Rural Poverty and Natural Resources: Improving Access and Sustainable Management

This was prepared as a Background Paper for Chapter 2 of the International Fund for Agricultural Development's 2009 Rural Poverty Report, and was developed under contract with IFAD.
http://www.ifad.org/rural/rpr2008/background.htm

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with contributions from Keith Wiebe, Leslie Lipper and Monika Zurek

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Abstract
This paper was prepared as a Background Paper for Chapter 2 of the International Fund for Agricultural Development's 2009 *Rural Poverty Report*. It begins by providing an overview discussion of the diversity of natural resources in developing countries, and rights of access, tenure and governance relevant to the rural poor, who are disproportionately dependent on natural resources. We then discuss four key challenges to enhancing assess and sustainable management of natural resources: (i) expanding access to natural resources to increase incomes and improve welfare; (ii) increasing security of access to natural resources, in the context of changing institutional and market conditions; (iii) improving sustainable management of natural resources, including improved resource quality; and (iv) enabling the poor to take advantage of evolving markets, including markets for environmental services. In each case, applications to agricultural land, water, forests and fisheries are elaborated. Finally, we examine five case studies that demonstrate successful approaches to sustainable natural resource management: expanding access to land (South Africa), increasing security of access and sustainable management of forests (Bolivia), supporting locally-driven sustainable management of watersheds (India), improving security of access and sustainable management of fisheries (Samoa), and enabling the poor to access the global carbon market (Mexico). We conclude with key lessons learned and their implications for management and policy.

Key Words: Rural poverty, natural resources, rights of access, land tenure, resource scarcity, conflict resolution, co-management, climate change, biofuel production, markets for environmental services.
JEL: O13, Q15, Q18, Q24, R52.

*Background Paper for IFAD 2009 Rural Poverty Report**

Rural Poverty and Natural Resources: Improving Access and Sustainable Management

by

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I. Why Does Improved Access to Natural Resources Matter?

A. Framing the Challenge

General Background.

Most of the world's poor are rural. And most of the rural poor depend on agriculture or are otherwise dependent on natural resources in generating their livelihoods. Thus the linkage between rural poverty and natural resources is necessarily a close one. But the full potentials resulting from this linkage cannot be realized unless the poor have improved and more equitable *access* to those resources and the poor are better able to *sustainably manage* their resource base. These goals are at the root of the first strategic objective of IFAD's *Strategic Framework 2007-2010* – to help "ensure that, at the national level, poor rural men and women have better and sustainable access to...natural resources (land and water), which they are then able to manage efficiently and sustainably" (p. 18).

How is this to be achieved given the enormity of the challenge? While the share of the world's extreme poor – those living on less than $1 per day – has dropped from 40 percent of the world's population in 1981 to an estimated 18 percent in 2004, this still amounts to almost one billion people (Chen and Ravallion, 2007). Another 1.5 billion of the world's poor are estimated to be living on less than $2 per day (Chen and Ravallion, 2004). Between 70% and 75% of poor people live in rural areas, where the poverty rate is around 30 percent globally (nearly 70 percent using the $2 per day line), contrasted with a much lower 13 percent for urban areas. Many of the rural poor are highly dependent on primary natural resources and ecosystem services (Millennium Ecosystem Assessment, 2005; World Resources Institute, 2005).

Solving rural poverty entails overcoming many problems, some of which are very familiar: assuring food security, providing employment opportunities for burgeoning urban and rural populations, and maintaining a sustainable natural resource base. But other issues and threats have recently gained heightened attention. Climate change promises to alter fundamental features of the natural resource base, for example, through changes in patterns and timing of precipitation and water supplies and changes in soil characteristics, together increasing the risks and uncertainties associated with traditional paths of livelihood generation. Upward shifts in global energy and commodity prices and the increased production of biofuels may benefit some producers and rural households, but in doing so, may increase land and water scarcity in some regions and make food more costly for the many poor who are net food buyers. In all countries, industrialized and developing alike, the threats posed by the impacts of resource degradation and environmental externalities are becoming increasingly apparent.

Whether these challenges are longstanding or newly emerging, the livelihoods and well-being of the rural poor depend fundamentally on the opportunities available to them; these opportunities are shaped, in substantial part, by their access to natural resources. That access – and the capability of the poor to increase access and enhance their management of their resource base – is, in turn, dependent on numerous underlying political, social and macroeconomic factors. These factors are also changing, as forces of globalization, migration, market integration, democratization, and decentralization, among others, continue to alter the relationship between rural people, their resource base, and their capacity to effect change. Making improved management decisions regarding resource use, formulating informed policy changes, and making wise public investments are all critical to expanding the choices available to poor rural men and women, and to empowering them to improve their livelihoods.

What natural resources?

Poor people depend on a wide set of primary natural resources. Various frameworks can be employed to usefully distinguish these resources. One recent approach distinguishes between *provisioning* services (those responsible for supporting human life), *regulating* services (basic ecosystem processes), *cultural* services (nonmaterial ecosystem benefits), and *supporting* services (basic long-term ecosystem services) (Millennium Ecosystem Assessment, 2005). This is a useful approach because it focuses on the specific functions that ecosystems deliver, and thus on the sustainability of those services in supporting human livelihoods: providing basic soil and water resources for crop and livestock production; regulating air, water, and climatic processes; supporting the biophysical processes of photosynthesis, soil formation and nutrient cycling; and helping provide a diversity of social, cultural, spiritual, recreational aspects to life. More specifically, we can identify several key natural resources on which we all, including the poor, are dependent: land, water, forests, fisheries, climate, crop genetic resources and mineral resources.

Natural resources vary in the degree to which they are "naturally" available versus being altered by human actions. Resource quality and quantity are heavily influenced by human behavior and the sustainability – or lack of sustainability – of management practices. Current concerns about global climate change address some of the most basic aspects of ecosystem processes and regulation and thus are of particular concern. Land quality is affected by degradation, or enhancement, as a function of prior use and current management patterns. Water availability is highly influenced by irrigation infrastructure and management in many regions, while water quality is affected by human actions which may lead to soil erosion and sedimentation, and pollution by agricultural, industrial and human waste. Agricultural genetic resources have been influenced by genetic selection and manipulation by both farmers and scientists over many generations.

Forest and fishery resources have been the object of human activity over thousands of years. Global forests now cover roughly 4 billion hectares (UNEP, 2008), about one-third less than the extent of forests at the time of the origins of agriculture some 10,000 years ago. Net deforestation (area deforested minus forest areas planted and natural regeneration) was about 7.3 million hectares annually between 2000 and 2005, an area about the size of Panama or Sierra Leone (UNEP, 2008). Fisheries face even greater degradation. A recent report from the World Resources Institute (2004) states that 75 percent of the world's commercially important fish stocks are currently overfished or are being fished at their biological limit. Stocks of valuable predatory fish species (cod, tuna, grouper, shark) are estimated to have declined by

90 percent from levels existing just 50 years ago (World Bank, 2004). Natural resources, particularly open access resources and those managed under common property systems, are under severe threat in many countries, as are the livelihoods of many of the poor who depend on them.

What is access?

Access is a central criterion to assuring sustainable rural livelihoods. Natural resources become natural "assets" when access is assured, either through asset ownership or other forms of secure access and control. Natural capital or natural assets are often considered one of the five forms of capital, the others being financial capital, physical capital, social capital, and human capital (Carney, 1998). Rural poor people who lack access to natural capital and other forms of capital are challenged on many fronts: obtaining food, accumulating assets and responding to shocks and misfortune (Baumann, 2002). What may be the critical limiting type of access faced by poor people in any given situation will differ widely.

Amartya Sen (1981) famously distinguished the production-based *availability* of food from household *access* to food. So too, is it critical to distinguish between the physical *availability* of natural resources and the *access* that people, poor people in particular, may, or may not, enjoy. Importantly, it is access to resources, not the supply of resources or their overall availability, that determines whether poor men and women will be able to make the most of the opportunities they have to enhance their livelihoods.

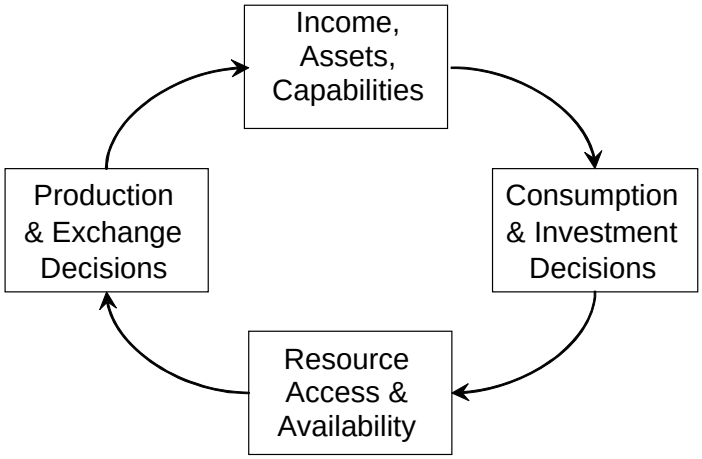
Another benefit of the emphasis on access and assets is that it explicitly focuses our attention on the *rights* to assure access. Resources without the rights to access the benefits potentially accruing to resource ownership and control are not assets (Boyce and Pastor, 2001). Access is determined by formal and informal rules and institutions that govern who can use natural assets, when, where, how and for what purposes. As discussed further below, access to any particular resource at any time can be described in terms of the bundle of rights that are ascribable to a given resource, even if held by different agents. For example, a farmer may hold the right to cultivate a parcel of land for a particular period of time and to consume or sell the harvested product, but the right to sell the land or to build a house on it may be held by the landowner, while rights to draw water from a stream passing through the land may be held by the community or the state. Private ownership, while important, may not be necessary in order to assure the rights to access and control natural resources.

