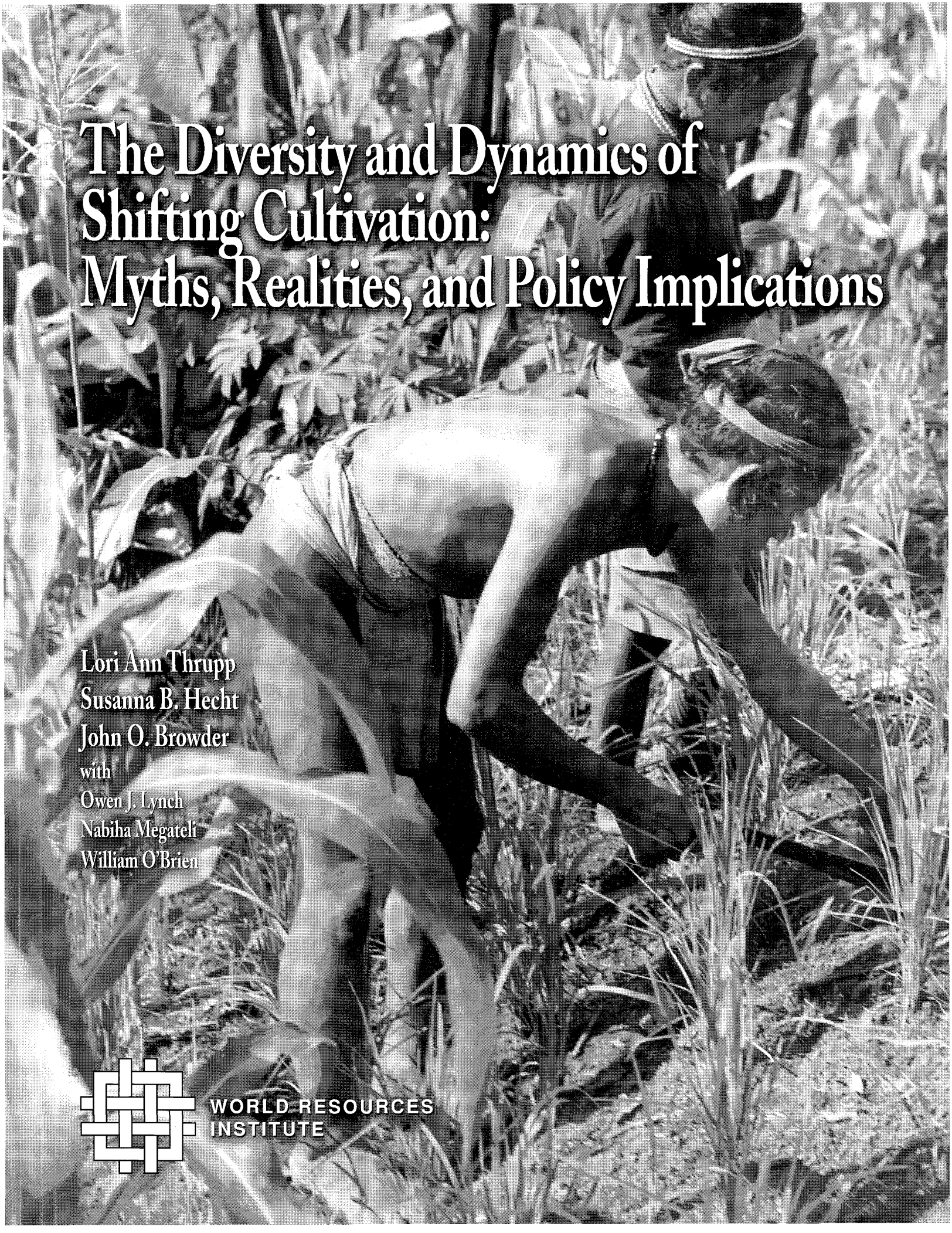

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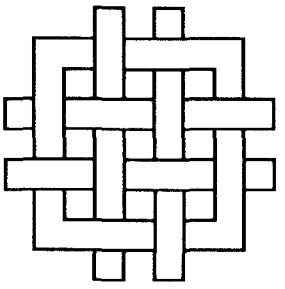

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Cover photograph courtesy of Harold C. Conklin
(Rice, maize, manioc, pigeon pea, and banana plants surround two Hanunóo shifting cultivators as they weed their extensively intercropped hillside swidden for a second time on Mindoro island in the Philippines.)

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Contents

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The Authors

Introduction

Shifting cultivation is the most complex and multifaceted form of agriculture in the world. Its highly diverse land use systems have been evolving since as early as 10,000 BC in a wide range of distinct socioeconomic and ecological conditions, from montane to lowland ecosystems, and from tropical forests to grasslands (Spencer, 1966). Shifting cultivation encompasses cropping systems such as horticulture and annual cropping, perennial tree crops, animal husbandry, and management of forests and fallows in sequential or rotational cycles; it is currently practiced in a wide variety of forms by 500 million to one billion people around the world.

Shifting cultivation has been a subject of debate and intervention since the colonial era, and it has often been subject to public misconceptions and stereotyping. Many in the environment and development community have criticized shifting cultivation as a primitive, backwards, destructive, or wasteful form of agriculture, and as a mere precursor to what are perceived to be more modern, sustainable and sedentary forms of agriculture. Contemporary critics and the media often call it "slash and burn" agriculture—a pejorative term that perpetuates misperceptions about shifting cultivators.

This publication highlights the multifaceted, dynamic characteristics of shifting cultivation and identifies socioeconomic and policy factors that affect shifting cultivators. It challenges prevailing misconceptions by highlighting the diversity, myths, and realities of shifting cultivation. The concluding section summarizes reasons for supporting agroecological principles and livelihood security and avoiding historical mistakes. It also draws on insights based on field research and makes recommendations for policy change as well as other opportunities for supporting sustainable and equitable land use, including participatory community-based approaches for integrating local knowledge in research and development.

I. The Basics of Shifting Cultivation Systems: What, Where, Who

Meaning of Shifting Cultivation

Shifting cultivation consists of many diverse land use activities and is, therefore, difficult to define. Broadly speaking, the term refers to any temporal and spatially cyclical agricultural system that involves clearing of land—usually with the assistance of fire—followed by phases of cultivation and fallow periods. Most shifting cultivation systems blend agriculture with hunting, fishing, gathering, and resource-use systems in multi-niche strategies that make economic and social sense in many settings. Typically, shifting cultivators incorporate perennial crops such as fruit, medicinal, nut, and resin trees. Some shifting cultivation systems are actually forms of agroforestry systems (Raintree, 1986; Dove, 1985; Peluso,1992; Denevan and Padoch, 1988; Alcorn, 1990a, 1990b; Brookfield and Padoch, 1994).

The colloquial term "slash-and-burn agriculture" refers to the method of clearing and preparing land, common among shifting cultivators. This term, however, has pejorative connotations and is avoided in this report. The term "swidden farming" is preferred by anthropologists as a neutral concept; it is drawn from the Old English word *swidden*, meaning burned clearing (Conklin, 1957; Peters and Neuenschwander, 1988). Swidden farming as a term does not adequately capture the dynamic quality and stages of shifting cultivation, however.

Extent of Shifting Cultivation

The total land area affected by shifting cultivation is difficult to assess because the practice includes many land use activities. A reasonable estimate of the global area is 2.9 billion hectares (Stiles, 1994). Hauck (1974) and Sanchez (1976) estimate that various types of shifting cultivation are practiced on about 30 percent of the world's exploitable soil. Dove (1985) suggests that roughly one half of the land area in the tropics is modified by shifting cultivation.

Shifting cultivation was common in the temperate zones of the Mediterranean and Northern Europe until the 19th century, as well as in the southwestern and northeastern pine woodlands of North America until the 1940s (Dove, 1983; Brookfield, 1996; Warner, 1991). Currently, it occurs almost exclusively in the tropics of Africa, Asia, and Latin America. Figure 1 shows the main areas in which shifting cultivation systems are practiced today. Other agricultural land use systems are practiced in these areas, but shifting agriculture is the prevalent system.

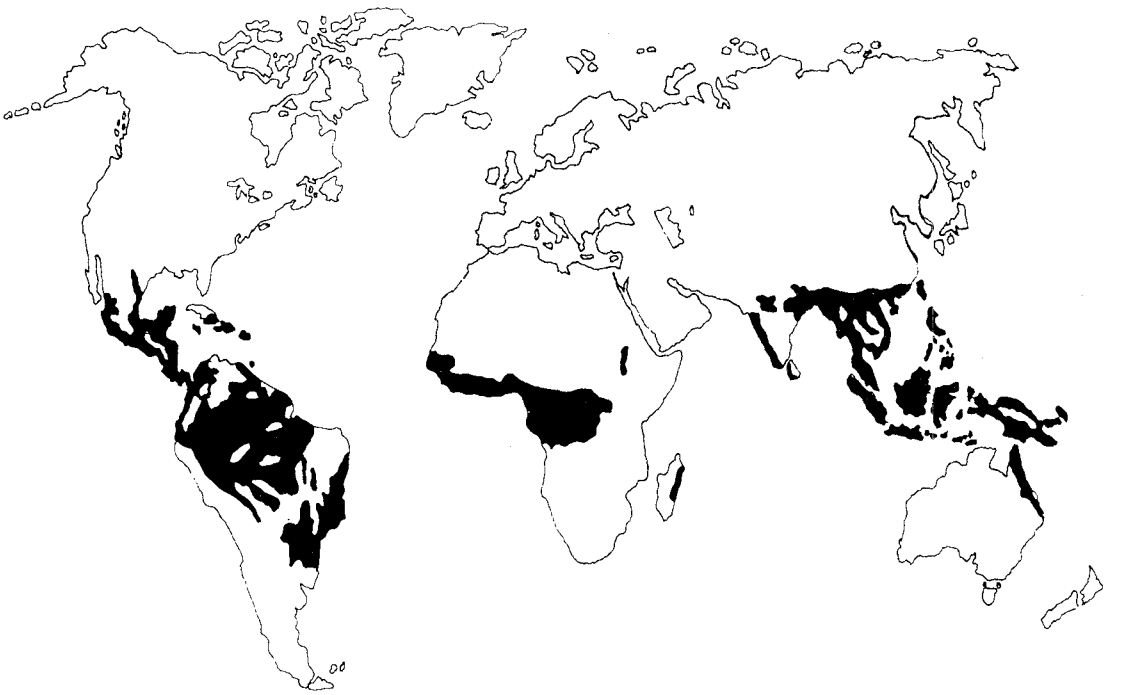
Shifting cultivation is found in a variety of topographies, ranging from steeply sloped hilly areas to flat lands and low-lying valleys (Sarkar, 1982). Likewise, it is found in diverse ecosystems that range from tropical moist forests to dry tropical forests and savannas, grasslands, and even seasonal floodplains. (*See*

Chapter II.) Land uses derived from shifting cultivation often blend with or are mistaken for natural forest. Some forest formations, as in the Babassu forests in northeastern Brazil, are the results of resource management by shifting cultivators (Balick et al., 1991). Many forests in Kalimantan, Indonesia, are dotted with forest and fruit gardens planted over time by shifting cultivators (Padoch and Peters, 1993). The total number of people engaged in some form of shifting cultivation system has been only loosely estimated. Three hundred million (Russell, 1988) and five hundred million (Lanly, 1985) are conservative estimates frequently cited, but some have argued that more than 400 million people in Asia alone are forest dependent and that a majority of them engage in shifting agriculture (Lynch, 1992b). It is probably not unrealistic to estimate that as many as one billion (22 percent of the population of the developing world in tropical and subtropical countries) rely directly or indirectly on some form of shifting cultivation. These shifting cultivators belong to at least 3,000 different ethnic groups (Stiles, 1994).

