4. A protected guadua stand (*Guadua angustifolia*) along the Rio Cayapas in the Chachi village of San Miguel (Ecuador.

From a broad perspective, humans manage plant populations in three, non-exclusive ways: planting, protecting, and collecting. Some species are intentionally planted (e.g., cultivars – Figure 3). Others are protected when clearing fields and forests (e.g., fruit trees and medicinal plants – Figure 4). Others are wild collected (e.g., saw palmetto – Figure 5).

Foragers and pastoralists are primarily collectors, though they may occasionally plant or protect some species. Farmers, both agriculturists and horticulturists, are primarily planters but they may protect valued species and supplement their economies through foraging. For example, the Shuar (of Amazonian Ecuador) who rely on manioc (*Manihot esculenta*) as their primary crop, protect at least 155 woody species when clearing fields.

Figure 5. Saw palmetto (*Serenoa repens*) – as much as 23,000,000 kg are wild collected each year in the state of Florida (USA).

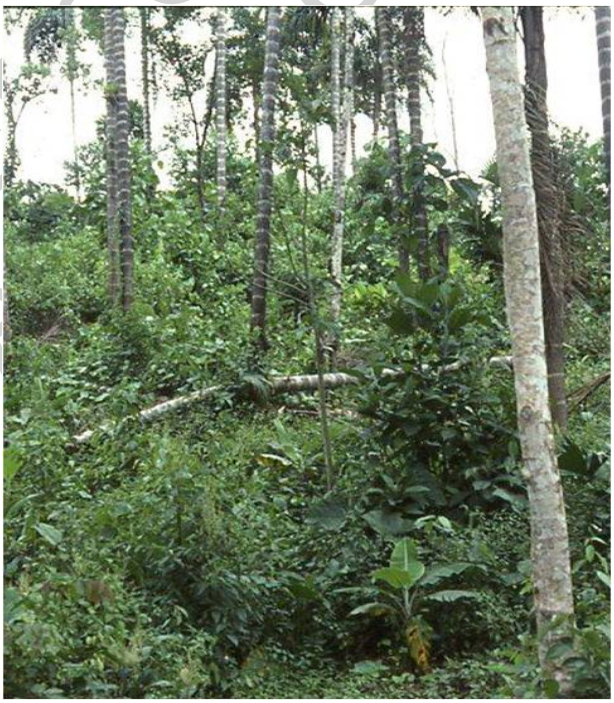

Figure 6. Old growth Quichua field (purma) which mimics secondary forests in terms of taxonomic composition, diversity, and structure (Ecuador).

Planting: Planting, as practiced by agriculturalists and horticulturalists, is the most intensive form of management. Farmers create novel ecological communities. These may be depauperate in the monocultures of modern agriculture or they may approach the diversity of natural systems in polyculture swidden systems Figure 6).

Even natural populations are enhanced by planting. Collectors often leave or intentionally plant some portion of seeds or vegetative propagules to assure that populations remain viable. Ritual offerings or restrictions on harvest can have the same effect on enhancing populations of desirable species.

Plant Protection: In addition to preserving plants when clearing fields, horticulturalists employ other forms of management to enhance populations of desired species. Weeds may be removed from the vicinity of desirable herbaceous species (Figure 7). Lianas and parasites may be removed from trees. Natural fertilizers are sometimes added and pruning of woody species may be employed to improve their growth and output. Fire is a commonly used tool that influences both populations and entire ecosystems. Annual fires ignited by indigenous people of California (USA) increase the abundance of *Muhlenbergia rigens*, a grass used for basketry and thatch.