Natural resources vary widely in the rules that govern access to them. Access to some resources is primarily held by individuals, while access to other resources may be shared across larger groups, including the state, and some resources are effectively not held by anyone. Such open access resources, including many forests and fisheries, are among those facing the greatest current pressures due to growing populations, accompanying resource demands, and the common lack of effective institutions that govern access. Because access entails rights, it is also fundamentally affected by social and political processes reflecting the distribution of power in communities and societies (including dimensions such as gender and conflict), by market forces reflecting the distribution of wealth, and by environmental forces which are often influenced by human activity.

Why is access to natural resources important?

Access to natural resources (e.g., natural assets) – along with access to the other four asset categories identified above – is key to determining the range of livelihood opportunities available to all individuals and households. The larger the asset base, the less constrained the choices available to households, and the greater the ease of substituting one form of capital for another. The more limited the asset base, the more constrained the choice set. The household's asset base, including access to natural resources, thus fundamentally conditions the production and exchange decisions it makes (Figure 2.1). The outcomes of these decisions – as represented by levels of household income, assets and capabilities – in turn influence the consumption and investment decisions of these same households. And those consumption and investment tradeoffs made by those households influence, in turn, the portfolio of natural and other resources to which households have access and the decisions they make in future periods.

Figure 2.1: Farm Household Assets and Choices



Source: Adapted from Maxwell and Wiebe, 1998.

It is important to note that, important as it is, access to natural resources may, in many situations, not be enough, in and of itself, to assure livelihood security (de Janvry, et al., 2001). Access to and the use of natural capital is complementary with the other forms of capital identified above. It is this asset complementarity or "asset bundling" – increasing access to natural assets along with simultaneously enhancing access to physical, financial or human capital – that is a particularly important mechanism for escaping poverty by strengthening the *capabilities* of the poor. Thus, as argued in another of the Background Papers to IFAD's *Rural Poverty Report 2009*, enhancing access of rural households to natural assets (specifically, land) will be most likely to be productive and lead to sustainable livelihood development if access is simultaneously increased to other production inputs (infrastructure and other physical capital), credit (financial capital), and improved education (human capital) (Valdés, et al., 2008).

Valdés, et al. (2008) provide survey-based empirical evidence showing how in two countries analyzed, Malawi and Nicaragua, the size of a household's landholding and the level of schooling of the household head are each inversely related to the probability of that household being poor; but in each case, a household's having simultaneous access to improved infrastructure will reduce the probability of being poor for *all* farm sizes and *all* levels of education. In any given situation, the most effective way to increase the capacity of the poor to escape poverty may indeed be assuring access to critical natural resources, but it may also be improving access to infrastructure, credit, education, or other forms of capital. This is an important aspect of the asset diversity of the rural poor, which is highly relevant to public policy and to public investments.

The rural poor's dependence on natural resources

Although access to primary natural resources is important for many rural households, it is particularly important for the rural poor. In large part, this is due to the fact that the livelihoods of the rural poor are disproportionately dependent on crop and animal agriculture and other natural resources – notably, forests, fisheries and genetic diversity – as well as the underlying environmental services that sustain these resources. Recent reports from the World Resources Institute (2005) and FAO (2006) offer some illustrative statistics (Table 2.1). Household income that is dependent on natural resources – "environmental income" – comes from a wide diversity of agricultural sources, both in cultivated settings (cropland and some grazing) and "wild" or uncultivated sources, including forests, fisheries (marine and inland), wetlands, and natural grasslands. More than 90 percent of African agricultural production is estimated to come from small-scale producers. At least 90 percent of the world's poor have been estimated to be dependent on forests for at least some of their income (World Bank, 2002). Roughly 250 million people depend substantially on fisheries for food and income (WRI, 2005).

Table 2.1 Number of people dependent on ecosystems

	Number of people (millions)
Dependent on agriculture	2,600
- in Sub-Saharan Africa	>500
- rural poor who keep livestock	600
Dependent on forests	1,600
Dependent on fisheries	250

Source: World Resources Institute, 2005, citing various sources; *FAO Statistical Yearbook 2005-2006.*

As a result of this dependence on primary natural resources, the rural poor are especially vulnerable to the shocks that emanate from many sources. The rich, on the other hand, can more easily substitute physical, financial and human capital for natural capital, and thus have a better "fall-back" mechanism that helps reduce vulnerability. The vulnerability of the rural poor is a prime distinguishing aspect of their livelihoods and lives (Baumann, 2002; Ellis and Allison, 2004). Environmental shocks include drought, floods, earthquakes, and climate change, among others. The impacts of these shocks can be mitigated, at least partially, by interventions such as irrigation systems, conservation agriculture practices, crop breeding strategies, and many other technologies and management interventions. The underlying

seasonality of production also imparts a source of vulnerability to many developing country farming systems; that production seasonality has been shown to be linked in various ways to employment, income, nutrition and disease – all of which have implications for the sustainability of the livelihoods of the poor (Sahn, 1989). Economic shocks also stem from multiple sources, including the inherent variability of agricultural commodity prices[1] and the broader global commodity markets to which they are linked. Recent developments in global markets, especially elevated commodity prices, illustrate this variability. Together these shocks, actual and potential, leave the poor in a highly vulnerable position with respect to generating household incomes, investing available surpluses to enhance their asset base, and productively exploiting natural resources, even if they enjoy access to them. A central challenge, then, is to develop mechanisms to enhance the resilience of the poor to adapt to these many sources of uncertainty and vulnerability.

An additional threat to the extreme poor is represented by rural "poverty trap" mechanisms (Nelson, 1956; Ben-David, 1998). The extreme poor, by definition, lack adequate access and capabilities to take advantage of natural capital and other forms of capital. As a result, they may have to mine the soil, overfish, overhunt and deforest in order to meet short-term needs (Sachs, 2006). Without adequate access and resources to reinvest in the quantity and quality of productive assets – or at least to create a "safety net" of assets to mitigate future shocks – poor households face "asset poverty", a particularly precarious position (Oliver and Shapiro, 1997). Escaping this position may only be possible through selling one's labor, often at unfavorable prices, in local markets, leaving households both poor and dependent (IFAD, 2001). For the extreme poor, it is important to note that the locally accessible natural resource base matters, not only because national accounts do not include the natural resource base, but because the aggregate resource base of a country may be different than the local one (Dasgupta, 2007).

As previously mentioned, the dependence of the poor on common property and open access resources creates yet another obstacle and source of vulnerability. It is important to distinguish between common property resources and open access resources, although these terms are often used interchangeably. Common property resources are typically allocated under customary property rights and tenure systems that provide rules governing the rights to and use of resources. Open access resources lack such rights and rules and are open to all. Common property resources have, in many cases, been sustainably managed for generations, but where tenure systems are weakened or where governance and enforcement mechanisms are ineffective, they may be used and exploited in a *de facto* open access manner. Access to these resources – including many forests, fisheries, marine resources, grasslands, etc. – is important to the livelihoods of the poor in many countries. Common property resources were found to contribute 15-25 percent of household income in India (Jodha, 1986); other estimates, for India and elsewhere, are even higher (Dasgupta, 2005). But it is these same resources that are often under the greatest threat in many countries as a result of population growth, intensification of production and resulting environmental degradation, resource appropriation for state or private use, and the frequent lack of effective governance systems. Poor households dependent on these resources thus face an additional challenge to sustaining their livelihoods due to the lack of ownership and control they enjoy over these resources on which they are so dependent.

[1] The sources of this underlying variability are several, including price inelasticities of both supply and demand for many commodities, income inelastic demands, and for specific products, seasonality of production or perennial supply.

Why is sustainable natural resource management important?

Sustainable development has most frequently been defined as "meet[ing] the needs of the present without compromising the ability of future generations to meet their own needs" (WCED, 1987). While this definition of sustainability has been subject to wide criticism, it does focus appropriately on two key dimensions of sustainability relevant to natural resource access and management by the poor: first, the ability of households to maintain their livelihood systems over time, and second, the implied sustainability (or lack thereof) of the availability, rates of extraction and utilization of the natural resources on which those livelihood systems are dependent. Particularly in the case of open access and common property resources, sustainable resource use is broadly threatened, as will be discussed in greater detail in the next section.

The diversity of natural resource settings faced by the poor as well as the diverse tenurial frameworks that govern their use serve as a reminder that "sustainable management" can have diverse meanings as well. Sustainable management in common usage is often taken to mean assuring the sheer availability of natural resources over the long-term; yet, meeting the needs of future generations has important economic and social (and other) dimensions as well. The critical obstacle influencing sustainable resource use in any given instance may not be resource availability *per se*, but rather the economic viability of a given system, the social acceptability of use, or the sustainability of institutions and governance systems that provide the framework establishing patterns of resource use. Resource management strategies that strive to be "sustainable" may thus need to address different critical factors that influence sustainability in given situations. These can range from improving soil nutrient management and reducing erosion in hillside agriculture; to developing sustainable forestry management practices to improve economic returns in forest settings; to introducing improved water pricing schemes to improve efficiency, operation, and sustainable water access in irrigation systems; to creating new rules and institutional mechanisms to improve long-term fisheries management.

Emerging threats and opportunities facing the rural poor in accessing natural resources

Access to natural resources is conditional on and limited by many factors: population density and growth, rural to urban migration, forces of globalization, changes in income, presence of political or military conflicts, existing tenure and governance systems, and ongoing changes in institutions, laws and policies. Many of these factors are very familiar; together they define the setting that many poor people face in attempting to overcome obstacles limiting sustainable livelihoods. In recent years, other forces have emerged which represent, simultaneously, threats and opportunities to different populations of the rural poor. Many of the most troublesome of these forces play out particularly with respect to common property and open access resources; these are discussed in more detail in Section II below. In this section, we briefly discuss two specific emerging developments and some of the implications of each for natural resource access and management.