Main Features of Shifting Cultivation

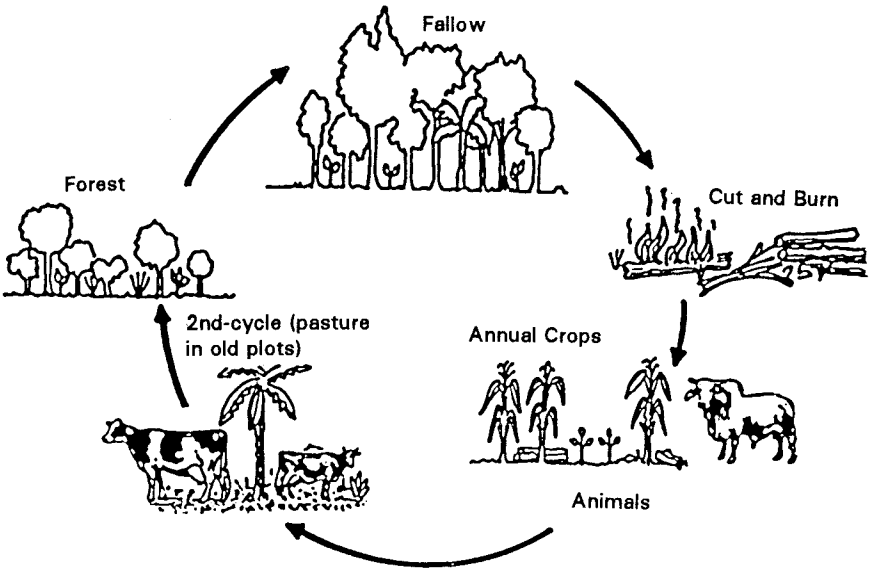
Shifting cultivation is cyclical, and its cycles encompass an array of land use activities. The specific stages and features of each cultivation cycle vary and are sometimes difficult to distinguish. In woodland and montane forms of shifting cultivation, for example, the cycle is often comprised of six stages: site-selection and clearing, burning, planting, weeding and protecting, harvesting, and succession. In other forms, the stages do not follow such a clear pattern. Graphic portrayals of shifting cultivation risk oversimplification of its complexities, but attempts to show the main general stages and their relation to vegetation regrowth in common cyclic sequences are in Figures 2 and 3.

Figure 1. Areas of Shifting Cultivation



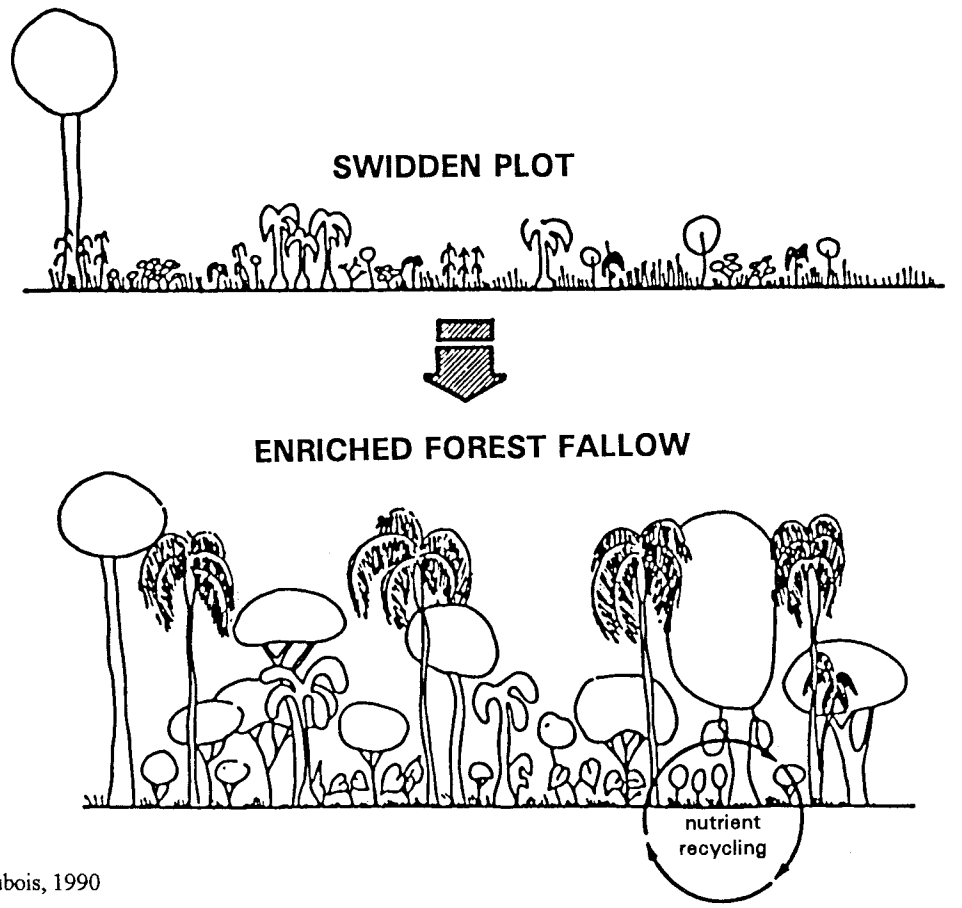
Source: Approximation based on Warner, 1989, with estimated update by WRI

Figure 2. Example of Basic Shifting Cultivation Cycle



Source: From Dubois, 1990 and OTS/CATIE, 1993

Figure 3. Example of Fallow Variation in Shifting Cultivation



Source: From Dubois, 1990

The cropping cycle in shifting cultivation refers to the "planting, care, harvesting, and protection of intentionally introduced flora" (Conklin, 1957, p.72). The types of crops and the manner in which they are planted diverge greatly among shifting cultivator groups (Hecht and Posey, 1989). In South America, for example, "intercropping of many varieties of the same crop species may take the place of the intercropping of many species of different crops" (Beckerman, 1983, p.3). In some areas, swidden plots are like miniaturized tropical forests or complex agroforestry systems (Geertz, 1963; Alcorn, 1991, 1990a, 1990b). Even individual households commonly manage a variety of crops and trees, depending on the local economy and ecology (Eden, 1993).

In general, the cropping cycle in any given system lasts at least several years and is followed

Box 1. Burning and Fallow: Key Stages in Shifting Cultivation Cycles

Burning. Burning is the typical method employed by shifting cultivators for clearing vegetation and preparing a site for planting. There are at least seven beneficial effects of burning, all of which contribute to increased food production (based largely on Rambo, 1981; Peters and Neuenschwander, 1988):

- Clearing of unwanted vegetation and weeds from the field;
- Elimination of unwanted insects and plant diseases from crops;
- Alteration of soil structure to make planting easier;
- Increase in available soil nutrients;
- Decrease in soil acidity;
- Enhancement of soil fertility with nutrient-rich ashes from burnt plant biomass (i.e., creating a natural ash fertilizer);
- Sterilization of soil and reduction of microbial pathogens; and
- Reduction of labor requirements compared with other forms of clearing.

Tools such as machetes and axes are usually used to fell trees, which are typically secondary growth. Sometimes, only tree crowns and some branches are lopped off (Chidumayo, 1987). Shifting cultivators use diverse techniques for burning, fire protection, and reburning (Peters and Neuenschwander, 1988). *Chitemene* (dry forest) systems in northern Zambia (Stromgaard, 1989) and Bhutanese grass-fallow systems (Roder et al., 1992), for example, use supplementary fuels brought in from outside the burning area. Broadcast burning is preferred by many groups because it requires the least labor (Peters and Neuenschwander, 1988). The land is subsequently planted with a basic staple crop, such as cassava, rice, millet, or maize, or some combination of these crops.

Fallow. The fallow stage follows the cropping stage, typically after a swidden field has been used for several years. The native vegetation is allowed to regenerate to improve the physical properties of the soil and capture nutrients from deep in the soil. Fallow fields are often perceived by outsiders as abandoned or wasted land, but usually shifting cultivators manage fallows, using them for planting trees or crops, collecting edible and commercial products, or hunting and pasturing animals. Certain trees valued for their products or prices are often protected within shifting cultivation fields both during burning and the fallow cycle. Shifting cultivators also observe, weed, transplant, and carefully manage vegetation regrowth during the fallow cycle in preparation for the next planting. Fallow times vary greatly in shifting cultivation systems (Kunstadter and Chapman, 1978; Bose et al., 1982), and they are often adapted to demographic pressure and socioeconomic conditions (Baum, 1968; Ruthenburg 1980). In many rain forest areas, shifting cultivation systems traditionally have involved long fallow cycles of one to three decades and cultivation cycles of at least two to four years (Ruthenburg, 1980; Miracle, 1967). In many parts of the world, however, fallow lengths are becoming progressively shorter.

by a fallow period, during which land is seldom cultivated, the natural vegetation regenerates, and soil nutrients are restored. The fallow period, clearing of vegetation, and burning are particularly important. (*See Box 1.*) The cultivators sometimes practice horticulture in the fallows as well (Padoch and Peters, 1993).

Succession refers to the multiple stages or cycles of vegetation regrowth, in the fallow or in other land adjacent to the cultivated plots. Shifting cultivators typically manage and use such successions for multiple purposes: to protect valuable species, plant desired species, and weed, burn, thin, and prune to manage fallows and the remaining forest or woodland (Anderson and Yoris, 1991; Denevan and Padoch, 1988; Alcorn, 1982; Redford and Padoch, 1992; Hecht and Cockburn, 1989; Balee, 1992; Posey and Balee, 1989). This allows them to extract an array of forest products from the land. The products of the manipulated succession can equal or exceed the returns generated from the annual cropping phase or wage labor (Hecht et al., 1988; Anderson and Yoris, 1992; Denevan and Padoch, 1988; Hecht, 1993; Padoch, 1988; Dove, 1983; Brookfield and Padoch, 1994).

In most traditional forms, shifting cultivation practices are closely tied to cultural and spiritual activities. For example, among traditional cultivators in many Philippine upland regions "religious beliefs and practices are intimately linked to swiddening, especially in relation to the various phases of the annual cycle such as site selection, clearing, firing, planting and harvesting" (Bennagen, 1983, p.257 and personal communication). The cultivators generally have detailed knowledge about local ecological factors and constraints and adapt their practices accordingly (Collier, 1975). Such complexity of culture and knowledge has been documented in many countries, such as Malaysia. (*See Box 2.*)

Dynamics of Shifting Cultivation

The features, stages and lengths of cycles of shifting cultivation have changed over time. The pace of change has been rapid during the last 30 to 50 years, largely due to the political, economic, and cultural transformations discussed here. In particular, the length of time that fields are left in fallow is increasingly shortened, which leaves less time for restoration of soil fertility (Patnaik, 1982). In northeast India, for example, fallow times historically were as long as 40 years, but are now an average of five years, well below the time required (10 years or more) to allow soil fertility to recover in a a fallowed site (Ramakrishnan, 1992; Goswami, 1985). In Zambia, *chitemene* shifting cultivation systems have shortened fallow periods from 25 years to 12 years (Chidumayo, 1987, p.23).

Box 2. Culture and Ritual in Iban Shifting Cultivation

Among the traditional Iban shifting cultivators of Malaysia, rice production is interwoven with their world view, beliefs, and social organization (Majid, 1983). Ritual and religion are integrated into all aspects of swiddening—from appeasing the "spirits of the earth jungle" with the *manggo* ritual before clearing, to rituals associated with the storage of harvested rice. The rice itself is viewed as sacred. Various rituals before and during reaping ensure that the spirit of the paddy is not frightened away, that there will be sufficient rice for the coming year, and that the crop will be abundant and easy to reap. Rice is also harvested so that the paddy spirit following the reaper will not get lost. "Rice is not just a staple food; it has a spirit, a soul, and the proper rituals must be followed in order to win the esteem and favor of the paddy spirits, for a plentiful supply of grains" (Majid, 1983, p.196). Land use practices and religious rites are closely integrated because the Iban perceive the world as one shared with other orders of beings, each of which plays a crucial role in the success of their agriculture. Given this close integration, changes to farming systems inevitably affect aspects of native cultures.

At the same time, shifting cultivators generally have been intensifying their land use practices over time, in many cases through the introduction of new crops and technologies. In some regions, they have also been expanding their practices into forested areas. Such changes can sometimes increase the cultivators' immediate incomes, but the agricultural results have been adverse or unsustainable, especially if unsuitable land is overused or inappropriate inputs or crops are used.

These changes have resulted in disruptions or instabilities in previously well-adapted shifting cultivation and resource use, and they have made the systems unsustainable ecologically and economically in some cases (Raintree and Warner, 1986; Warner, 1991).

The main factors contributing to such changes include government restrictions of forest use, changes in land tenure systems, demographic pressures including large-scale migration and resettlements, and policies that promote cash crops (Nair and Fernandes, 1984, p.169). These factors have also raised concerns about the sustainability of shifting cultivation and have led to research and development efforts on alternative land uses.

Such unstable, changing conditions are not found in all shifting cultivation systems, but they have reinforced public misconceptions about shifting cultivators. The ecological and socioeconomic sustainability of shifting cultivation needs to be understood in relation to local conditions and the causes of change to these conditions. The general principles that underlie shifting cultivation must also be appreciated (Kleinman et al., 1993).