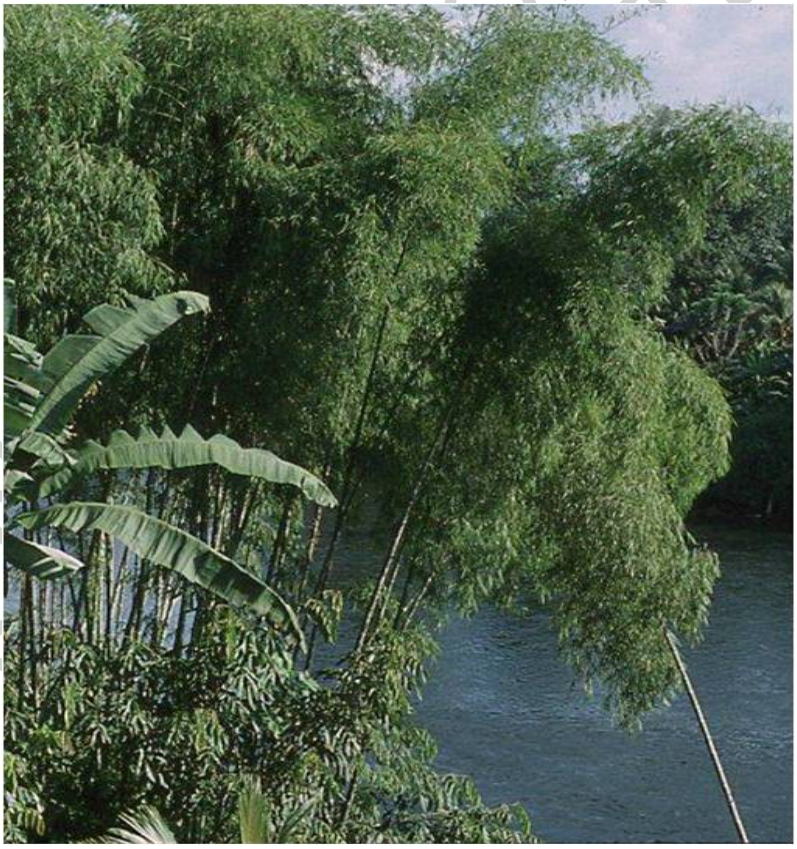

Figure7. Tintuk (*Aphandra natalia*) is protected when clearing fields in southern regions of Amazonian Ecuador. Potential plant competitors are removed from the area occupied by the palm.

Plant Collection: Collecting wild resources is the exclusive subsistence strategy of

foragers, but pastoralists, horticulturalists, and even some agriculturists also gather plant resources from natural environments (Figure 8). The viability of collecting is closely tied to population density and collection pressure. Collection can lead to localized extinction of plant populations. The ancient Greeks harvested a plant called silphion (probably a member of Apiaceae) for several uses including as a birth control agent. The plant is no longer extant. The Siona-Secoya relocate their settlements, not because soil is depleted or game is exhausted, but because of the over-harvest of canoe trees. Ginseng (*Panax quinquefolius*) has disappeared from much of its range in the Appalachians due to excessive collecting. However, collectors may intentionally modify plant populations in several manners.

Figure 8. Quechua man in the highlands of Ecuador collecting grasses to use for guinea pig or cui (*Cavia porcellus*) forage.

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Biographical Sketch

Dr. Bennett is Director of the Center for Ethnobiology and Natural Products and a professor in the Department of Biological Sciences at Florida International University in Miami, Florida. He earned a B.A. in Biology and Geology from Bucknell University, and M.S. in Biology from Florida Atlantic University, and a Ph.D. in Botany from the University of North Carolina at Chapel Hill. He was the 2004-2005 president of the Society for Economic Botany and currently is an associate editor of the journal Economic Botany. He also is a member of the American Botanical Council's Advisory Board and the National Institutes of Health's National Center for Complementary and Alternative Medicine Special Emphasis Panel. His main research focus is Neotropical ethnobotany and ethnopharmacology. Dr. Bennett and his graduate students work in Bolivia, Brazil, Cameroon, Cuba, Costa Rica, Ecuador, Guyana, Japan, Mexico, Panama, Peru, and the U.S. Dr. Bennett's book *Ethnobotany of the Shuar of Amazonian Ecuador* won the 2006 Klinger Award from the Society for Economic Botany. His research has been published in Ambio, BioScience, Brittonia, Economic Botany, Selbyana, Journal of Tropical Ecology, and Journal of Ethnopharmacology.