Climate change and access and management of natural resources. Climate change has become an important concern to many policy makers as the increase in greenhouse gases in the atmosphere – including CO_2, methane, N_2O, and SO_2 – contributes to an overall warming of the Earth's atmosphere due to the burning of fossil fuels, deforestation and other human activities (IPCC 2007). The effects of climate change on land and water resources can be

traced back to six factors: 1) an increase in global mean temperatures, 2) gradual changes in the amount and frequency of precipitation, 3) increases in the frequency and intensity of extreme weather events such as droughts, hurricanes, etc., 4) greater weather variability, 5) the effects of CO_2 fertilization, and 6) a rise in sea levels, resulting in salt water intrusions and coastal flooding. Each of these factors has different impacts on water, land, biodiversity and other resources. Especially in connection with developing responses to deal with these impacts, it is important to distinguish immediate impacts, such as the ones caused by extreme weather events, from the ones whose influence will only be felt over the coming decades, such as gradual changes in weather patterns.

Changes in natural resources due to climate change that can already be observed or that have been projected to occur over the next 50 years include (FAO, 2008a):

- changes in the suitability of land for different types of crops and pasture,
- shifts in ecological zones and resulting impacts on (agro-)biodiversity,
- changes in the health and productivity of forests,
- changes in the distribution, productivity and community composition of marine resources,
- changes in the incidence and vectors of different types of pests and diseases (including for human health),
- loss of biodiversity and ecosystem functioning of natural habitats,
- changes in the distribution of good quality water for crop, livestock and inland fish production, and
- loss of arable land due to increased aridity and associated salinity, groundwater depletion and the rise in sea level.

All of these changes can be expected to modify the environmental services provided by natural and managed ecosystems to rural people, such as the amount of food produced, the availability of water supplies, or the climatic, disease and nutrient regulation functions of ecosystems. Whether these changes will be positive or negative for human well-being is thus far difficult to foresee, particularly because different regions are expected to experience dramatically different impacts. With respect to agriculture, for example, yield and productivity impacts in many temperate regions are expected to be positive, while those in many tropical regions will be negative, although there is still considerable uncertainty about how projected changes will play out (IPCC, 2007). Projected impacts could also be altered by the adoption of risk management measures and adaptation strategies that strengthen preparedness and resilience. In addition to these impacts, other effects of climate change – possible increases in extreme weather events, a rise in sea levels, and greater weather variability – are today already threatening infrastructure and capital assets, changing insurance risk and income structures, and increasing vulnerability in developing and developed countries alike.

As the rural poor, in particular, are often directly dependent on the use of natural resources to sustain their livelihoods and lack the ability to reduce vulnerability by substituting physical and financial capital for natural capital, changes in resource availability or quality due to climate change will affect them directly. The most immediate effects are likely to result from increased resource scarcity, due to the loss of arable land in drought-prone areas, a reduction in water resources for agriculture and human consumption, and changes in resource quality, such as changes in species composition in forests and grasslands. The implications for resource access and management by the rural poor are therefore very significant.

Choices available to households can represent responses of both adaptation and mitigation (Abramowitz, et al., 2002). Both changes in resource availability and quality require careful management and adjustments in current practices and the establishment of monitoring systems to better react to new developments. Conflicts over access to diminishing or degrading resources will likely be a consequence if these systems are not adjusted.

Higher commodity prices and expanded production of biofuels. Higher global commodity prices since 2003 have changed – in some cases dramatically – the economic picture facing farmers and food consumers in all nations. Higher prices have been experienced for both energy and agricultural commodities. Energy prices have increased in response to instability in key oil-producing areas and increased demands from rapidly growing economies such as China and India. This, combined with growing awareness and concerns about climate change and the problems posed by greenhouse gases, has generated an enormous amount of interest in bioenergy as a substitute for petroleum-based products, as well as improved economic feasibility. Particular attention has been focused on liquid biofuels for transportation, especially bioethanol (produced from crops such as sugar and maize) and biodiesel (produced from crops such as palm oil and rapeseed). These have the potential to mitigate climate change by reducing emissions of greenhouse gases, lowering dependence on imported oil for net oil importers, and in stimulating rural development by increasing farmers' incomes.

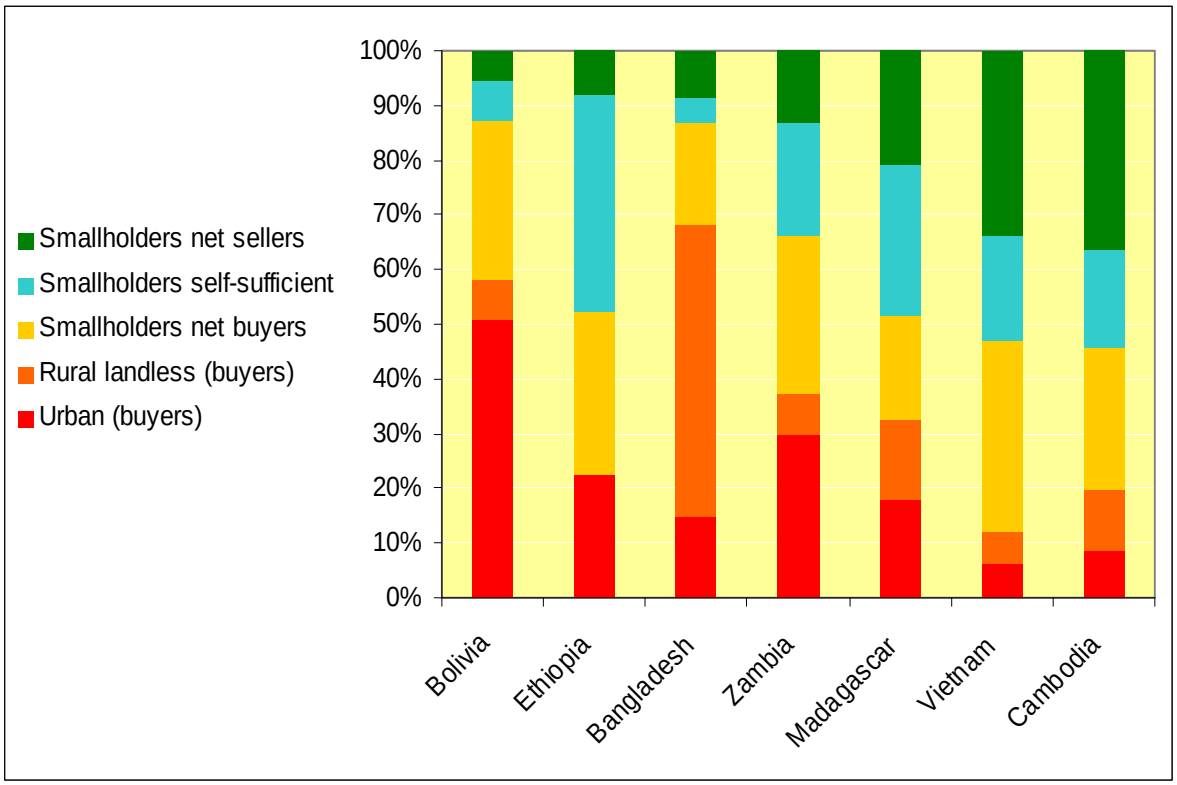
Despite these potential benefits, most types of biofuel (with the exception of bioethanol from sugar in Brazil) are not yet commercially viable[2]. As a result, a variety of policy measures have been introduced to support biofuel production, including subsidies, favorable tax treatment, protective trade barriers, and requirements that biofuels be blended with conventional gasoline and diesel in specified proportions. These policy measures have induced a rapid increase in the production of biofuels from food crops, and this pattern is expected to continue for the next several years. Over the longer term, "second-generation" biofuels produced from other sources (such as wood and crop residues) may become commercially feasible. These would reduce direct competition for food crops, but would continue to compete for the resources used to produce biofuel feedstocks, including land and water.

Such trends pose both opportunities and challenges for the rural poor. After decades of declining real prices for agricultural commodities, increased production of biofuels has contributed to a rapid rise in the price of commodities and in the incomes of farmers who produce them. At the same time, though, higher prices result in a loss in purchasing power by those who are net purchasers of food, including not only the urban poor and the rural landless, but also a significant number of small farmers. Figure 2.2 demonstrates that even in developing countries where the poor are heavily dependent on agriculture-based livelihoods, net food sellers – the primary beneficiaries of higher commodity prices – often constitute a small proportion of households, while net food buyers who are likely to be negatively affected by higher food prices – the urban poor, the landless, and smallholders – are a much greater part of the poor population. Other potentially negative effects of increased biofuel production include environmental impacts on land and water quality and on wetlands.

[2] For example, it has been estimated that US maize-based bioethanol becomes competitive when oil reaches $55 per barrel (Schmidhuber 2006). Oil prices are considerably higher at present, suggesting that US ethanol would now be profitable, but maize prices have risen as well, so the break-even price is now correspondingly higher (Birur et al. 2007).

A further concern arises from the increase in the value of natural resources – particularly land – generated by the rise in commodity prices. While increased demand for land increases the wealth of landowners who have secure property rights, it may also pose a threat to farmers

Figure 2.2: The proportion of the poor population who are net buyers or sellers of rice, wheat, maize and beans.



Source: World Bank, 2007.

who lack secure tenure to land, for example, if governments come under pressure from investors to allocate extensive tracts of land for large-scale production of biofuel feedstocks. Local institutional changes may favor cooperatives or outgrower schemes to generate scale economies in production (Pesket, et al., 2007). An additional constraint imposed by insecure access to land is that smallholders may be limited in their ability to take advantage of higher commodity prices because insecure tenure diminishes their incentive to invest in measures that increase or sustain productivity, or because lack of registered title may diminish their access to credit to support increased input levels. In local areas particularly affected by biofuels development, there may be related potential for stress on local institutions and governance systems affecting resource property and use rights as those rights increase in value.