II. Myths and Realities

Shifting cultivation and the people who practice it are often negatively stereotyped. They are widely perceived by many scientists and policy-makers, as well as the general public, to be primitive, backwards, unproductive, wasteful, and exploitative and destructive of the environment. Regardless of the location, they are believed to be destitute and to lead subsistence-based lives. They have been blamed for most of the world's tropical deforestation, land degradation, and climate disruption. Thus, many current national laws and policies that affect shifting cultivators are antagonistic toward them and aim to replace shifting cultivation with forms of farming considered to be more modern. The result in many areas has been the assertion of state control over lands used by shifting cultivators, and the forced displacement of local people.

Negative attitudes toward shifting cultivators are also prevalent in agricultural research and development institutions in both hemispheres. Many research analysts and decision-makers presume that modern agriculture always means agriculture that is settled, intensive, and makes use of monocultures and Western technologies. They often overlook opportunities to learn from, use, and improve some of the effective features of shifting cultivation (Ramakrishnan, 1992; Alcorn, 1991; Redford and Padoch, 1992; Padoch, 1982; Brookfield and Padoch, 1994).

These perceptions of shifting cultivation and cultivators, which have led to policies and laws adverse to the practice and its practitioners, are based on misinformation and oversimplifications that have deep historical roots. Eight common myths about shifting cultivation are summarized and refuted below. Implications for research and policy are also summarized.

Perceptions of Agricultural Development Stages

MYTH 1 — *Shifting cultivation is a primitive precursor to more commercial ("modern") forms of production in the theoretical stages of agricultural development.*

Perceptions of shifting cultivators as primitive are rooted in the scientific and colonial encounters of the 17th, 18th, and 19th centuries that followed European expansion into the tropics (Wolf, 1982). Typical descriptions of tropical peoples, including shifting cultivators, were of "savages"; "backwards," "ignorant," "stubborn," "child-like," or "aggressive" pagans; or "infidels" (Hecht, 1993). British explorers such as Sir Walter Raleigh thought that "indolent local populations" in areas being colonized needed the "guiding hand of civilization" to convert their natural resources into productive enterprises (Raleigh, 1597; Stanley, 1899). Another early analyst asserted that "shifting cultivation ought not to be tolerated except in a very wild and unpeopled country . . . . It leads to unsettled habits and takes away from the regular cultivation of a fixed spot. It is carried on by a set of savages who would be more profitably employed on public works or coffee plantations" (Cleghorn, 1851). Such perspectives have been influential for decades and remain so today.

During contemporary times, shifting cultivation has also been described in linear evolutionary terms as part of an inevitable, historically determined progression from primitive to modern forms of agriculture. Conventional models of change within development and agriculture typically suggest linear movement through stages, from hunting/gathering to shifting cultivation to settled agriculture (Greenland, 1974). In this interpretation, low-density shifting cultivation is seen as the most primitive agriculture and intensive sedentary agriculture as the most advanced. Likewise, much of the associated literature suggests that shifting cultivators are at the far margins of civilized, modern societies, thus justifying external interventions into their way of life.

The linear models sometimes present population pressure as a driving force in the stages of agriculture (Boserup, 1965; Greenland, 1974), suggesting that increasing population density leads to more frequent cultivation of fields, shortening of fallows, and, eventually, degradation. If migration does not remove the population pressure, the theory states, the only alternative is to introduce technologies or methods that promote higher yields per unit of land or greater cropping intensity.

REALITY 1 — *Shifting cultivators respond to agroecological and socioeconomic factors in dynamic, nonlinear ways.*

Shifting cultivators are too diverse to fit neatly into any deterministic economic or demographic transition model. Theories of linear agricultural development stages rest on a set of assumptions that can be misleading, are unsupported by empirical evidence, and reflect ethnocentric views (Shrire, 1984). Linear models limited to specified stages of development are not universal generalizations; they are "basically untestable in the field . . . [and] essentially ambiguous" (Hill, 1986, p.24). Suggesting natural linear stages of agricultural evolution neglects the complexities of historical change. In reality, transitions between different types of agricultural production involve dynamic processes rather than categorical divisions. For example, Punan hunter-gatherers in Borneo once moved from shifting cultivation to hunting and gathering, which would be seen as an impossible step backward according to linear models (Hoffman, 1984). This shift occurred not because of population pressure or evolutionary agricultural regression, but because hunting and gathering became more profitable than shifting cultivation in the Punan's relations with Chinese traders. Other groups in Southeast Asia, such as the Kubu of Sumatra and the Toala of Celebes, were agriculturalists who became nomadic hunter-gatherers (Hoffman, 1984). The Dayaks in East Kalimantan, Indonesia, have changed their agricultural practices in ways that have differed depending on the degree of their integration in the monetary economy (Inoue and Lahjie, 1990; Dove, 1985, 1993). (*See also Myth 3 below.*)

Another problem with the linear model is that it is rooted in a theory of internal population dynamics which overlooks the potentially destabilizing effects of markets and tenurial changes among other factors (Padoch, 1982; Bray, 1985; Descola, 1993). (The development of cattle ranching in Central America and in the Amazon are examples of serious degradation independent of population pressure.) Moreover, population is not the only factor prompting intensification of land use. Assuming that cultivators rely exclusively on the short-cycle successional phase of shifting cultivation overlooks the contributions of fallow and forest resources that provide both products and income. Assuming an empty fallow ignores the diverse practices and human innovations that permit much higher population densities in various tropical environments to function in complex economies. In addition, less intensive land uses can be vastly more destructive on a regional scale.

IMPLICATIONS: Decision-makers and researchers need to discard simplistic stereotypes about the "primitiveness" of shifting cultivation and avoid linear models of agricultural stages. To make rational decisions and land use improvements, they need to better understand the complex dynamics of land use, both temporally and spatially. The agricultural practices of shifting cultivators should be understood as adaptations to ecological, socioeconomic, and structural constraints. Lessons can be learned from these systems that are useful to modern agriculture and the promotion of sustainable development. Better knowledge of these factors should be incorporated into planning, policies, and programs for land use.

Diversity of Shifting Cultivation

MYTH 2 — *Shifting cultivation systems in tropical rainforests are uniform and unchanging, and shifting cultivators are homogeneous poor peoples.*

Shifting cultivation is often viewed as simple and homogeneous by several scientists, environmentalists, government decision-makers, and the media. Typical misconceptions are that "all shifting cultivation techniques are similar everywhere" and that "shifting cultivation is a waste of land" (Watters, 1971, p.3). This notion, expressed in historical studies and in influential reports from the Food and Agriculture Organization of the United Nations (FAO), remains pervasive. Shifting cultivation systems are also often lumped together as the cause of deforestation and other forms of environmental degradation worldwide (Bandy et al., 1994; Myers, 1994; UNDP, 1992).

Many analysts also assume that shifting cultivators belong to poor and undifferentiated communities. Communities of shifting cultivators are rarely desegregated or analyzed by social class, gender, ethnicity, or historical background. Often traditional and indigenous cultivators are lumped together with migrant cultivators. Little attention is given to the differential in groups of shifting cultivators' distribution of productive resources both within and between individual households and communities (Thapa and Weber, 1991).

REALITY 2 — *Shifting cultivation systems encompass a remarkably diverse range of land use practices developed and changed over time by farmers in varied social, ecological, economic, and political settings.*

"To speak of shifting cultivation as a single system shows our misunderstanding of its diversity" (Peters and Neuenschwander 1988, p.77; Ruthenberg, 1980). Shifting cultivation systems are more varied than almost any other type of land use, a logical occurrence given that over 3,000 ethnic groups practice shifting cultivation (Stiles, 1994), in diverse environmental conditions (Dove, 1993, 1983; Padoch, 1982; Hoffman, 1984; Shrire, 1984; Spencer, 1966; Fujisaka et al., 1995). Recent research indicates that considerable intra-ethnic diversity and variability in settlement and cropping patterns, population density, and fallow practices exist among shifting cultivators inhabiting different regions. Such differences exist even among groups in the same region, such as the Tanghkhul Naga of northeastern India, the Dayak of Kalimantan and the Hmong of Thailand (Bose et al., 1982; Kunstadter and Chapman, 1978; Dove, 1993; Hungyo, 1982; Inoue and Lahjie, 1990; Padoch and Peters, 1993). In one region of northern Thailand there are six distinct shifting cultivation systems, three each practiced in evergreen and deciduous forest (Smitin et al., 1978).

Although shifting cultivation today occurs mostly in the tropics of Africa, Asia, and Latin America, it is not restricted to tropical rainforests. It extends into woodlands, savannas and dry tropical and subtropical forests and

grasslands. Contrary to popular belief, there are shifting cultivation systems in use in the *miombo* grassy woodlands and the grasslands of Southern Africa (Chidumayo, 1987; Stromgaard, 1989), as well as in the grasslands of Southeast Asia (Dove, 1985) and Bhutan (Roder et al., 1992). Even pastoralist groups in East Africa, such as the Barabaig, practice maize shifting cultivation in the savanna plains of Tanzania (Lane, 1994). In the Congo Basin, savanna vegetation covers a large portion of the shifting cultivation areas (Miracle, 1967). Other examples include the grassland systems of the Hariq in the Sudan (Miracle, 1967) and *chitemene* among the Mambwe in northern Zambia (Richards, 1937; Stromgaard, 1989).

Diversity in Cropping Systems and Cycles of Shifting Cultivation: Shifting cultivation systems consist of a variety of cropping systems, cultural practices, and components within each region where they are found. Shifting cultivation can be seen, therefore, as a mosaic of land and resource uses, that is adapted to local ecologies, cultures, and regional economies. These mosaics are differentiated by a range of shifting and unshifting elements, managed and unmanaged successions, and varying levels of intensity in cropping systems. (*See Box 3 for examples.*)

Moreover, shifting cultivators typically manage a variety of cultivated crops and wild plants. Studies have found that an individual plot can include more than one hundred species per hectare (Descola, 1993). The Kantu in Kalimantan, for example, plant over 44 varieties of rice, averaging 17 per household (Dove 1993). Congo Basin farmers often "grow thirty or more different crops—and as many as sixty [have been] recorded" (Miracle, 1967, p.283). In East Kalimantan, Indonesia, Dayak shifting cultivators use over 22 varieties of upland rice and nine of glutinous rice (Colfer et al., 1988). In Sierra Leone, 98 shifting cultivator households were found to use 59 distinct rice varieties; each particular field is maintained with four to eight varieties (McNeely et al., 1995). Dozens of rice varieties have been found in swidden plots in other parts of Asia and Africa as well (Dove, 1993, McNeely et al, 1995). Approximately 5,000 varieties of sweet potato are found in shifting cultivation systems of Papua New Guinea, with up to 20 varieties used within a single garden (Wood and Linne, 1993). Some shifting cultivators also maintain wild relatives of cultivars and overall levels of species diversity that are close to those of older growth forests (Padoch and Peters, 1993).

Many of the groups maintain and manage sedentary farming plots, such as home gardens and plantations, along with cyclical swidden plots. They intensively manage such production systems to complement shifting cultivation, often domesticating and experimenting with many of the wild plants found in the successions of shifting cultivation. In fact, managed successions may have higher species diversity than unmanipulated successional sites (Irvine, 1989). Many Indonesian farmers, for example, manage their fallows to enhance diversity (Padoch, 1988).

Polycultural home gardens often have very high species diversity. Documented cases have reported more than one hundred plant species, including roots, tubers, vegetables, fruits, herbs, medicinals, dyes, oils, fodder, and fibers (Padoch and de Jong, 1993; Fernandes et al., 1988; Soewarmoto et al., 1985; Padoch and Peters, 1993). In this context, the cultivators may intensively grow grains and carbohydrates such as taro, cassava and paddy rice, the last of which often relies on nutrients transported from forest systems or via swamp or irrigation waters (Saldanha, 1990; Miracle, 1967; Guyer, 1984).

Box 3. Variations in Shifting Cultivation: Examples from African *miombo* Woodlands

Shifting cultivation systems have persisted for centuries throughout the ecosystems of Southern Africa's *miombo* woodland which is characterized by herbaceous layer and semiclosed tree canopies, generally on infertile acid soils that spread across Angola, Malawi, Mozambique, Tanzania, Zaire, Zambia and Zimbabwe. All *miombo* shifting cultivation systems have made use of fire to clear land, and different natural plant biomass fertilizers, including cattle manure, to improve soil fertility (Chidumayo, 1987; Stromgaard, 1989).

Probably the most well-known and successful *miombo* shifting cultivation system is the circle *chitemene* system practiced by the Bemba, Lamba, and Lala in the northern wetter *miombo* of Zambia (Trapnell, 1957; Chidumayo, 1987, p.37; Stromgaard, 1989). Crops such as finger millets and cassava are grown, without tilling the soil, in ash gardens averaging eight hectares. A pile of branches trimmed and lopped from trees in a large woodland area ("outfield") is burned to make the ash (Chidumayo, 1987; Stromgaard, 1989). The Lamba and Bemba tend to practice a block *chitemene* in which brushwood is burned in part of a cleared garden area. The Lala practice a circle chitemene with smaller cultivated gardens, and sometimes larger outfield areas serve as a source of ash (Stromgaard, 1989). The practices allow stumps and trunks in the outfield to quickly regenerate back to woodland (Chidumayo, 1987). Traditionally, a new ash garden was made every year, and during the second year cassava succeeds millet before the plot is abandoned for 25 to 30 years (Trapnell, 1957).

The *fundikila* (or *chibela)* system is another form of shifting cultivation found in *miombo* woodlands; it is practiced by the Mambwe and others in northeastern Zambia. It is more intensive; adapted to higher population densities, up to 30 people per square kilometer (Stromgaard, 1989; Chidumayo, 1987); and depends on nutrients in grass biomass compost mounds and a legume-cereal crop rotation that maintains fertility and production for longer periods than the *chitemene* system allows. Nitrogen-fixing legume crops (beans or groundnuts) are sown on grass mounds, often with cow manure. Crops are rotated for three to six years before abandonment, without any significant change in the soil nutrients (Chidumayo, 1987, p.36).

The Bemba, Mwambe, Lamba, Lala, and other *miombo* shifting cultivators supplement their shifting fields in various ways. In their gardens near the homestead, for example, they interplant diverse crops such as sorghum, maize, rice, cassava, pumpkin, sweet potatoes, groundnuts, bull-rush millet, cow peas, castor oil, and tobacco. They also harvest wetland fish, hunt game, and use numerous wild herbaceous vegetables, edible insects such as caterpillars and termites, over 28 mushroom species, 106 tree species that include medicinal functions, and some 25 edible fruits (Chidumayo and Siwela, 1988; Stromgaard, 1989).

Paradoxically, even though these cultivation systems have been relatively effective and are well adapted for the local people, the British colonial and postcolonial governments have attempted to ban the use of fire and settle the shifting cultivators. Since the 1980s, they have also imposed use of soil tillage and hybrid maize based on subsidized inorganic acid fertilizer and encouraged shifting cultivators to clear trees to ground level. Such attempts are seldom successful, as people continue to practice the methods that have ensured them of their livelihoods.

In recent years, however, the *chitemene* and *fundilika* systems have come under stress, as fallows are shortened and soil fertility has been reduced. For example, Bemba households now tend to clear fields every two years, fallows are maintained for 12 rather than 25 years, and millet has been replaced by sorghum. Such changes are due to increasing population density and migration, rising use of the *miombo* for charcoal, growth of agroexport crop plantations, and urbanization. Consequently, these systems may need external assistance to intensify sustainably. Integration of traditional shifting cultivation land use patterns and contemporary agricultural methods in a balanced way could support cultivators as they cope with changing conditions (Stromgaard, 1989b).

Some groups intensively manage plantations of perennial cash crops, such as rubber, cacao, rattan, coffee, palm, and coca as part of the shifting cultivation system (Hecht, 1982; Alcorn, 1982; Denevan and Padoch, 1988; Plotkin and Farmolare, 1992; Dove, 1985). Many of these variations are mixed agroforestry systems that are weeded and fertilized, usually with locally acquired organic substances.

Diversity of Socioeconomic and Labor Characteristics: Within shifting cultivation communities, there are differences in social positions, subgroupings of the people, labor arrangements, and historical and social experiences. Contrary to popular perception, these communities are often stratified rather than homogeneous and egalitarian. Shifting cultivation systems do not clearly fit into simple ethnic and social categories (Kundstater and Chapman, 1978; Atal and Bennagen, 1983). Although little research literature addresses this issue, several cases demonstrate the importance of social differentiation in resource management. In Orissa, India, for example, "tribals" practicing shifting cultivation pursue different production strategies, according to their class and social status (Fernandes et al, 1988; Sachchidananda and Pathak, 1983).

Labor arrangements in shifting cultivation are also diverse in different regions, and even within a given culture, but systems are usually integrated into labor and commodity markets. Even isolated shifting cultivators are connected to labor markets. Labor may be hired or exchanged for clearing land and other labor-intensive tasks. In Africa, where large portions of the male workforce may not be in the rural zones, hiring labor and exchanges of labor are common. Labor arrangements are also often linked with customary rituals or social relations in a given community. In the Congo Basin, for example, the most common way for households to supplement their own labor is to organize a "working bee" (or a work party) in which beer or food is offered to anyone willing to help with tasks.

Off-farm employment is becoming increasingly important for both traditional and newer shifting cultivators. Throughout Latin America, for example, shifting cultivators typically engage in off-farm work during parts of the year. Swidden groups in Indonesia often work for logging companies (Inoue and Lahjie, 1990; Soewardi, 1983). In Thailand, among the northern swiddeners off-farm labor is for timber cutting and charcoal production (Chapman, 1978). Among the Lua and Karen swiddeners in Thailand, many work as wage laborers for mining or logging companies (Kunstadter, 1978b).

In nearly all shifting cultivation systems, labor is typically divided among household members; women, men, elders, and children participate in distinct tasks. The division of labor by gender is pronounced in many of these systems (Colfer et al., 1988). Men are mostly responsible for cash-crop activities and tasks such as clearing land. Women play an important role in maintaining subsistence-cropping components, but their contribution is generally not recognized and is rarely researched. Among the Minang of West Sumatra, Indonesia, for example, women are almost entirely responsible for swidden rice production, forming work parties for planting, weeding, and harvesting (Colfer et al., 1988). Gender based roles, therefore, shape the conditions and impacts of shifting cultivation systems.

In recent years, some analysts have noted differences betweeen traditional (or longer-residing) shifting cultivators and migrant shifting cultivators, appropriately called shifted cultivators. Increasing numbers of migrants have moved into frontier zones, particularly humid, tropical forest areas. Many are forced there by economic needs or demographic pressures and are in search of available land and

resources for their livelihoods (Kane, 1995). Some are resettled or are paid by larger wealthy landholders to clear land for cash crops (Myers, 1994; Peters and Neuenchwacher, 1988; Alcorn, 1994; Dove, 1994). This division can be overly simplistic, but generally the shifted groups have less knowledge than indigenous groups of effective shifting cultivation land-use and labor practices (Moran, 1993). They tend to use fire more frequently and practice sequential annual cropping more often than is done in indigenous systems.

In sum, the diverse, mosaic patterns of shifting cultivation systems have been consistently overlooked, partly because scientific analysts and decision-makers have tended to focus on single dimensions of the short-cycle agricultural plot. The standard disciplinary separation between forestry and agriculture also tends to limit understanding of shifting cultivation. In fact, components of shifting cultivation are highly variable and interconnected.

IMPLICATIONS: The tremendous diversity of shifting cultivation systems, agroecologically, regionally, socially, and economically, is valuable and has strong potential for the sustainable management of local environments. This fact should be acknowledged and addressed in the design of agricultural development programs and policies. Decision-makers and analysts must not ignore or restrict the great variety of land use types, cultural knowledge, and species associated with shifting cultivation. Further research and programs are needed to identify and enhance the diverse indigenous agroecological practices and principles in shifting cultivation systems. In addition, the analyses of shifting cultivation systems should account for the labor of both men and women, as well as differences in their control over land, produce, and other natural and financial resources (Colfer et al., 1988).

Subsistence and Commercial Farming Activities

MYTH 3 — *Shifting cultivation is the sole activity among rural subsistence farmers in forest margins and is unconnected to commercial market activities.*

Shifting cultivators are often assumed to be subsistence-based producers who barely eke out a living and are unconnected to the market (cash) economy (Watters, 1971). Similarly, they are seen as isolated from modern economic influences. Contemporary reports, as well as historical studies, have perpetuated this stereotype, which is tied to conventional theory about categorical agricultural stages (Todaro, 1989, based on Boserup, 1965).

REALITY 3 — *Shifting cultivators engage in a wide variety of activities in subsistence and cash economies and often merge subsistence production with commercial surplus-oriented production.*

Although some shifting cultivation systems are largely subsistence oriented in remote areas (as in some parts of the Amazon and Congo Basins), most are not confined to subsistence. In fact, shifting cultivators are not primitive people residing outside of broader economic forces. Most are linked to local and regional commodity and labor markets and the cash economy. Shifting cultivation systems have been tied to markets for millennia (Hecht, 1982; Alcorn, 1982; Denevan and Padoch, 1988). Over time, many shifting cultivation systems have increasingly integrated cash crops into the cropping cycle and in fallows. They have produced a complex array of commodities, including rubber, nuts, rattans, medicinals, oils, and dyes, as well as food, fuel, and construction materials that have been traded locally, regionally, and internationally over centuries (Barlow and Tomich, 1991).

The cash crops in shifting cultivation systems often include tree products, which are part of agroforestry systems. Tree crops, including cocoa, oil palm, and coffee, are often marketed in the domestic, village, regional, national, and international economies (Richards, 1937; De Schilippe, 1956; Alcorn , 1990a, 1990b; Padoch, 1982; Dove,1985; and Kundstater, 1978b). In some areas, the producers integrate tree crops spontaneously in response to market opportunities (Dove, 1985). The incorporation of trees provides an array of benefits, enabling cultivators to gain added value for new products, to enhance ecosystem functions such as nutrient cycling, and to improve their livelihoods.

Furthermore, shifting cultivators usually engage in a wide variety of economic pursuits besides cultivation per se. In Thailand, for example, "the practitioners of shifting cultivation participate in many phases of the economy of the North beyond the confines of their own villages —in marketing their agricultural products, trading for supplies, and most notably, in the wage labor market of the region" (Kunstadter and Chapman, 1978). Thais in the lowland north often supplement paddy rice, orchard farming, or off-farm labor with shifting cultivation (Chapman, 1978). In East Kalimantan, Indonesia, different villages of like ethnicity pursue varying economic strategies in addition to shifting cultivation, ranging from animal husbandry to wage labor for logging and mining companies (Inoue and Lahjie, 1990).

Pursuing multiple economic activities is also typical among traditional shifting cultivators. In the Indian state of Arunachal Pradesh, for example, shifting cultivation is practiced by tribals in different ecological contexts in combination with terrace cultivation, plow cultivation, and irrigated agriculture (Sarkar, 1982). In many tropical rural areas, extractive resources from natural forest areas, such as rubber, nuts, fibers, and timber, are crucial sources of income for the communities, as illustrated in the Brazilian Amazon (Hecht et al., 1988), Central America (Alcorn, 1989; Starkey, 1993), and Southeast Asia (Colfer et al., 1988; Peluso, 1992; Denevan and Padoch, 1988).

A growing body of field-based research is also challenging the general assumption that shifting cultivators are always materially impoverished. Although many cultivators are relatively poor, especially in terms of cash income, it would be incorrect to assume that they are among the poorest people in their societies. In Pulai in West Sumatra, for example, through diversification and local adaptiveness, the people "provide us with an example of one way to live reasonably well in these marginal upland areas of the humid tropics, standard of living—though still low—is noticeably higher than that of the transmigrants who are trying, with government encouragement, to transplant a settled agricultural system . . ." (Colfer et al., 1988, p.206). In East Kalimantan, the Benuaq Dayak not only earn "relatively much income" through their traditional rattan production, but also maintain a swidden system that is "very sustainable" (Inoue and Lajhie, 1990, p.281). In Orissa, India, shifting cultivation is practiced by members of all economic classes of farmers, including the wealthiest landowners (Fernandes et al., 1988).

IMPLICATIONS: The range in welfare and economic activities undertaken by shifting cultivators—including not only subsistence farming, but also market-oriented production—needs to be understood and addressed by policy makers, project designers, and the general public. Policies and projects that affect land and resource users need to respect shifting cultivators' experience and interests in accessing commercial markets of products and they must provide equitable opportunities (but not impose obligations) in market development where appropriate and desired by the local people.