Higher global commodity prices, the development of biofuels, and the potential for increasing resource scarcity stemming from climate change are among the many emerging changes faced by the rural poor. These developments illustrate the importance of distinguishing resources – notably natural resources – from the institutions that govern access to those resources. By increasing the value of the natural resources on which the rural poor disproportionately depend, or by altering relative price relationships between and among outputs and inputs,

these developments have the potential to generate increasing conflicts among resource owners and users. Increasing resource values also attract the interest of parties who are better placed to take advantage of ambiguities in the institutions, laws and practices that govern access to land and other natural resources. As discussed below, common property and open access resource settings which often involve ill-defined or overlapping rights to resource access and use and are especially prone to conflict.

To what extent will the rural poor be able to make the most of these (and other) emerging developments characterized by changing prices, resource scarcity and changing power relationships? A key part of the answer to this question lies in increasing the *capabilities* of the poor. There are several dimensions to this. Whether held under customary or private property systems, clear and secure rights to land are essential if smallholders are to benefit from the opportunities presented. (This theme is explored in more detail in Section II). Another part of the answer goes back to the discussion above on the role "asset bundling" as a solution to poverty. Enhancing access to natural resources is likely to be most effective in improving rural livelihoods and reducing poverty when simultaneously improving access to *other forms of capital* – technology, infrastructure, education and improved information provided through effective social networks. Improving access on these multiple fronts is most likely to create the environment necessary to best leverage the opportunities created by improved resource access and improved tenure security.

A more informed and supportive policy environment is also a key part of the solution. Since the 1980's, interest has grown in devolved and decentralized governance systems as a mechanism to help empower the poor to achieve better access and exert more control over the resources – land, water, forests, fisheries – on which they depend[3]. A related direction of contemporary policy is the development of market- and incentive-based ways of balancing short-term and long-term objectives, private and public interests, and economic, environmental and other objectives. These policy directions include market-assisted land reforms, innovative water pricing and water rights transfer mechanisms, private and community-based forestry management schemes and concessions, and transferable quota and licensing systems in fisheries. Another type of institutional and policy response to increasing scarcity and demand for resources that has generated increasing interest in recent years is payments for environmental services (PES) programs (also discussed further in Section II). These programs move away from "command and control" environmental regulations and policies and are based on incentive-oriented approaches to encouraging resource owners to supply environmental services that benefit resource users.

These and other policy and management tools currently under discussion in many countries go in new directions in terms of addressing the emerging rural environment within which the poor must seek to improve their livelihoods. This environment is not focused simply on agriculture and natural resource extraction but on *opportunities* for the rural poor in off-farm labor markets; in rural-urban linkages; in supply chains linking food, fiber, forest and mineral production with processors, manufacturers, wholesalers and retailers located in distant urban and international markets; even with the local economic effects of increasing remittance income of migrants[4]. This environment is a dynamic one and one which must respond not

[3] As Ribot (2002, 2004) and others have argued, the empirical evidence on the success of decentralization reforms in empowering the poor with regard to their access to and use of natural resources is decidedly mixed, as discussed further in Section II.

[4] Many of these trends are discussed in much more detail in the Background Paper to Chapter 5 of IFAD's 2009 Rural Poverty Report: "Access to Multiple Livelihoods in the Rural Economy".

only to emerging market forces but emerging trends in governance that characterize many countries – decentralization, democratization, increasing accountability of the public sector, and expanding involvement of local and community-based institutions and civil society. Whether incremental changes – as opposed to more innovative and radical changes – in policies and institutions will be enough to improve the welfare of the poor in the face of sometimes dramatic changes remains to be seen.

B. **The Diversity of Natural Assets and Tenure Systems**

Natural asset diversity and the rural poor

One of the distinguishing characteristics of the rural poor are the highly diverse endowments and settings they face in terms of agro-climatic conditions, population density, access to markets and services, and many other dimensions (Ellis and Allison, 2004; World Bank, 2007). As a result, the livelihood generation strategies employed by the rural poor are equally varied. This diversity has many implications, discussed below, including the importance of advancing a varied set of management strategies to address improved access to and management of natural resources, and avoiding a "one size fits all" approach to policy.

Underlying the diversity of livelihood strategies are the highly variable physical and agro-climatic resources that rural households face across the developing world. Agro-climatic zones are defined by many characteristics. Climatic variation includes seasonality of rainfall, length of growing period, and thermal zone (Wood, et al., 2000). Land topography or steepness ranges from flatlands conducive to irrigation and mechanization to those that are very steep and difficult to farm (>30 percent slope). Soils are characterized by numerous constraints related to drainage, acidity, soil structure, salinity, shallowness and erosion hazard (FAO, 2000). In addition to initial land and soil endowments, human actions have had a major impact over time in eroding and otherwise degrading much of the natural landscape through annual cropping, overgrazing, deforestation, and other practices.

Between the original natural resource endowments and the frequently degrading impacts of humans on land, soils and water, highly productive land and areas of abundant water resources are scarce globally. For example, soils defined as free from major physical constraints limiting agricultural productivity have been estimated to account for only nine percent of land in North Africa and the Near East, 10 percent in South and Central America, 18 percent in Sub-Saharan Africa, and 23 percent of Asia and the Pacific (excluding North Asia) (FAO, 2000). Water is even scarcer in many regions. Between one-third and 40 percent of the world's population faces some degree of water scarcity[5], including over 1.2 billion people facing physical water scarcity (International Water Management Institute (IWMI), 2007). The pressure on scarce productive soils and water resources can be expected to increase significantly with continuing population growth and other trends that are contributing to growing resource demands, including high commodity prices, growing demands for biofuels, and strong economic growth in major transition economies such as China and India.

Although the natural resources used by rural people are highly diverse, it is useful to make some broad distinctions in the makeup of the resource base, particularly in so far as these influence the livelihood strategies of the rural poor. One useful distinction that is prominent in

[5] The recent global report on water by IWMI (2007) distinguishes between physical water scarcity and economic water scarcity, where water supplies are inadequate to meet demands at current prices.

contemporary analysis of rural poverty is that between *favored* and *less-favored* environments[6]. *Favored environments* themselves vary widely, but they often are characterized by access to irrigation. Other characteristics include soils of high quality and flat topography; high population density; good access to purchased off-farm inputs (fertilizers and pesticides, improved seeds, credit, machinery, fuel, etc.); and close proximity or favorable access to markets for both outputs and purchased inputs. These systems are, moreover, often knowledge- and information-intensive. Favored environments include many of the world's most highly productive irrigated lands, such as those in India, China, Pakistan, Egypt, and Mexico.

Less-favored, or marginal, environments, by contrast, lack many of the attributes that positively influence production in favored landscapes. These are typically low-potential rainfed areas, although even within rainfed areas, there are dramatic differences in productive potential (FAO, 2003). Soils in less-favored lands may suffer from one or more of the physical constraints mentioned above. The land is typically hilly and mountainous and/or forested. Aside from physical and agroclimatic constraints, rural households in these areas typically face limited access to infrastructure and markets (Pender and Hazell, 2000; World Bank, 2007). They also typically lack easy access to productive off-farm inputs and efficient, functioning markets for their products. Population density is typically low, and partly as a result, physical, market and communications infrastructure is often inadequate. Supportive services such as extension services and technical assistance are commonly limited or wholly lacking, and education and health services necessary for human capital development may be rudimentary at best.

Table 2.2 illustrates one classification of rainfed lands, which divides these into several categories based in their inherent suitability for agriculture. Less-favored rainfed areas – here considered to be those which are "marginally suitable" or "unsuitable" for rainfed agriculture – can be seen to account for the majority of land in most regions, particularly in the Near East/North Africa region (91 percent of rainfed land), East Asia (74 percent) and Sub-Saharan Africa (55 percent) (FAO, 2003). Overall, these less-favored areas are estimated to account for nearly two-thirds (62 percent) of rainfed land in developing countries. This clearly illustrates the vast physical and climatic constraints facing those who live and work on these lands.

In terms of the focus on resource access in this paper, it is important to understand not just the physical characterization of rural areas, but where the rural population, particularly the rural poor, are located. Some studies have concluded that less-favored areas are home to greater numbers of rural poor than better endowed areas. Estimates of the number of rural poor living in less-favored areas, however, have varied widely, from an estimated 371 million people (Renkow, citing Leonard, 1989) to 634 million (Nelson, 1997)[7].

[6] Less-favored environments have, in the literature, often been further sub-divided into two or more sub-groups based on degree of agricultural potential, type of agroclimatic region, or other characteristics (Scherr, 2000; FAO, 2003; Hazell and Wood, 2007; etc.). Because the focus of this paper is primarily on access to natural resources and not on a detailed characterization of the natural resource base *per se*, we limit ourselves to the two-way classification here, while acknowledging its limitations.

[7] Although these estimates are by now dated, they are still widely cited in the literature.

Table 2.2: Land with rainfed crop production potential

	Total land surface	Share of land suitable (%)	Total land suitable	Very suitable	Suitable	Moderately suitable	Marginally suitable or not suitable
	Million ha						
Developing countries	7,302	38	2,782	1 109	1,001	400	4,793
Sub-Saharan Africa	2,287	45	1,031	421	352	156	1,359
Near East/North Africa	1,158	9	99	4	22	41	1,091
Latin America and the Caribbean	2,035	52	1,066	421	431	133	1,049
South Asia	421	52	220	116	77	17	212
East Asia	1,401	26	366	146	119	53	1,083
Industrial countries	3,248	27	874	155	313	232	2,548
Transition countries	2,305	22	497	67	182	159	1,896
World*	13,400	31	4,188	1,348	1,509	794	9,748

* includes some countries not covered in this study

Source: FAO, 2003, p. 130.