Productivity Levels

MYTH 4 — *Shifting cultivation is always characterized by low productivity and low yields and can support only low population densities.*

Scientific analysts and policy institutions concerned about agricultural development have generally perceived shifting cultivation to be not only inefficient and simple, but also low producing and low yielding. It is seen as inferior in comparison with "modern" agriculture. Another common assumption is that shifting cultivation can support only sparse populations in remote areas. These viewpoints are perpetuated in studies, policy reports, and by the popular media.

REALITY 4 — *Shifting cultivation systems are often productive, make relatively efficient use of resources, and have supported large populations.*

Shifting cultivation practices have been quite productive in many areas, supporting relatively large populations compared with some other land uses. Assessing the number of people that a system supports is one indicator of resource efficiency and productivity. In Kalimantan, Indonesia, shifting cultivation supports 23 people per square kilometer, which is more than twice the number supported by commercial logging (Dove, 1983). In Mesoamerica, shifting cultivation of the Mayans supported 100 to 200 people per square kilometer and 700 to 1,150 people per square kilometer with intensive agriculture (Gomez-Pompa, 1987, p.24). Shifting agriculture produced 20 to 100 percent of the subsistence needs of Mexico. Today, the people of this region practice ranching and commercial mixed farming; the population is only 10 people per square kilometer (Gomez-Pompa, 1987, p.24). The population capacity of shifting cultivation also far exceeds that supported by cattle-ranching. For example, Amazonian cattle ranches, with an average size of 5,000 hectares, support only 10 laborers (Hecht, 1996). The move to permanent fields does not necessarily improve output in the long-term.

Furthermore, gross yield is only one criterion for evaluating farming systems. Production should be seen in relation to risk reduction, consumption, and resource management as well as crop yields. The diversity of shifting cultivators' land use methods and the variety of the crops they produce reduce risks posed by drought, pestilence, and other weather-related phenomena. Shifting cultivators eat much of what they produce, which contributes to self-sufficiency and livelihood security. Their multiple outputs, such as fuel and medicinals, have added values for farming systems. When the cultivators engage in cash-cropping, they also contribute to broader economic growth. Some shifting cultivators provide resource-related services—beneficial to themselves and to society—through their watershed management, conservation of plant diversity, and use of tree cover. Such benefits are seldom measured, but are nonetheless important criteria for evaluating shifting cultivation.

IMPLICATIONS: Decision-makers and analysts need to understand and learn from shifting cultivators' ability to produce and use resources effectively and sustainably in many cases, and to analyze when and why the systems sometimes lose productivity over time. Shifting cultivators' use of land and resources should be viewed and measured holistically: yield measurement of a single given crop should be replaced with measurements of the productivity and efficiency of the entire system—inclusive of factors such as risk reduction, nutrition, income, and sustainable management, as well as crop yields per se. A holistic measurement of productivity needs to be used and supported in agricultural development policies and programs.

Environmental Impacts and Resource Use

MYTH 5 — *Shifting cultivation systems are environmentally destructive, wasteful, unsustainable, and cause the majority of tropical deforestation and soil erosion.*

Another common generalization related to Myth 4 is that shifting cultivation practices are environmentally destructive and need to be eliminated or replaced. Shifting cultivation is blamed for between 50 and 75 percent of tropical deforestation worldwide (ASB, 1993; Cleaver and Shrieber, 1993; Myers, 1992, 1994; UNDP/UNEP, 1992). One recent publication, claims that "....slash-and-burn agriculture is one of the greatest threats to the biodiversity of our planet, destroying ten million hectares of tropical forest annually...." (ASB, 1993, pp.1,5) Similarly, studies attribute to the growing populations of shifting cultivators a key role in overall population increase, which they cite as a cause of deforestation (Myers, 1990, 1992). Many foresters in the Philippines, openly blame shifting cultivators for most deforestation in that nation (Lynch, personal communication, 1997). Some of these perceptions are found in earlier reports as well; in the 1970s, FAO publications claimed that shifting cultivators were by definition "destructive" (FAO, 1973).

Shifting cultivators are also blamed for much soil erosion in the tropics (Watters, 1971). Recent studies particularly criticize and disparage their use of fire: burning is commonly characterized as inherently harmful. Furthermore, shifting cultivators' fires are blamed as the source of a major proportion of global carbon emissions, which lead to global climate disturbances (ASB, 1993). Popular use of the term "slash and burn" perpetuates this negative stereotype of harmful fires.

Such views also lead to the related perspective that shifting cultivation is categorically unsustainable. For example, a 1993 World Bank publication on Africa claims that "Traditional low input low productivity farming with sharply shortened fallow periods is neither environmentally sustainable nor viable in terms of long-term agricultural productivity... Slow technological innovation has inhibited shifting cultivators from switching from subsistence to market crops..." (Cleaver and Shreiber, 1993, pp.4-7).

REALITY 5 — *Shifting cultivation systems are not responsible for the majority of deforestation or land degradation, and they have varying and complex environmental impacts, some of which may be sustainable and enhance biodiversity.*

The environmental impacts of shifting cultivation are diverse; they depend on cultivation practices used, as well as socioeconomic and ecological factors. Field-based evidence does not prove that shifting cultivation is responsible for the majority of global deforestation; the general claims noted above are exaggerations (Dick, 1991; Angelsen, 1996; WRI, 1997). One analyst recently concluded: "While the contribution of traditional shifting agriculture to overall tropical deforestation is clearly an issue of concern, its magnitude in relation to other causes is sometimes put way out of proportion in aggregate figures for global deforestation which are at best crude measures" (Angelsen, 1996).

Regional and national data confirm this conclusion. For example, in Indonesia, satellite data showed that shifting cultivators account for only 22 percent of deforestation, while the remaining 68 percent is due to programs supported by the government (Dick, 1991). Referring to this study, the World Bank (1994) has concluded that these and other data "challenge the conventional wisdom that traditional shifting agriculture is the main agent of deforestation" (World Bank, 1994, p.51).

Similarly, in South India, data-based landsat and aerial photographic images show that deforestation caused by shifting cultivators is less than 30 percent, whereas dams, reservoirs, and plantations have caused 70 percent of deforestation (Kamal Bawa, University of Massachusetts, personal communication). In Nigeria, recent assessments suggest that the majority of deforestation is due to large-scale rubber and agroexport plantations and the oil industry rather than shifting cultivation (Osemeobo, 1988). Other regional and national estimates have revealed similar patterns (e.g., Jarosz, 1993). Evidence indicates that shifting cultivation systems are actually less degrading in many ways than settled "modern" farming, because they do not convert vegetation permanently—fallows usually allow regeneration of forests or other plant ecosystems.

Shifting cultivation systems also do not necessarily waste and degrade land. As noted previously, a look at the numbers of people supported per area of land under shifting cultivation shows that some systems use resources more efficiently and less wastefully than many other forms of land use, and they can also support more people (*See Myth 5*; Hecht, 1996; Dove, 1983). Similarly, blaming climate change on shifting cultivators does not follow the evidence. Although carbon emissions from burning biomass are partly from shifting cultivation, a focus on the emissions alone is misleading, as it ignores another important parameter—carbon absorption (or sequestration) by vegetation. Both output and absorption must be understood together. Shifting cultivation systems have relatively high carbon absorption because they typically maintain and enhance vegetation in the successions and often include trees in the cropping cycle. In other words, shifting cultivation is closer to being carbon-neutral than to being a major carbon contributor. It contributes to carbon disturbances less than other forms of land use.

Some studies that acknowledge differences between shifted and indigenous shifting cultivators place most of the blame for degradation on the migrants, although indigenous peoples are also sometimes implicated (Kleinman et al., 1993; Kunstadter and Chapman, 1978; Myers, 1994; Peters and Neuenschwander, 1988; Borthakur et al., 1985; Husain, 1981; Komkris, 1978; Roy and Verma, 1980). (*See Box 4.*) But blaming shifted cultivators for destruction is simplistic, partly because it ignores the underlying economic causes that usually induce them to use certain unfamiliar practices. In parts of Latin America,

BOX 4. The Northern Thai Cultivators: Example of Migrant Practices and Conditions

The northern Thai are the largest ethnic group of shifting cultivators in their region of the country (Chapman, 1978). Most are newcomers to shifting cultivation practices. They have been described as reluctant swiddeners forced to switch from traditional paddy rice cultivation (Chapman, 1978, p.222). For most northern Thai, shifting cultivation is a critical, but minor, part of household income. Economic necessity has forced them to expand the land farmed through shifting cultivation because limited land resources, combined with a relatively recent upsurge in the local population, has led to food shortages. Development has resulted in two new economic strategies—employment of men in off-farm labor (mainly timber cutting and charcoal production) during the dry season; and increasing agricultural production (mainly rice, groundnuts, maize, and cotton) via shifting cultivation during the rainy season. Rates of return to labor in the swidden system are often very low. Yet, since there is not much alternative employment available during the period when field preparation takes place, the swidden and wet-rice systems integrate well. Fallow times in the region are typically short—3 to 4 years in areas where they should exceed 10 years to maintain soil fertility. Thus, the Northern Thai appear to be caught in a situation of decreasing resources combined with shortening fallows and falling yields (Charley and McGarity, 1978).

for example, even colonists who have had less than a generation of tropical forest living experience sometimes practice adaptive and innovative shifting cultivation strategies, contrary to popular perceptions (Browder, 1994).

Of course, all systems of agriculture, including shifting cultivation, can contribute to deforestation and other kinds of natural resource degradation—depending on the practices and surrounding conditions. Both traditional and migrant shifting cultivation systems provide examples of both relatively degrading (unsustainable) and relatively nondegrading (sustainable) types (Browder, 1994; Inoue and Lahjie, 1990; Kunstadter et al., 1978; Spencer, 1966). For example, in many areas of the world, shifting cultivation systems have recently evolved in ways that make certain practices such as burning unsustainable and have become poorly adapted to local conditions. Consequently, the soil erodes, nutrients are depleted, and fertility declines. But such conditions are not universal. Nor do they reflect inevitable patterns of environmental destruction.

What are the more important causes of deforestation and environmental degradation? As suggested above, commercial logging and large-scale cash-cropping account for more deforestation than shifting cultivation (Thapa and Weber, 1991; Dei, 1992; Thiesenhausen, 1991). The underlying causes of environmental degradation are generally tied to skewed land use and resettlement policies, inequitable national land tenure systems, and other socioeconomic conditions, including the extractive practices of large scale enterprises, summarized in Table 1. These factors, in turn, can squeeze shifting cultivators onto small areas or pressure them to overuse resources. Such destabilization usually results over time from a combination of socioeconomic and political changes, demographic pressures, and biophysical factors that force cultivators to change their practices.

TABLE 1. Causes of Destabilization and Degradation in Shifting Cultivation Systems

Outcomes or Symptoms of Destabilization and Degradation	Proximate Causes (agents)	Underlying Causes (roots)
Shortening or ceasing fallows Over-exploitation of land/soils Declining soil fertility Decreasing yields Increasing deforestation Loss of biodiversity	Development of roads and other infrastructure Expansion of monoculture agriculture and timber industries Scarcity of land and other resources available to cultivators Changing demographic trends, e.g., migration and population growth Lack of alternatives for production and income for rural people Resettlement of new groups in frontier areas Lack of access to stable markets for shifting cultivators	Inequitable political-economic structures affecting use of resources International/national economic policies, esp. trade liberalization, structural adjustment Disrespect for or neglect of the rights of shifting cultivators Lack of knowledge of environmental factors in agriculture Lack of sustained economic development and employment for poor Lack of political commitment for poverty alleviation Inadequate attention to social needs in environmental policies

IMPLICATIONS: Shifting cultivators should not be blamed categorically for deforestation, environmental degradation, and climate disruptions. Some shifting cultivation systems have clearly become contributors to resource degradation, but this is not universal, and many forms and aspects of shifting cultivation are environmentally sound. The variations on and evolution of these land use systems need to be appreciated by decision-makers and the public so that more effective programs and policies can be developed to conserve and sustainably use resources and improve agricultural development. At the same time, the underlying causes of environmental degradation need to be understood and addressed. More attention should be given to identifying and addressing degradation's roots, including biased policies, market forces, and extractive enterprises. Likewise, when shifting cultivation does lead to degradation, these economic factors need to be appreciated so that the degradation is not blamed categorically on migrant colonists or traditional shifting cultivators. Methods for addressing such economic factors influencing shifting cultivation include ceasing policies that displace, remove and, resettle shifting cultivators, and removing legal incentives and programs designed to encourage colonists to settle in marginal areas that are unsuited for farming.