More recent estimates, however, suggest that although the *poverty rate* is often highest in marginal areas, the *largest number of poor people* live in more-favored areas (World Bank, 2007). One recent study (Hazell and Wood, 2007) estimates that irrigated (favored) areas comprise only 10.3 percent of land in low- and middle-income countries but are home to 42.5 percent of the population of these countries (Table 2.3). High-potential rainfed areas comprise 35.2 percent of the land, but 26% of the population, while low-potential rainfed areas account for more than half of the overall agricultural land (54.4 percent) but only 31.4 percent of the population. Another recent study which defines "favored" regions more broadly – as characterized by irrigation, adequate rainfall and good access to markets – asserts that they include an estimated 60 percent of the rural population overall in Asia, Africa and Latin America. By contrast, less-favored areas, constrained either by rainfall or market access, are home to almost two-thirds of the rural population in Sub-Saharan Africa, but only 25% in South Asia (World Bank, 2007). Whether in favored or less-favored environments, Asia has the greatest absolute number of rural poor.

Table 2.3: Distribution of land and rural population in low- and middle-income countries

Agricultural Productivity Area	Middle-Income Countries		Low-Income Countries		Total (Low- and Middle-Income Countries)	
	Area ($1000km^2$)	Population (million)	Area ($1000km^2$)	Population (million)	Area ($1000km^2$)	Population (million)
Irrigated	3,284 (9.6%)	534.1 (38.8%)	2,193 (11.7%)	649.1 (46.2%)	5,477 (10.3%)	1,183.2 (42.5%)
High-potential Rainfed	11,884 (34.7%)	373.0 (27.1%)	6,788 (36.2%)	351.4 (25.0%)	18,672 (35.2%)	724.4 (26.0%)
Low-potential Rainfed	19,068 (55.7%)	470.7 (34.2%)	9,786 (52.1%)	404.4 (28.8%)	28,854 (54.4%)	875.1 (31.4%)
Total	34,235 (100.0%)	1,377.8 (100.0%)	18,767 (100.0%)	1,404.9 (100.0%)	53,002 (100.0%)	2,782.7 (100.0%)

Source: Hazell and Wood, 2007.

Thus, initial land endowments as well as the distribution of rural poverty are both highly diverse across developing countries. Favored areas, especially irrigated lands, are generally home to intensive crop cultivation, while less-favored areas tend to be associated with more extensive cultivation and livestock production. However, the extent to which relative poverty is correlated with production environments is unclear from the empirical evidence which is inconsistent, given the diversity of production environments and the presence of many confounding factors (Kelley and Parthasarathy Rao, 1995; Byerlee and Morris, 1993; Heisey and Edmeades, 1999; UNEP, 1997).

Water is an increasingly scarce resource across many global ecosystems. The recent *Comprehensive Assessment* of global water resources by the International Water Management Institute (IWMI, 2007) asserts that one-fifth of the world's population – more than 1.2 million people – live in areas of physical water scarcity. These are areas where water use by humans has "surpassed sustainable limits", including regions that are experiencing severe environmental degradation, falling water tables, and surface and groundwater pollution. These regions include large expanses of northern Africa and the Middle East, Central and South Asia, Mexico, and parts of southern Africa. An estimated additional 1.6 billion people live in regions of economic water scarcity, where access is limited by human and financial capital, infrastructure and institutions. These areas include much of Sub-Saharan Africa as well as parts of South and Southeast Asia, the Andes and Central America. Specific factors limiting access to water by the poor are many and vary by location and agroecozone: water pollution and growing water quality problems, in many regions; climate change, affecting temperature and precipitation; water depletion in irrigated lands and declining groundwater levels; urbanization and associated water demands that often compete with agriculture; changing crop production patterns including higher demands for high-value (often irrigated) crops; and higher energy prices and associated water costs.

Forests and *fisheries* are also critically important resources for the poor. A recent comprehensive review of 54 case studies in 17 developing countries (Veveld, et al., 2004) offers some broad insights regarding the role of forest-based environmental income of the poor. It finds that sources of forest-related incomes are highly diverse, including: hunting wildlife; charcoal and fuelwood production; fodder, grass and thatch; wild medicines; fish smoking and tobacco curing; and the production of timber, poles, fruits, and vegetables. Forest-based income serves many roles among rural dwellers, primarily as a "safety net" during periods of hardship, to fill gaps in other income sources over the year, and to diversify income sources. For subsistence users, forest products can be a source of commercial income and direct household consumption; cash income only accounted for about half of forest-based income overall. On average across the case studies, forest-based income was found to account for 22 percent of household income, compared to 37 percent from agriculture, and 38 percent from off-farm activities. The distribution of income sources across different forest-based sources is given in Table 2.4. The dominant sources were forests as a source of wild foods and fuelwood, which together accounted for 70 percent of forest income in the total sample. Forest-based income was found to be particularly important for the poor, who were disproportionately dependent on forest income – accounting for 42 percent of total income – and who tend to be more remotely located than other households.

With regard to *fisheries*, FAO's *State of World Fisheries and Aquaculture Report* (2007) reinforces the importance of the fisheries sector in developing countries. Fish are a key food source for the poor: 60 percent of people in developing countries depend on fish for at least 30 percent of animal protein supplies. Of the 15 million people directly engaged in coastal

and ocean fisheries, 90 percent are estimated to be small-scale operators, using small boats and minimal capital investment. Since 1960, global fisheries production has increased rapidly to its current level of around 132 million metric tons valued at over US$58 billion, over 60 percent of which is in developing countries. Major developing country producers include China, Peru, Indonesia, Chile, and India. Fisheries serve many functions in these countries and for the poor more specifically: as a source of income, a source of foreign exchange, and as a source of employment for over 41 million persons in developing countries, 84 percent of whom are in Asia.

Table 2.4: Distribution of forest environmental income, by source

Source of forest environmental income	Forest environmental income for cases reporting that source (USD PPP-adj)	Share of total sample income
Wild foods	286.5	38.3
Fuelwood	215.5	31.7
Fodder	123.5	5.8
Timber	28.0	2.3
Grass/Thatch	82.5	5.0
Wild medicine	46.5	3.7
Gold panning	6.2	0.2
Others	128.9	13.0
Total	677.9	100.0

Source: Veveld, 2004.

Another resource that is centrally important to agricultural production on which so many of the rural poor depend is the diversity of *plant genetic resources*. Genetic diversity plays many roles in agriculture (Hawtin, n.d.): providing plant species the critical ability to adapt to changing stress stemming from pests, diseases and drought; providing protection against unfavorable conditions; and serving as a source of crop improvement through improved quality and yield traits. Over time, much of this genetic diversity has been eroded. FAO (1998) estimates that since the beginning of the 20th century, 75 percent of the existing plant genetic diversity has been lost. It is estimated that just over 100 species contribute 90 percent of the world's plant food supply, and just three (rice, wheat and maize) contribute an estimated 60 percent of calories and protein derived from plant sources (FAO, 1998; Hawtin, n.d.). The major risk of genetic uniformity is increasing susceptibility to pests and disease and the dramatic production and yield declines that can result. A key to maintaining genetic diversity is improving farmer households' access and control over the plant genetic resources on which their livelihoods are often heavily dependent.

Increasing Resource Scarcity and the Poor

As we have seen, the distribution of natural resources, as well as the rural poor who depend on those resources, varies widely geographically, by agroecozone, by continent, country and region. There is a common thread, however: although the specifics vary widely, natural resource scarcity is an endemic feature of the lives of many hundreds of millions of rural poor people in Asia, Africa, Latin America and elsewhere. Tables 2.5a–2.5c dramatize this conclusion by showing estimates by FAO of declining per capita availability of arable land, irrigable land and renewable water resources over the period 1970 to 2050 (projected)[8]. The

[8] Past estimates for 1970 and future estimates for 2050 are estimated from available data.

decline is particularly striking in the case of water resources. As discussed above with regard to water resources, "scarcity" can be attributable to many sources: in some cases, physical scarcity due to the sheer lack of adequate resources where the rural poor happen to live, while in other cases, economic scarcity as a function of lack of purchasing power, weak institutions, and inadequate access to and control over the resources necessary to generate a sustainable livelihood (Mehta, 2006). Either way, the situation faced by poor rural households is often a desperate one.

Table 2.5a: Total arable land in use per capita (ha)

	1970	2000	2015	2030	2050
Developing countries	0.27	0.20	0.18	0.16	0.14
Sub-Saharan Africa	0.49	0.38	0.31	0.25	0.19
Near East/North Africa	0.48	0.22	0.17	0.14	0.12
Latin America and Caribbean	0.43	0.39	0.36	0.35	0.32
South Asia	0.28	0.15	0.12	0.11	0.10
East Asia	0.15	0.12	0.11	0.11	0.11

Source: FAO 2003 and FAO 2006.

Table 2.5b Irrigated land in use per capita (ha)

	1970	2000	2015	2030	2050
Developing countries	0.05	0.04	0.04	0.04	0.03
Sub-Saharan Africa	0.01	0.01	0.01	0.01	0.00
Near East/North Africa	0.09	0.07	0.06	0.05	0.04
Latin America and Caribbean	0.04	0.03	0.03	0.03	0.03
South Asia	0.07	0.06	0.05	0.05	0.04
East Asia	0.04	0.04	0.04	0.04	0.04

Source: FAO 2003 and FAO 2006.

Table 2.5c Annual renewable water resources per capita (m^3)

	1970	2000	2015	2030	2050
Developing countries	10,940	6,019	4,908	4,245	3,792
Sub-Saharan Africa	13,168	5,684	4,045	3,042	2,286
Near East/North Africa	2,956	1,380	1,038	841	699
Latin America and Caribbean	47,719	26,037	21,523	19,020	17,597
South Asia	3,487	1,843	1,465	1,252	1,118
East Asia	7,364	4,587	4,063	3,816	3,816

Source: FAO, 2003 and FAO, 2006.

Many of the emerging trends discussed above – economic growth in transition economies, climate change, higher commodity prices, and biofuels development – as well as other underlying trends such as population growth, urbanization, and changing dietary patterns in response to income growth, hold the potential to greatly exacerbate the conditions of resource scarcity facing the poor. Sub-Saharan Africa, already home to many of the world's rural poor, is expected by many to be disproportionately affected by the loss of arable land and lower water availability resulting from climate change (Castle, 2008). Any approach to natural resource access and management must acknowledge and respond to these conditions

of increasing scarcity and the diversity of resource management and livelihood strategies among the poor. Generic management strategies and policies to improve household livelihoods, reduce poverty, and enhance natural resource access and management are unlikely to be effective (Renkow, 2000; Fan and Chan-Kang, 2004).

Diversity of rights and tenure systems: an organizational framework

As suggested above, improving access to natural resources is an essential element to improving the livelihoods of the rural poor. Resource access is differentiated by many factors – the characteristics of the physical resource base, accessibility as permitted by local infrastructure, national policy and legal frameworks, local customary rules and traditions, and other factors. Key to assuring security of access is understanding the *property rights* of people, in this case, the rights of the rural poor to access natural resources and thus to enhance their capability to overcome poverty through improved access.

Property rights have been described as the set of "claims, entitlements and obligations" (Furubotn and Pejovich, 1972) regarding the use of a resource, here considered to be a natural resource – land, water, forests, fisheries and crop genetic resources. This conception of property rights emphasizes not simply the relation between a person and the resource, but also the notion that rights involve social relationships *between people*; put another way, property rights are effective only when there are *institutions* acknowledging, legitimizing and enforcing them (Meinzen-Dick and Nkonya, 2002). Often in the case of individualized or private access rights, that institution is the state, but not necessarily. Other institutions whose rules and norms define property rights range from international treaties to local authorities and customary law, resource (e.g. forest and water) user groups, and religious authorities.

Perhaps the most widespread interpretation of property rights characterizes them as a "bundle of rights" to resources (Schlager and Ostrom, 1992), where the bundle may be thought of as consisting of a bundle of "sticks", each of the sticks representing separate and distinct rights of:

- *Access (e.g. entry)*: the right to enter a physically defined property
- *Withdrawal*: the right to obtain products from a resource
- *Management*: the right to regulate use, improve and transform a resource
- *Exclusion*: the right to determine who will have access rights and how that right may be transferred
- *Alienation*: the right to sell or lease either or both the rights to management and exclusion

Some would add the right to earn an income for a resource, or the right of a government to tax the use of a resource (Alchian and Demsetz, 1972). In fact, national governments always retain underlying rights of regulation, eminent domain, and enforcement that they may choose to employ on occasion, and they also have the capability to alter the national legal and governance structures that ultimately define the individual strands of rights identified above.

There are three primary types of property institutions that affect natural resource access: 1) *private or individualized systems*, often (but not always) involving individual title to land; 2) *customary systems*, in which group membership rules and other internal rules and mechanisms assign rights and procedures for resource use; and 3) *state systems*, in which access to state lands is determined, nominally at least, by central legal and administrative

authorities. In each system, specific rights are distributed across individuals, the community, and the state. And any of these systems may, if not functioning properly, deteriorate into a situation of *open access*.

Private property rights are often thought of the closest to owning the entire "bundle" of property rights "sticks." As each stick represents a distinct and separate right – the right to use resource, to enter it, sell it, lease it, transfer it, and to choose whether or not to exercise any of these rights – private property rights are the most inclusive and usually the most valuable. Alternatively, private property is often described as having a well-defined right of alienation, meaning that, without this right, property rights systems may be ill-defined and inefficient since holders of rights may be unable to exchange, sell or transfer their holdings to more productive users (Agrawal and Ostrom, 2002). At the same time, the mere existence of the right of alienation does not guarantee that voluntary market transactions will in fact occur and that efficient management will follow (Larson and Bromley, 1990).

The advantages of private or individualized property rights are many and are well documented in the literature (de Janvry, et al., 2001; Deininger, 2003; Quan, 2006). Above all, private property rights are typically characterized by the greatest security of tenure. Security of tenure has many implications, perhaps the most of which is that future payoffs from productivity-enhancing investments in the land are most likely to be assured (compared to other forms of property rights). This, in turn, is important because it is these investments in land productivity through use of credit, technology, labor-intensive farming practices, and other mechanisms that are commonly required on the part of smallholders to make their landholdings economically sustainable. Other dimensions of security of access and tenure are discussed in Section II below.

Customary land tenure systems provide a wide variety of alternative mechanisms for facilitating access of the poor to natural resources. This is particularly true in areas, such as Sub-Saharan Africa, where there is a long history of strong customary traditions and social and cultural rules and regulations governing resource access, allocation and use. Customary systems are widely eroding in many areas, although they still provide the underlying basis for the allocation of rights to and use of land and other resources in much of Africa, Asia and selected other locations. Customary tenure systems are particularly important in determining access and use of *common-pool resources* (both common property and open access) in many developing countries: agricultural lands, particularly in pastoralist economies, water, forests and fisheries.

The general basis for customary tenure systems is customary "law", typically unwritten traditional rules and arrangements on the part of collective ownership units – the village, tribe, lineage or extended family – which regulate the territory of, and resource use by, the unit's members (Cotula, 2006). Customary authorities may have wide-ranging abilities to manage access and the use of natural resources by: allocating land and other resources; distributing use rights to land, water, forest and fisheries; determining acceptable resource uses; supervising the exchange and transfer of land and resources; and adjudicating conflicts over resources (Platteau, 1995).

Compared to private property rights systems in which the individual "sticks" in the "bundle" of rights are typically concentrated in the hands of one individual unit, in the case of customary systems – particularly with respect to the common property resources they govern – it is more often the case that the individual "sticks" are owned or used by different rights-

holders. In fisheries, for example, Schlager and Ostrom (1992) identify four different types of property-rights holders – owners, proprietors, claimants and authorized users – each of whom possesses a different set of rights associated with the various rights to water: access, withdrawal, management, exclusion and alienation.

Customary tenure systems are enormously diverse, and that diversity extends across multiple dimensions. For that reason, it is difficult to classify customary tenure systems even in a single region, much less more broadly. For a single piece of land, customary systems may incorporate multiple uses and multiple users (Cotula, 2006). Substantial differences exist between systems involving crop-based and pastoral farming. Customs pertaining to land use may reinforce, or conflict with, those pertaining to water use (Hodgson, 2004). Differences in ethnic backgrounds and religious beliefs may extend over the same shared resource in the same or proximate areas. In a given location, customary law may be stronger, weaker, may overlap, may reinforce, or may contradict statutory law. As a practical matter, this means that local tenure systems, which may be a hybrid of customary rules and statutory laws, are hard to categorize and are oftentimes ambiguous (Meinzen-Dick and Nkonya, 2002). This is particularly true in areas where significant changes in resource use are underway due to such factors as population growth, in-migration, land intensification to meet food or livelihood needs, or where other pressures on common property resources exist.

State property rights. The third principal mechanism that governs access to natural resources is through the rights of central governmental authorities – the state – to ownership and management of land, water, forests and other resources, or to the delegation of these rights to others. The role and importance of the rights of the state vary widely by country and by type of natural resource, and this role has changed significantly over time in many instances. In intensively farmed agricultural lands in many countries, the role of the state is typically limited to setting statutory law regarding the overall framework of resource use within which rural households operate: land registration and titling; land transfers; product standards for purchased inputs; rules, guidelines and standards for marketed products; means of adjudicating disputes, for example over land ownership and use; and, through national policies and international agreements, establishing the overall framework for market access and price determination. With regard to resources characterized by common property and open access – many water, forest and fishery resources, for example – the state often owns the resource and retains the ultimate authority to delegate use rights to others, including private individuals, community and indigenous groups. As discussed further below, the delegation of state rights over the ownership and use of these common-pool resources to others has been an important and widespread trend over the past 20 years.

The "bundle of rights". It is possible for a single individual to own all the sticks in the bundle of rights to a particular resource, or some of the rights, or none of the rights. Similarly, separate rights in any given resource can be held independently of each other by different individuals or groups. Individuals and communities can hold well-defined property rights without retaining the entire set of rights identified above (Schlager and Ostrom, 1992). Private or individualized property rights generally incorporate all of the abovementioned rights, and for that reason are typically preferred, particularly given the importance of the right to transfer the resource (*right of alienation*) and generate a return from that transfer. (Even in private property rights, however, governments generally reserve several additional rights, such as the right of eminent domain, e.g. to use the land for some public purpose). Customary rights may include one or more of the above "sticks". Indeed, customary law and tradition affords many different types and combinations of rights, as discussed further below.

The notion of a "bundle of rights" can be illustrated by example. Kiptegan is a water protection site in Nyando basin of western Kenya. In Kiptegan, the above-mentioned rights are delimited as follows (Meinzen-Dick and Nkonya, 2002):

- Any community member has the right to *access and withdraw* drinking water below the source pipe; water may be withdrawn for use by cattle but only from a trough, which must be kept clean;

- Community members who have contributed to improving the site and protecting the stream are entitled to additional *withdrawal rights* for piped water supply for home and garden use and are entitled to have a role in selecting members of the committee that manages the spring site;

- Those who spend time and resources to serve on the management committee have further *control and management rights*, including deciding who is included in the user group (*right of exclusion*), how the spring is to be managed (*right of management*), and collecting fees from group members to reinvest in the water delivery infrastructure.

Table 2.6 provides one example of how specific rights might be held by different parties under different property systems, although the details can vary in virtually an infinite number of ways in practice. To the five specific types of rights that were identified above, we add a sixth, the ultimate rights of resource "regulation", denoting the fact that, regardless of the type of property right system that may exist in a given setting, the state typically retains a set of miscellaneous rights to control resources through such mechanisms as taxation, policing, and imposing eminent domain authority.