Levels of Productive Technologies and Agroecological Knowledge

MYTH 6 — *Shifting cultivators usually use primitive, low levels of technology, have limited knowledge about agriculture and the environment, and rarely adopt new technologies.*

A commonly cited FAO study defines shifting cultivation as techniques of farming "used by those farmers who have only the most primitive tools at their disposal... [Shifting cultivators] do not change because of passive acquiescence to mediocre results of production and a low standard of life." (Watters, 1971). Other studies convey similarly pejorative views of these methods. A renowned agronomist stated that "The poor farming methods and soil depleting practices prevalent among African peasant and shifting cultivators stem from ignorance, custom and lethargy...the main obstacle to overcome is the native's lack of understanding for the need for the prevention of soil erosion." (Clayton, 1974, p.12). In discussions of swidden systems in northeast India, writers have critically stated that "no animal or implement is used by the farmers for the preparation of the land. The only tools used are the chopping knife, dibbling sticks, a small hand hoe, and a sickle/knife. The only inputs are seeds and human labor" (Borthakur et al., 1985, p.150; Saikia, 1982). In 1993, World Bank analysts wrote that African shifting cultivators have "limited technical know how" and that their "slow technological innovations inhibit farmers from switching from subsistence to market crops" (Cleaver and Shrieber, 1993, pp.4-5). Such stereotypes have led many analysts to believe that shifting cultivators always have limited knowledge.

REALITY 6 — *Techniques used in shifting cultivation systems are generally appropriate for their agroecological contexts (although not "modern"), and cultivators often have complex and useful knowledge about resources, land use, and surrounding environment.*

Shifting cultivators employ an array of technologies and land use practices, including modern technologies when appropriate, depending on the availability of alternatives, markets, and resources. The practices used are typically well adjusted to local environments and have been adapted to economic, environmental, and technological changes over time. Historically, three types of tool-based systems were common: digging-stick systems, hoe systems, and plow systems. But the range of technologies has expanded over time.

In the Congo Basin, for example, as in other areas of shifting cultivation, "a common type of technological change has been the introduction of new crops or new varieties of existing crops" (Miracle, 1967, p.287). In *chiteme* systems of Zambia, cultivators have integrated legumes and composting to improve soil fertility (Chidumayo, 1995). In Indonesia, some shifting cultivator groups have incorporated rubber trees. Some African shifting cultivation systems include external inputs such as compost, animal manure, and irrigation (Miracle, 1967). Shifting cultivators in grass-fallow systems in Bhutan add collected pine needles and animal manure to mounds of topsoil used as fuel for burning (Roder et al., 1992). Purchased fertilizers, pesticides, and herbicides are used less frequently because they are not accessible to many shifting cultivators, although this is changing. The Saribas Iban swiddeners of Sarawak, Malaysia, for instance, use small amounts of diammonium phosphate fertilizers and the herbicide paraquat to supplement weeding (Cramb, 1989). In India, "most of the tribes, at least in Orissa, Andhra and Madhya Pradesh or even in Meghalaya, Nagaland, Manipur and Tripura, have adopted technology of modern agriculture, though not on a very large scale" (Bose et al., 1982, p.223). Some cultivators employ chain saws to clear forest (Dei, 1992).

Furthermore, studies show that shifting cultivators usually have a wealth of knowledge, —based on their experience and experimentation—about their biophysical conditions, agronomic practices, and the environment and economy that influence them (Alcorn, 1994; Warner, 1991; Brookfield and Padoch, 1994). Some have detailed and complex knowledge about the management of vegetative regrowth, and management of forest resources and medicinal plants (Alcorn, 1989). They are commonly knowledgeable about ecological principles such as nutrient cycling, soil fertility, decomposition, and use of organic matter—although they do not use such terms (Gliessman et al., 1981; Warren et al., 1989; Brookfield and Padoch, 1994; Kleinman et al., 1993).

Box 5. Shifting Cultivation and Complex Knowledge — An Example from Mexico
(adapted from Collier, 1975)

The classic swidden agricultural cycle practiced by the Zinacantecos in Chiapas, southern Mexico, is adapted to local conditions. These people have complex knowledge about the resources and the methods needed to maintain production and have adjusted their practices over time, in response to various kinds of change. Their swidden fields are generally located in steeply sloped and high-altitude areas (3,000 to 8,000 feet).

Zinacantecos generally have complex knowledge of agroecological features and practices for swidden farming and have particularly sophisticated insights (based on experience) about soils, plants, and management of the fallow. Such knowledge has helped maintain their livelihood as well as social cohesion. Cultural traditions and spiritual beliefs are also important in the Zinacantecos swidden cycle. Rituals are performed at certain stages in honor of the spirits, including Wind, Lightning, and Rain. For example, a milpa ritual is performed when corn tassels appear and is intended to avoid damage from Wind. The main farming operations —such as planting and harvesting—are adjusted to the phases of the moon (coordination with the lunar cycles is common in swidden systems in many parts of the world and has a scientific basis for optimizing growth). Products gathered from the fallow areas or forests, such as pine boughs and needles, are used in rituals.

Not all of the Zinacanteco's practices are in harmony with the environment, however. Many of the people's lands have suffered from soil erosion and declining fertility, partly owing to scarcity of land and increasing intensity of farming. Such changes have occurred with population shifts and political and economic developments, especially the expansion of wage labor, increasing market pressures, and inequitable land tenure.

Mayan shifting cultivation practices, for example, reflect complex knowledge, not simplicity. (*See Box 5.*) Women, elders, and children, as well as men, have specific knowledge about these factors in the shifting cultivation cycle.

Studies from the fields of botany, geography, agroecology, cultural ecology, ethnography, and archeology have shown that shifting cultivation systems are complex, resilient, and dynamic in the context of environmental and social constraints (Altieri, 1997; Gleissman, 1989; Gliessman et al., 1981; Conklin, 1963; Warner, 1991; Posey and Balee, 1989; Denevan and Padoch, 1988). In many areas, shifting cultivation may be seen as managed deforestation, building around patchy clearings where fire is carefully controlled and regeneration aided through manipulation of succession by the selective weeding, fertilizing, and protecting of particular plants (Alcorn, 1991). In other cases, as in West Kalimantan, shifting cultivation is a form of tropical forest management. (*See Box 6.*)

Similarly, shifting cultivators are often sophisticated managers of biological diversity. As noted earlier (*in Myth/Reality 2*), they may plant dozens of varieties in a single garden and conserve and use wild varieties in fallows. (*See Box 6.*) These cultural practices contrast sharply with modern agricultural systems, which usually erode diversity and aim for homogeneity. For example, forests that may contain as many as 400 species per hectare have been replaced by pastures with only 10 or 20 species, or plantations with only one species.

Shifting cultivators use a variety of soil management methods to sustain productivity, usually adjusting to low soil fertility in large areas of the tropics. The most pervasive types of soil management practices are the shifting (rotation) cycle, which restores soil fertility, and burning, which creates a useful ash fertilizer (Nye and Greenland, 1963). Many additional methods are used, as noted in Table 2.

BOX 6. Forest Gardens Managed by Tara'n Dayak Shifting Cultivators in West Kalimantan

Dayak shifting cultivator groups in Kalimantan, Indonesia, use sophisticated agricultural practices to manage three diverse forest vegetation types: forest gardens, managed forests, and agroforestry plots, detailed as follows: a. Tembaweng Forest Gardens are home gardens of 10 or more hectares that begin as mixed plantings of fruit trees around dwellings, and later contain additional planted species (such as rubber, rattans, and medicinal plants) and also a mixture of spontaneous vegetation that grows up around fruit trees; b. Tanah Adat Forest Reserves are preserved by traditional law, set aside many generations ago and have never been cleared. However, the Tara'n Dayak of Balai manage these tanah adat by removing unwanted weeds or less useful species while planting timber and fruit trees such as illipe nut, rattan, sugar palm, bamboo, langsat, rambai, mentawa and durian; c. Tanah Usaha Agroforesty Plots are typically commercial plantings that are usually part of the cyclic agroforestry system. Rubber is the most important tree planted along with other commercial trees.

All of these forest systems may look alike but each has different histories and management practices. Each type is species rich. The Dayak managed forest gardens, for example contain upwards of 42 tree species in a 0.2 ha plot and tanah adat upwards of 51 tree species per 0.2 ha plot. (By contrast, Dipterocarp forests in Kalimantan can contain from 200-250 tree species per hectare.) These cultivators promote *in situ* conservation of important cultivars and their wild relatives and maintain biodiversity forest gardens while feeding themselves. This diversity management could be an exemplary form of sustainable resource use. Such systems could be good alternatives to the present practices of logging and total forest conversion.

Source: C. Padoch and C. Peters, 1993. "Managed Forest Gardens in West Kalimantan." In C. Potter, J. Cohen, D. Janezewski, (eds). *Perspectives on Biodiversity: Case Studies of Genetic Resource Conservation and Development.* AAAS Press, Washington DC pp. 167-176.

Table 2. Soil Management Methods in Shifting Cultivation

Management Category	Specific Method
Physical modification for soil protection and erosion control	Mounding Ridging Contour structures for erosion control Terraces (made of logs, grass balks, etc.)
Soil protection	Planting ground covering vines Multi-story agricultural architecture Mulching Windrows
Fertility enhancement	Use of short cycle legumes Use of bush or tree legumes Multi-level resource use by crops Nutrient additions from outside the plot Nutrient added from plants in the plot Composting and manures Use of insect nests as fertilizer Reburying within the plot Manipulated fallows

Source: Hecht and Posey, 1989.

IMPLICATIONS: Decision-makers, institutions, and the wider public need to understand that many shifting cultivators have complex knowledge of and experience with natural resources and agroecological conditions. This know-how should be respected, understood, and supported in research and development. It can play an important role in environmental management and agricultural projects (Posey and Balée, 1989; Redford and Padoch, 1992, Thrupp, 1989, 1994; Thrupp et al., 1994; Rhodes, 1994). At the same time, the displacement of local knowledge and the imposition of Western technologies should be avoided. Shifting cultivators' traditional agroforestry and soil management techniques can be beneficial and need to be incorporated into contemporary projects, as they encompass agroecological principles that complement modern scientific findings. The use of participatory methods such as Participatory Rural Appraisal (PRA) can help make effective use of peoples' local knowledge. Participatory methods have proven to benefit research and development, contribute to conservation and livelihood security, and can also help empower local people (IIED, 1990-1995; Thrupp, 1994; Chambers et al., 1989; Farrington and Martin, 1987). (*See also Reality 8.*) The use of such participatory methods in research can also improve understanding of why some of the practices have become unstable, such as shortening fallow periods, and can help design measures that need to be taken to mitigate adverse changes.

Tenure and Property Systems

MYTH 7 — *Shifting cultivation systems exist in empty, open-access forests without any form of legal rights or controls, thereby necessitating state and private control for management.*

As in colonial times, contemporary analysts often regard the fallow period of shifting cultivation as abandonment, and lands used by shifting cultivators as unused open-access or empty lands (Dove, 1985, 1993; Peluso, 1992; Lynch and Talbott, 1995). In the British Empire anything that did not look like a cleared agricultural field was considered *territorium nullius* (Lindley, 1926). Furthermore, many analysts presume that shifting cultivators do not have tenure systems or property rights and are not attached to any particular land.

REALITY 7 — *Shifting cultivation cultures embrace a variety of tenure regimes that mediate access, use, and transfer of resources, including informal community-based, household, and individual rights that overlap with state authority.*

Shifting cultivation systems rarely exist in open-access situations. Instead, most are based on community property rights, which are typically differentiated as individual, gender, family, lineage, and community rights of access (Berry, 1993; Peluso, 1992; Guyer, 1991, 1984; Rocheleau, 1991; Stamp, 1989). A common-property rights pattern consists of communal, lineage holdings of land areas, with family and individual members having usufruct rights, as occurs in the case of patrilineages in Garo, northeastern India (Ramakrishnan, 1992; Majumdar, 1980). The Minangkabau of Pulai in West Sumatra have a matrilineal land holding system with divisions of labor, rice production, and rubber tapping occurring along gender lines (Colfer et al., 1988).

Despite the presence of community-based property rights, most shifting cultivators are treated as squatters under national laws, regardless of their length of occupancy. Lands used for shifting cultivation, particularly fallow areas, are often classified as public forest land or condemned as empty or unused and appropriated or enclosed by state agencies (Lynch and Talbott, 1995; Dove, 1993, 1985; Bryant, 1994; Peluso, 1992; King, 1988).