Table 2.6: Distribution of specific rights under different property systems: one example

	Private property system	Customary property system	State property system	Open access
Access (e.g. entry)	i	i	s	everyone
Withdrawal	i	i	s	everyone
Management	i	c	s	everyone
Exclusion	i	c	s	no one
Alienation	i	c	s	no one
Regulation*	s	s	s	no one

i = individual holds this particular right
c = community holds this particular right
s = state holds this particular right
* This includes miscellaneous resource control rights – the right to tax, police, restrict certain uses, impose rights of eminent domain, etc. – that are typically held only by the state.

Each of these systems thus involves a specific set of rights, configured in different "bundles" in different institutional settings. Each is associated with different sets of problems and issues, some of which are discussed further below. Each is relevant to a different degree in different countries and to the use of the different resources of interest here, primarily land, water, forests, fisheries, and crop genetic diversity (e.g. seeds). In reality, these different systems of rights are often highly interdependent and intermingled as they underlie the livelihood generation of the poor (Ellis and Allison, 2004).

It should be noted that the traditional description of property rights as a bundle of rights strictly entails a fairly narrow definition of "access" – simply the right to enter a property. The conception of "access" that is used in this paper, and that is common to much of the recent research and literature on natural resource access, is a broader and more utilitarian one, analogous to Sen's concept of access to food, and entailing not only the rights of households of entry, but their ability to use and manage resources in order to improve food security, enhance nutrition and reduce household vulnerability (Binswanger and Deininger, 1999).[9] This distinction is important because typically implicit in contemporary use of the notion of "access" are assumptions, often unstated, that extend beyond physical access and that may include corollary rights of management, withdrawal and usufruct. But these assumptions, in turn, depend on the institutional framework framing any particular example, the relationships between those institutions and local users, and other aspects.

Property Rights and Natural Resources

As we have seen, widely different types of property rights systems typically apply to different types of natural resources and thus define widely different institutional frameworks for resource access by the rural poor. In Table 2.7, for example, we return to our earlier distinction between favored and less-favored *agricultural lands* and summarize some of the illustrative distinguishing characteristics of each[10].

A prototypical "favored" landscape, for example, might be characterized by intensive crop production on irrigated land, favorable climatic and soil resources, high population density, ready accessibility to product markets, and with good availability of purchased off-farm inputs, information and technical assistance. Such an environment is most likely to be characterized by private, individual land title, entailing the entire "bundle" of land rights. A prototypical "less-favored" landscape might involve low-potential, less intensively farmed cropland or rangeland, more constrained agroclimatic and soil resources, low population density, poor accessibility to markets for output and inputs, a more intensive use of local resources and own household labor, and a limited availability of purchased external inputs and technical assistance. Such an environment would be more likely to entail informal or customary rights to land. And, of course, many systems lie between these two extremes.

Water rights differ from land resources in many respects, particularly the multiple and overlapping legal and customary domains that, sometimes simultaneously, govern its use (Meinzen-Dick and Nkonya, 2002; Shyamsundar, et al., 2005). Water use is governed under widely different legal and institutional structures in different countries: private ownership, sometimes tied to the land, sometimes not; public ownership, often allocable by licenses or other mechanisms; communal water rights governed by customary water law (especially in Africa); different rights tied to groundwater versus surface water; etc. There is often also a significant overlap in these rights regimes, one of the results of which is that conflicts over water rights and water access are endemic in many countries. Perhaps in no other area of resource management (other than fisheries) are governance issues more critical, in part due to

[9] In fact, the concept of access to resources is analogous to the concept of access to food within the broader notion of food security. Just as food availability does not necessarily imply that an individual or household has access to that food (due to economic or other constraints, for example), natural resources, such as water, may be available in a particular location but some individuals or households may lack access to that resource.

[10] It is important to note that the stylized types of agroecosystems characterized in Table 2.7 are illustrative only and may rarely apply precisely as shown.

growing recognition of the increasing scarcity of water resources in many countries resulting from growing populations and demand for food, the production of which accounts for 70-75 percent of total water use. Policy and governance changes which influence water rights and water use include transfer of irrigation management responsibilities, the development of river basin and watershed management organizations, the trading of water rights, and the pricing of irrigation water to promote greater efficiency in its use (IWMI, 2007).

Table 2.7: Characteristics of Stylized Production Systems: Resources, Access and Management

	System Attributes	
Characteristics	**Favored Environments**	**Less-Favored Environments**
Land and Resources		
Land type	Irrigated, high-potential rainfed	Moderate and low-potential rainfed, forests
Cropping systems	Monoculture, intensive	Polycultures, mixed cropping and agroforestry systems
Population pressure	Moderate to high	Low to moderate
Types of capital use	Intensive use of environmental endowments, local resources, household labor	Intensive use of off-farm capital inputs and human capital
Supporting environment	Good access to infrastructure, markets, credit, information	Limited access, poor quality, market failures common
Tenure and Resource Use		
Tenure status	Private, titled	Customary, community-based
Titles and transfers	Sale, short and long-term lease	Inheritance, gift, rent, sharecropping
Use rights	Individual, fixed, legally established	Multiple uses and users. Variable access
State role in resource control	Low	High
Management		
Objectives	Profit-maximizing	Risk reduction, output maximizing
Input use	Extensive use of off-farm inputs: fertilizer, irrigation, HYV seeds, machinery, credit, etc.	Own labor, draft animal power, recycling of animal and green manures and crop residues,
Knowledge	Intensive in the use of scientific knowledge, direct/indirect use of research results and extension.	Indigenous knowledge, learning from neighbors and social networks.

Source: Adapted from Wood, et al., 2000. Note that these are stylized systems and may characterize few production systems exactly.

Compared to intensively farmed cropland, *forests* are not typically subject to individualized tenure rights. Recent global estimates suggest that state lands, typically administered by national governments, account for between 77 percent (White and Martin, 2002) and 84 percent (FAO, 2005) of the world's forest resources. The extent of state-owned or administered lands ranges widely by region and country, however. While state ownership accounts for nearly 98 percent of forests in Africa, in Central America, it is less than 44% (FAO, 2005). "Public" ownership does not necessarily mean "state" ownership; it has been estimated, based on a partial sample of countries with major forested areas, that globally, seven percent of forest land is owned by local communities and another four percent of forest land is reserved for local communities (White and Martin, 2002). Private ownership of forests is low, only 12-13 percent on average, although it is much higher in some countries and regions (FAO, 2005). Due to the many problems associated with state ownership of forest lands, there has been a growing trend toward devolution and decentralization of forest ownership and management to stakeholders, both local communities and private entities.

Fisheries also typically suffer from chronic conflicts over access rights. The jurisdictional framework over marine fisheries is dominated by the Exclusive Economic Zones (EEZs), sanctioned by the U.N. Convention on the Law of the Sea (1982), under which countries can claim sovereignty to fisheries within 200 miles of their coasts, within which 90 percent of marine fish are caught. Notwithstanding this law, due to the inherent nature of marine fisheries, including the migratory nature of many fish stocks and lack of effective institutions and enforcement, marine fisheries continue to be exploited as an open access resource in many countries. Inland fisheries, which have been estimated to account for as much as 10 percent of total output of capture fisheries, also commonly suffer from open access problems, due to the large size of fresh water bodies, the mobility of fish populations, and weak regulations and institutions which often govern inland fisheries as well (Smith, et al., 2005).

Access by the poor to *plant genetic resources* (e.g., seeds) is difficult to categorize because it is a hybrid of informal customary practice and formal market-based transactions and because these resources embody a mix of natural resources and human capital in the form of selection, breeding and even genetic engineering.. Traditionally, poor farmers have accessed seeds informally through saving, exchanging, buying and selling seeds informally with neighbors and in dispersed local markets. In these traditional settings, farmers themselves play many roles in accessing seeds – selection, storage, production, diffusion and seed exchange (Chiarolla, 2006). Increasingly, however, poor farmers have potential access to improved seed varieties developed through formal seed systems in which plant breeders, seed producers and private sector firms play key roles in developing, producing and marketing seed varieties. In these cases, farmers' access is primarily gained through the market. Paying a premium for improved seeds – notwithstanding the higher crop productivity that can be achieved – is often not possible for poor households. Legal and regulatory requirements related to seed certification and plant variety protection create additional obstacles for farm households in accessing new varieties and even in maintaining traditional seed improvement practices.

With respect to all of these resources, it is clear that access rights can differ dramatically. Only in the case of agricultural land are private property rights common as a land tenure system, and even agricultural lands are often managed by individuals within the framework of customary tenure systems. For plant genetic resources, "hybrid" private and customary access systems are present. In the case of forests, state systems are dominant, while in the case of water and fisheries, common property and open access systems are common. Access rights

also differ in the extent to which they are associated with relatively mobile and fluid versus being immobile (Movik, n.d.). It is sometimes asserted that private property rights, in particular, are most easily conferred on immobile natural resources. Agricultural land, which is immobile (except in a broader dynamic context), is indeed is commonly associated with private or individualized property rights. Highly mobile resources, like fisheries (and indeed the atmosphere), are also the resources most often characterized by open access problems, where assignment of private use rights is difficult, at best. Water and forest resources can be viewed as intermediate cases between these two extremes, and, depending on the context, may share attributes of different property rights systems. Water, in particular, though literally a "mobile" resource, is generated by biophysical processes that retain a relatively fixed geographical location (streams, rivers, watersheds, acquifers), and thus private rights to its use are often assignable, albeit complex.

There is an extensive debate in the literature over the advantages and disadvantages of formal, individualized tenure systems compared to customary tenure systems that can only be touched on briefly here. Much of that debate is couched in the context of the transition from customary to privatized rights to land and the inevitability of that transition. The underlying hypothesis – often termed the "evolutionary theory" of property rights (after Boserup, 1965) – is that as populations increase and land use intensifies, land becomes more valuable and thus individuals have stronger incentives to assert private claims over rights to land. Over time, the argument goes, private property rights thus tend to supplant customary rights of the group. The consensus of this ongoing debate is that although private titling and tenure systems have many advantages compared to customary systems, that they are neither necessary nor sufficient to assure security of tenure. And it is ultimately security of tenure that is the central criterion of ensuring access.