IMPLICATIONS: Policy-makers, governments, and analysts need to respect and legally protect diverse tenure arrangements of shifting cultivators, particularly traditional, community-based property rights and management systems. Laws and policy-makers should not treat fallow areas as unused land, because these areas are an integral part of the shifting cultivation cycle. State authority should not be imposed over community-based systems (Lynch, 1992a). More analysis is needed to understand the complexities of the diverse tenure systems among shifting cultivators and how they are changing over time as a result of policy interventions, market forces, and other factors. The protection of local rights can reinforce local incentives for shifting cultivators to manage resources appropriately. Upholding the wider legal and political rights of these people is equally important and necessary.

Interventions of Governments, Agencies and Policies

MYTH 8 — *State and international agencies use interventions and policies to bring about beneficial agricultural and environmental changes affecting the practice of shifting cultivation.*

It is widely assumed that government institutions, development agencies, agricultural research centers, and non-governmental organizations provide the best methods for replacing or modernizing the practice of shifting cultivation. Policy officials in such institutions

usually see themselves as objective or as agents of positive changes (Blaikie, 1985). The institutions themselves are considered to have scientifically superior knowledge and are valued as a major information source for the Western techniques that are introduced to shifting cultivators. They are also seen as agents of progress able to transform shifting cultivation systems into modern and sedentary forms of agriculture.

REALITY 8 — *Mainstream programs and policies influencing shifting cultivators are biased and not neutral; they have often been unilaterally designed to stop, alter, or replace shifting cultivation or introduce land use practices that may not be appropriate for or desired by local people.*

1. Colonial Laws and Land-Use Policies

During the colonial period, officers of agricultural and forestry departments, missionaries, and scientists often viewed shifting cultivators as primitives; which often provided a moral justification for their subjugation (Comaroff and Comaroff, 1991; Pagdon, 1993). During the 16th century, for example, Portuguese colonial elites and Jesuit missionaries mandated that Indians learn agriculture so that they could be hired by colonial plantation owners (Alden, 1968; Gott, 1992). In early colonial enterprises, the colonialists sold products from shifting cultivation systems to traders who circulated extractive tropical products, sugar, and slaves. They intervened in local practices when they thought these products directly competed with the primary extractive resources and siphoned labor away from the more commercial sectors of the economy (Dove 1985, 1993,1994; Peluso, 1992).

Since the colonial period, many regulations have aimed to stop, prohibit, and transform shifting cultivation. They have also tried to replace community tenure systems and practices of shifting cultivation with state control, extraction, and commercial tree plantations (Chadran and Gadhil, 1993; Dove, 1985, 1993, 1994; King, 1988; Husain, 1981; Millington, 1985; Lindley, 1926; Peluso, 1992; Ratanakhon, 1978; Lynch and Talbott, 1995). Colonial laws

Box 7. *Taungya* as an Approach to Transform Shifting Cultivation

Taungya comes from the Burmese word for shifting cultivation, *Taung* (hill) and *ya* (cultivation). It is a system used to develop plantation forestry and agroforestry inexpensively, and it was widely promulgated throughout countries of the British colonial and post-colonial empire, including Borneo, Nigeria, Thailand, Nigeria, Ghana and Sri Lanka. *Taungya* in British Burma's forests was intended to wean the indigenous Karen shifting cultivators from what was in the colonialists' perspective a rude culture, and destructive and wasteful ways that placed teak resources in danger (Bryant, 1994). In Indonesia, the *taungya* system was adopted by Dutch colonialists and integrated into the Agrarian Law of 1870 and the Forest Law of 1927. *Taungya* has become a common 20th century international forestry practice (King, 1966) and generally consists of the following practices: the state or a forest company removes marketable trees, then cultivators cut and burn the residues and plant short-cycle crops for their own use for a few years and, concurrently, plant and tend tree seedlings (usually timber trees), which are harvested by the state or company.

For modern states, this model has been considered successful in consolidating administrative and political control over shifting cultivators and their forests and for producing revenue through timber sales. Adaptation of the *taungya* system also reshaped the nature of forest control and management. Local villagers lost land rights for shifting cultivation, legal access to forest resources, and the potential autonomy of forest settlements. The *taungya* system operates within a coercive legal framework of limited access to forest resources and labor and often results in the concentration of wealth. (Kio, 1978; Peluso, 1992). Consequently, the system has provoked a great deal of resistance from rural people such as the Karen (Adas, 1986).

were passed to formalize such interventions. The Indonesian Agrarian Law of 1870, for example, stipulated that customary property rights (known as *adat)* on Java, Madura, and later the Outer Islands were only recognized on lands that were continually cultivated (Lynch and Talbott, 1995). This excluded shifting cultivators from possessing property rights. Indonesia's 1927 Forest Law declared state forest lands to be lands owned by the state to which no other people have rights or control (Weinstein, 1993; Peluso, 1992; Lynch and Talbott, 1995). In Uttar Kannada, India, the British colonials prohibited shifting cultivation, and simultaneously cleared, extracted, and depleted deciduous hardwoods like teak (Chandran and Gadgil, 1993). These kinds of agrarian and forestry laws have remained in force up to the present day.

Starting in the late 19th century, the colonial governance systems in the tropics were organized according to European models (Davidson, 1992). Intervention in production processes became one of the primary endeavors of colonial governments, often through promotion of commercial agriculture and forestry projects. Efforts were focussed on controlling shifting cultivation in forest areas, producing export commodities, and making local people practice permanent cultivation. Such policies have often coerced shifting cultivators into labor at extraction and commercial plantations (Dove, 1993, 1994, 1995; King, 1988; Peluso, 1992; Millington, 1985). In Madagascar, for example, French colonial authorities banned shifting cultivation practices and tried to resettle the people to grow cash crops (Jarosz, 1993). A forest management model called *taungya* was among the main approaches to transform shifting cultivation. Most of these colonial methods of intervention have largely continued up to now. *(See Box 7.)*

Many other examples of policies adverse to shifting cultivation are found throughout Asia. In the Philippines, General Order 92 implemented by the U.S. colonial regime in 1900 prohibited unauthorized clearing of "public" lands by fire or felling of trees with fines of up to US$100 and 30-day imprisonment. Violators were also charged for the timber destroyed or an additional day in prison for each dollar of unpaid damages (Lynch, 1992). This prohibition, with much stiffer penalties, continues today based on the Revised Forestry Code of 1975 (Lynch and Talbott, 1995). The Bhutan Ministry of Agriculture, in an effort to sedentarize cultivators, introduced financial incentives for establishing orchards, terraces, bunds, and contours in permanent fields (Roder et al., 1992). Thailand's government has been attempting to resettle the Northern Thai people into the lowlands for a long time, often using coercion, in order to extract timber from or to develop permanent agriculture in their region (Chanphaka, 1986; King, 1988). The myths described in this paper have been used to justify governmental efforts to expropriate the cultivators' property rights and grant rights to logging and mining enterprises (Dove, 1983).

Strategies for agricultural commercialization have also been prevalent, starting in colonial times, for transforming shifting cultivators, and also to help fund the state. For example, groundnut schemes in Western and Eastern Africa by the British and French colonial governments were attempts to modernize agriculture and sedentarize cultivators (SEDES, 1965; Borget, 1986), although they were largely unsuccessful. The Senegal groundnut project, which included 30,000 hectares under mechanized agriculture and used local shifting cultivators and migrants as wage laborers, turned out to be uneconomical and seriously degraded soils (Borget, 1986). In some cases, colonial regimes used coercion to enforce the integration

of cash crops such as rubber, cacao, oil palms, tea, coffee, timber, and fruit trees in the fallow (Berry, 1993; Chadran and Gadgil, 1993; Dove, 1993).

2. Contemporary Settlement, Colonization, and Agriculture Schemes

In the contemporary era, resettlement and colonization programs intended for poor people are frequently used in attempts to transform agriculture, alleviate social ills outside colonization areas, and generate regional growth (Hecht, 1995). They have been a key part of rural development policies in Asia, Latin America, and Africa. Resettlement programs are typically aimed to reconstruct the livelihoods of cultivators as sedentary. In Brazil, colonization programs have been used as a means of avoiding agrarian reform and have become an escape valve to avoid addressing the socioeconomic crises in the northeastern and central west regions of the country (Hecht and Cockburn, 1989; Mahar, 1989; Binswanger, 1989). In the Amazon region, shifting cultivators such as rubber tappers have frequently been settled into agrarian reform areas or colonies in an attempt to compensate for loss of their holdings elsewhere.

Indonesia has developed elaborate programs for resettling shifting cultivators. They are justified by the state as promoting forest conservation, economic growth, and socio-political control. For example, the Indonesian forestry department directed a resettlement program from 1971 to 1981 that resettled some 13,058 households—mainly shifting cultivators, who were moved to new frontier areas (Weinstock, 1992). Most of these people were moved into the transmigration regions, and households typically received a small plot (about two hectares of land) and an 8-day short course on sedentary farming. Since the 1980s, Indonesia's resettlement and reforestation program have also brought Javanese farmers to the Outer Islands to start modern permanent agriculture in areas used by shifting cultivators (Peluso, 1992; Soewardi, 1983; Weinstein, 1994; Lynch and Talbott, 1995). Other colonization projects in Indonesia involve contract farming and wage labor for people who formerly were shifting cultivators, and the promotion of export crops. Another project, affecting approximately 200,000 households, aimed to develop sedentary and productive sources of living and to integrate these people into the regional and provincial market economy.

Along with such projects, the modern governments often impose authority over tenure and property systems, repeating colonial patterns. They generally eliminate the community-based tenure arrangements of shifting cultivator communities. For example, the state may allocate legal rights to outside enterprises or individuals who coopt the land of shifting cultivators and displace them. In much of Southeast Asia and in areas of the Amazon Basin, state agencies provide the legal rights to vast areas of land to large parastatal, international, and domestic corporations such as timber and mining companies, which then exploit forest and land resources. Typical inducements for coopting land include favorable tax rates, low export fees, minimal stumpage costs for forest removal, and infrastructure development. In regions where cultivators' land has been coopted, the people have often resisted, and conflict has ensued over access and ownership of resources (Lynch and Talbott, 1995; Peluso, 1992; Tapp, 1989; Hecht and Cockburn, 1989; Guha, 1989).

Although many development and colonization projects are well-intentioned, and can benefit certain companies and well-off producers, they have seldom been successful at achieving their aims and often are unsustainable and fraught with difficulties, especially for shifting cultivator communities. Cultivators are usually at a disadvantage, because they generally lack

economic resources and power, get displaced under unfamiliar conditions, lack formal tenurial security and political influence, and seldom are allowed to participate in the design of projects. As stated in a recent World Bank report, resettlement frequently implies landlessness, joblessness, marginalization, food insecurity, loss of access to common property, and social disarticulation (World Bank, 1994). Other problems result from inefficient organization of the programs, lack of social services, and poorly adapted crops and development models for local needs and conditions (Weinstock, 1992). They usually result in out-migration by the people, who may end up unemployed in poor urban areas or seeking out new possibilities in frontier areas.

3. International Development and Research Institutions and Programs

Efforts to transform shifting cultivation in developing countries are also shaped by international development agencies, such as FAO, and multilateral banks such as the World Bank. As noted before, early FAO reports judged shifting cultivation to be inherently "primitive," "backward," and incapable of supporting "civilization" (FAO, 1973; Watters, 1971)—beliefs that have formed the basis for many FAO projects aimed at replacing shifting cultivation.

One of the predominant approaches to economic growth used by FAO and other agencies is a market-led development model that focusses on the export of timber, minerals, and agricultural products as mechanisms to provide state revenues. Development agencies, along with many state institutions, tend to favor those actors deemed most dynamic as commercial entities, and backed by powerful economic and political groups (Berry, 1993). Similarly, they have prescribed and established policies for large-scale agriculture to open new frontier areas and expand markets; for this purpose, they have provided incentives such as favorable credit policies, tax and fiscal incentives, infrastructure development, and technical services for new production technologies.

This predominant view has been modified to some extent in certain FAO projects. For example, the FAO's recent program on Community Forestry reflects increased respect for shifting cultivator practices: "Swiddeners' knowledge can be applicable to both sustainable intensification of shifting cultivation and development of other sustainable land use systems with principles of integration of trees into the agricultural system, utilization of micro environments, micro sites, multiple crops and multi varieties and stability maintained by the many components of the system" (Warner, 1991). The program is very small, however, and represents an unusual perspective in the FAO institutional structure.

International and national research and development institutions, including the Consortium for International Agricultural Research (CGIAR) (consisting of over a dozen large agricultural research institutes throughout the world), university systems and National Agricultural Research Institutes have also established programs over several decades that have generally aimed to directly or indirectly eliminate or transform indigenous agricultural practices. For example, they have developed and spread the Green Revolution model, which promotes the use of monocultural production systems, high-yielding crop varieties and high input chemical technologies worldwide. Although these institutions do not have a general policy statement on shifting cultivation, they have been leading supporters of technologies intended to replace traditional systems through Green Revolution systems. CGIAR has developed significant technical innovations that contribute to rising agricultural productivity and has been influential in shaping rural development

programs. Yet, some patterns of agricultural research and modernization have also contributed to adverse social and environmental effects such as those described in this paper. Conventional research approaches have seldom involved full participation of farmers as well.

During the 1990s, several of the international and national agricultural research centers have become increasingly concerned about declining productivity, deforestation, and shorter fallows in shifting cultivation and have developed specific projects to address these problems (UNDP, 1992; ASB, 1993). These centers have generally assumed that shifting cultivators need to be settled, develop alternative practices, and integrated into modern, high-input monocultural agriculture (El Moursi, 1984; FAO, 1985; Nair and Fernandes, 1984; Okigbo, 1981, 1983, 1984). Recent research efforts in this field have helped to improve understanding of land use, resources and specific crops. A relatively small number of scientists have also given attention to the value of traditional practices, particularly indigenous agroforestry used by cultivators (e.g., Fujisaka et al., 1995; Smith et al., 1995; Brookfield and Padoch, 1994). However, many of the scientists involved still tend to overlook the traditional farming practices of shifting cultivators, who are often still assumed to be technologically incompetent (Benneh, 1996, lecture at IFPRI; Balee, 1989, 1992; Irvine, 1989; Hecht et al, 1988; Dove, 1993; Padoch and Peters, 1993). Agricultural research centers and scientists have an opportunity to better appreciate and build upon the agroecological knowledge and practices of indigenous shifting cultivation— and to avoid the misperceptions of the past (UNDP, 1992). Such an approach can improve the potential for sustainable agricultural development.

World Bank programs that influence agriculture and land use generally have aimed to develop industrial patterns of commercial agricultural development, and, by implication, to replace shifting cultivation and other traditional systems. Again, local residents are generally excluded in the design and development of such conventional programs. In recent years, some programs and individuals within the Bank have changed their views and given more positive attention to indigenous practices. For example, a recent World Bank publication on Indonesia recognizes that shifting cultivators are not necessarily the main cause of deforestation (World Bank, 1994). Such changes may help to overcome predominant perceptions.

4. Environmental and Forest Management Programs and Policies

Increasing numbers of programs and policies have been established that attempt to deal with the environmental impacts of shifting cultivation. They are again based on assumptions that all forms of shifting cultivation are destructive and must be eliminated or replaced. Interventions have included projects for reforestation, forest management and conservation, parks, forest reserves (Conelly, 1992), and forced resettlements into reservations (ASB, 1993; Lynch and Talbott, 1995; Padoch and Peters, 1993; Stewart, 1992). Some programs are specifically directed to halt shifted cultivators who are perceived to be particularly culpable for environmental destruction.

Establishing forest reserves has also been used to move shifting cultivators. One example is in Nagpana, Philippines (Stewart, 1992). Also, the recently created Mantadia National Park in Madagascar has excluded and prohibited shifting cultivation, despite historical property claims by cultivators. Agroforestry alternatives are part of the park plans (Sodikoff, 1996). Ugandan parks have evicted all local shifting cultivators even though traditional shifting cultivation was less ecologically harmful than cultivation by migrants paid by wealthy patrons interested in timber (Alcorn, 1994). The Karen in Burma and the Azande in Zaire are other

shifting cultivator groups who have been pressured off their traditional lands by nature conservation programs.

Resettlement programs are sometimes promoted to protect timber in gazetted forests and for conservation areas. Such projects are ongoing in Thailand, Indonesia, Malaysia, Uganda, Côte d'Ivoire, India, Ghana, Tanzania, Gabon, and Zaire, and involve over 2 million people. In the Kibale forest reserve in Uganda, 35,000 people were violently displaced and evicted in 1992 and their houses, food, and possessions burned by the forest police guards. They were resettled some 150 miles away. In Côte d'Ivoire, 200,000 forest residents were to be removed and provided with small agricultural plots. In projects financed by the World Bank for forestry and environmental protection, at least 109,000 families have been involuntarily resettled. In addition, dam construction programs have affected close to one million people (World Bank, 1994).

Such environmental interventions, both past and present, have seldom succeeded in catalyzing positive reforms for environmental and socioeconomic purposes. They rarely account for the needs and experiences of shifting cultivators. Although such efforts may be designed with the well-intentioned aims of conservation or development, they tend to lack practicality and the participation and support of local communities (Bass and Morrison, 1994). In fact, they often displace and disrupt shifting cultivators and aggravate environmental degradation and poverty. The adverse effects are further aggravated by inequitable political and socioeconomic structures that work against the local peoples' interests.

For example, many of the reforestation programs undertaken in the South benefit large forest industries and displace local people who do not have secure tenure in the area. In Indonesia, for example, traditional diverse rattan gardens that provide livelihoods for shifting cultivators are being destroyed to accommodate reforestation projects controlled by timber companies (Stephanie Fried, personal communication, 1997). Monocultural forest plantations reduce biodiversity and associated economic values, as well as disrupt the lives of indigenous people (Janis Alcorn, Pat Durst, Alex Moad, personal communications, 1997). Similarly, some forest protection programs, such as forest reserves and parks, have led to the eviction of shifting cultivators and other rural populations, who tend to lack rights (Lynch and Talbott, 1995; Wells and Brandon, 1992).

Moreover, government agencies have established other policies and programs that contradict conservation and forest protection programs, and that instead are aimed to stimulate deforestation. Examples are colonization projects, road development, and credit programs. In Latin America, one incentive to farmers to clear forest lands and maintain them as pastures is that doing so establishes their legal claims to land (Hecht, 1993; MacDonald, 1992; Ledec, 1992.)

Some groups have reacted to the environmental or forest-related policies described above by trying to defend their rights. For example, some have resorted to poaching from the reserve areas (Wells and Brandon, 1992; Peluso, 1992) in an effort to meet their food needs. Indigenous peoples have also undertaken political efforts to regain rights. In Bolivia, for example, the traditional lands of the Chimane (forest-based shifting cultivators) became part of a debt-for-nature swap intended to convert the lands to a state-controlled protected reserve. This provoked great resistance from thousands of local people, who marched from the Amazon to La Paz triggering the largest popular demonstration in modern Bolivian history. They were successful in affirming their rights.

On the other hand, certain types of reforestation efforts have, indeed, helped to improve forest management and livelihoods, or at least they have the potential for positive outcomes, if they involve social forestry activities or agroforestry directed to benefit and involve shifting cultivators and other rural people (Gradwohl and Greenberg, 1988; Warner and Wood, 1993; Wells and Brandon, 1992). Such projects are more environmentally sustainable and socially beneficial, but have been few and under-funded compared with other forest projects.

IMPLICATIONS: Development institutions and researchers can no longer continue to ignore the mistakes, deleterious effects, and myths that have been common to development and environmental programs and policies. They must reform policies and programs, to stop the inappropriate patterns of displacement and resettlement of shifting cultivators, and instead build incentives for sustainable management, including tenurial security and opportunities for cultivators to improve their well-being. In attempts to develop alternatives and policies that can benefit shifting cultivators, local communities must be respected and integrated in policies and projects. Likewise, the diversity of shifting cultivation systems, and the agroecological principles upon which they are based, need to be better understood and appreciated. It makes sense for people to participate in decisions that affect their lives. As noted earlier (*See Myth 2.*), the use of participatory research methods, and the involvement of local people in planning and policy-making can help towards achieving beneficial results (IIED, 1990-1995; Chambers et al., 1989; Thrupp, 1994). Yet, besides this, more substantial reforms are also urgently needed in land use policies and agricultural development paradigms, to improve livelihoods and empower local people. Developing effective changes in policies and programs for land use by shifting cultivators will also help in promoting broader goals related to sustainable development.

III. Conclusions: Reconciling Policy with Reality

From this analysis emerge lessons about policy issues, research approaches, and development programs related to shifting cultivation and its alternatives. Clearly, change must come from many actors, particularly development agencies, governments, and research institutes. These groups must overcome myths, acknowledge realities, and focus on the implications identified in this paper. Recognizing the diversity, rights, and knowledge of shifting cultivators is essential.

Many of the diverse forms of shifting cultivation have been and still are effective adaptations to tropical conditions. They have evolved dynamically in different patterns over time. In the face of adverse interventions and regulations, shifting cultivators have survived and thrived, often continuing their strategies for risk reduction. Even though some shifting cultivation practices have become unsustainable in recent times, the knowledge upon which shifting cultivation systems are based offer insights useful to agricultural development strategies.

Four crosscutting general principles—lessons that can be used in developing changes to research, development, and policy initiatives—follow:

- *Use an Integrated Approach*
  The integration of socioeconomic, political, and agroecological factors affecting shifting cultivators is central to the design and implementation of effective policies and programs. An interdisciplinary systems approach to research and development is needed.

- *Respect Local Knowledge*
  Understanding and building on the knowledge and experience of shifting cultivators (and the policies that influence them) is useful and needed for agricultural development.

- *Enhance Diversity*
  Diversity and flexibility are vital principles for both agroecological and socioeconomic purposes, in developing effective options.

- *Confront Root Causes of Problems*
  Attempted solutions should confront the underlying causes of problems and should ensure that the rural poor have fair access to resources and opportunities to influence decision-makers, and participate actively in agriculture and land use programs.

In addition to the policy suggestions mentioned throughout this paper, some final general recommendations on policy options are reiterated as suggestions for government and development agencies:

1. Develop participatory approaches to policy decisions, research, and development activities to support the involvement of shifting cultivation populations, as well as other farmers, extractive enterprises, and researchers.

2. Establish incentives for community-based

approaches to resource management. (This should include the strengthening of legal rights and protections and the creation of opportunities for poor rural men and women to acquire secure land tenure.)

3. Rationalize (and when necessary repeal) laws that restrict shifting cultivation practices.

4. Eliminate inappropriate land settlement and colonization programs that can lead to land exploitation or otherwise disrupt shifting cultivator populations.

5. Reform market policies to build market opportunities for shifting cultivators (e.g., non-timber forest products or agroforestry products) where appropriate.

6. Promote sustainable land use practices and approaches, including agroforestry, agrobiodiversity soil conservation, cover crops, intercropping, and use of organic materials, in shifting cultivation systems, taking advantage of local knowledge of such methods.

7. Enforce regulations to control exploitative practices and domination by extractive industries that are often responsible for large-scale deforestation and displacement of shifting cultivators.

8. Develop training programs and community activities on land use practices and options for local shifting cultivator populations and new immigrants, again building on local knowledge.

All of these policy suggestions require elaboration and adaptation in particular national and local circumstances. Each needs to be considered on a case-by-case basis by local decision-makers. The implementation of such strategies requires concerted actions by both public and private entities.

Among these suggestions, agroforestry is often upheld as a solution on its own. Although agroforestry systems are promising, planting trees alone in farming systems is not adequate to address land use problems. The other policy and socioeconomic changes noted above are also needed, partly to enable the implementation of appropriate agroforestry options. Furthermore, since agroforestry is well known to many shifting cultivators, it is vital to take advantage of and build upon shifting cultivators' local knowledge of trees and resources. Hybrid strategies that include principles from local techniques as well as scientific methods are more likely to be adapted successfully.

Further research can make a significant contribution to understanding and taking advantage of shifting cultivation systems and principles, and to developing sustainable and productive use of natural resources while improving the livelihoods of rural people. But research needs to be interdisciplinary, and is more constructive if it is applicable to policy and development processes. The contributions of anthropological studies and studies of the political economy of land use change are especially valuable. At the same time, research is likely to be more beneficial if it involves participation of policy decision-makers and local people from project design through follow-up and evaluation activities.

It is also essential for researchers, as well as policy decision-makers and development officers, to assess and learn from past and existing research and development programs in order to better understand what has been effective and ineffective in improving sustainability, social well-being and equity, and productivity. Understanding the diversity, dynamics, and social processes underlying land use change can be an important contribution toward more sustainable and equitable development patterns.

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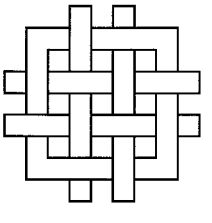

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