Before turning to a consideration of several specific challenges facing the poor in accessing and managing natural resources, we offer several general remarks regarding property rights to natural resources overall. First, it is useful to note the distinction often made between *de jure* (formal legal) rights to resources and *de facto* rights. It is commonly asserted that *de jure* rights are necessary to assure access to forests and other common property resources. As suggested above, however, in cases where customary systems work well, commonly accepted *de facto* recognition of those rights may be enough to assure continued access (Dorji, et al., 2006). Second, while access is ultimately validated through property rights, ownership of those rights can be gained through many mechanisms. Legal mechanisms include voluntary sales, transfers, gifts and bequests. But *de facto* rights to natural resources can also be gained through bribes, graft, corruption and other illegal means. In countries with weak institutions and capacity to enforce property rights and the rule of law, extra-legal means of assigning property rights – or taking them away – are common. This is particularly a risk where the value of natural resources is rising more rapidly than the legal system's ability to adapt. The negative effects of corruption on the security of property rights, on a household's ability to mobilize its assets especially though access to formal credit, and on economic growth more generally are widely recognized (O'Driscoll, Jr. and Hoskins, 2003).

Finally, we note that the effective *locus and scale* of natural resource use, control and management can vary dramatically in different settings. While we are here interested primarily in assuring local resource access by the rural poor, the obstacles to addressing that goal can reside at local, regional, or national levels, depending on the context. Thus the most effective level at which changes in policy and management might take place can vary widely – for example: improved technologies and resource management practices adapted and

adopted at the household level; community-level modifications of customary tenure systems to address local resource scarcity; regional and national-level policy changes to enhance the effectiveness of devolution and decentralization efforts in governance.

In the following section, we explore some of the critical challenges faced by the rural poor in improving their access to and management of natural resources, as well as the diversity of tenure settings (private property rights, customary tenure systems, and state systems) and the diversity of resources (land, water, forests, fisheries, plant genetic resources) with respect to which these challenges are addressed.

IV. Key Challenges to Enhancing Assess to, and Sustainable Management of, Natural Resources

This section addresses several clusters of challenges faced by the poor in terms of enhancing access to, and improving management of, natural resources. These challenges are: 1) *expanding access* to natural resources to increase incomes and improve household welfare; 2) *increasing security of access* to natural resources, in the context of changing institutional and market conditions; 3) *improving sustainable management* of natural resources, including improved resource quality; and 4) enabling the poor to *take advantage of evolving markets* for natural resources, including markets for environmental services. In each case, a set of sub-challenges characterize each challenge[11]; these are incorporated in the discussion below.

The challenge framework adopts a people-centered perspective that puts poor rural men and women at the center of addressing solutions to rural poverty. This approach seeks to explicitly address the needs of the rural poor, recognizing the vast diversity of circumstances, situations and resource bases they face. This framework also attempts to identify the obstacles faced by the poor, and thus the mechanisms needed to overcome rural poverty and the perspectives of the enabling agents involved in that process.

Challenge 1: *Expanding access to natural resources* to increase incomes and improve welfare.

A country may possess an adequate – or even an abundant – supply of land, water, forests and other natural resources, but this does not mean that all people necessarily enjoy adequate, or even minimal, *access* to those resources. There are many countries, including some of those with great resource abundance, where the ability of the poor to access resources is heavily constrained and highly unequal, and where, as a consequence of these and other factors, poverty is severe and widespread. The specific challenges of expanding natural resource access are many: gaining access to additional cropland; gaining reliable access to open access and common property resources such as water, forests and fisheries; expanding access on the part of those in society whose prior access has been most constrained, such as women. In addition, since many of the rural poor live in less-favored regions, the specific constraints involved in increasing access through public investments in these regions must be addressed.

The obstacles encountered in increasing incomes and improving livelihoods through improved access to resources are many: poor infrastructure and availability of public services,

[11] Note that there are significant interconnections and overlaps in addressing these challenges, thus the discussion of specific obstacles and solutions in one sub-section versus another is somewhat arbitrary.

widespread imperfections in output and input markets, and lack of adequate knowledge and information. But underlying many of these limitations are based on even more fundamental obstacles – weak institutions, ambiguous or unequal rights to resource access, inequities in the underlying distribution of economic and political power, and the inability of many to fully participate in the process of governance and in self-determination. This section addresses several selected possible solutions to the challenge of expanding access to resources.

Expanding access to land

The livelihoods of between nearly 9 out of 10 rural people[12] depend in whole or in part on agriculture. Consequently, assuring expanded access to land remains the centerpiece of many efforts to improve rural livelihoods. Expanded and more secure land access remains key, in many settings, to making agriculture more productive and capable of generating not only food but a major share of household incomes. As discussed in detail in one of the other Background Papers (Valdés et al., 2008), the relationship of land to poverty is a complicated one. Empirical work has shown that the size of landholding can be positively or negatively related to household income, and in some cases there is no discernible relationship. This is largely due to the presence of many confounding and complementary factors – including labor markets, human capital (education) and infrastructure – that together provide many different mechanisms by which the poor's access to natural resources, including land, can be combined with other assets to improve rural livelihoods. In short, the pathways out of rural poverty are many (World Bank, 2007). Access to land is also important because it is often tied to access to other natural resources, including water, forests and plant genetic resources. Access to land and water resources, a connection that historically was close, has, with the onset of many forces of modernization, has become increasing divorced (Hodgson, 2004).

Further insight into patterns of access of rural people to land is available from the range of countries included in FAO's Rural Income Generating Activities (RIGA) data base, based on World Bank Living Standards Measurement Surveys from numerous countries and other selected household surveys (Zezza, et al., 2007). The distribution of rural households owning land across 14 surveyed countries in four regions is shown in Table 2.8. It is clear that in most of these countries, there are vast numbers of rural households that own no land; landlessness is particularly high in Latin America and Asia, where it accounts for 40 to 60 percent of rural households (Zezza, et al., 2007). Many other rural households access land through renting in or sharecropping. In general, the percentage of rural households owning land *decreases* with household wealth, as more wealthy households often transition out of agriculture.

Turning to specific mechanisms to increase access to land, *state-led land reform programs* have been a common policy for increasing access to land among the poor. The popularity of land reform and land redistribution programs has stemmed from several sources. First, land distribution is highly inequitable in many developing countries, particularly in Latin America and Southern Africa (Quan, 2006). High inequality coincides, in many countries, with high rate of rural poverty, lack of local control and management of resources, and the persistence of inequality over time (IFAD, 2001). Thus, land reform is often an attractive means to directly addressing rural inequality, particularly where those inequalities are severe. Second, as discussed previously, the direct benefits to the poor resulting from improved access to land are compelling. Under the right circumstances, improved access can lead to: higher

[12] According to the World Bank's most recent *World Development Report*, an estimated 86 percent of the rural population depends on agriculture for some proportion of household income.

Table 2.8: Rural Households Owning Land, by expenditure quintiles

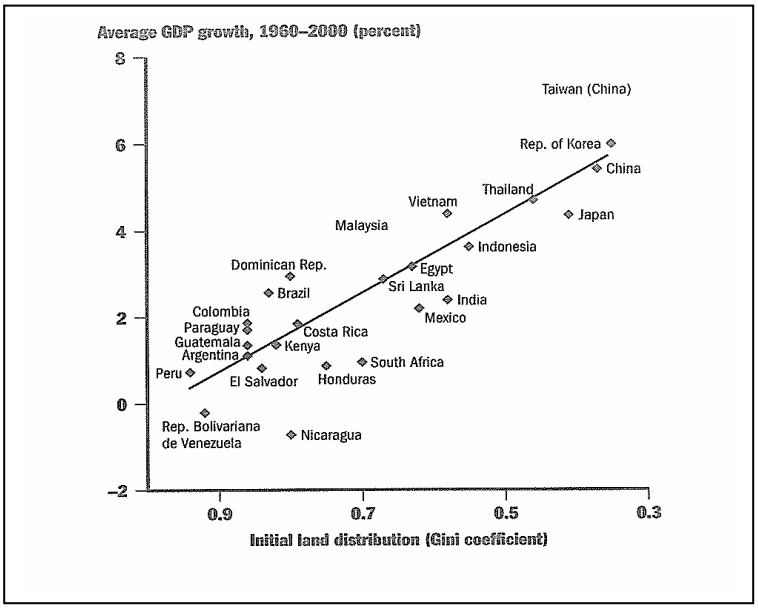
Region/country	Percentage of Land-Owning Households					
	Expenditure quintiles					
	1	2	3	4	5	All
Africa						
Ghana (1998)	11.6	27.1	35.0	34.9	34.2	28.5
Madagascar (1993)	73.5	81.0	75.3	73.3	69.8	74.6
Malawi (2004)	94.7	94.9	93.4	91.7	82.3	91.4
Nigeria (2004)	65.4	70.2	70.2	72.2	73.0	70.2
Asia						
Bangladesh (2000)	32.7	40.7	52.5	55.9	63.6	49.1
Nepal (1996)	75.5	79.4	79.4	78.4	80.5	78.6
Pakistan (2001)	20.4	27.9	35.2	37.9	42.1	32.7
Vietnam (1998)	91.8	93.3	90.8	90.8	84.5	90.2
Eastern Europe						
Albania (2005)	92.0	91.8	94.2	97.0	95.1	93.9
Bulgaria (2001)	34.1	61.7	76.1	78.9	75.4	65.2
Latin America						
Ecuador (1995)	63.7	63.3	56.0	52.2	53.2	57.7
Guatemala (2000)	63.7	63.3	56.0	52.2	53.2	57.7
Nicaragua (2001)	45.8	44.0	45.3	40.1	32.9	41.7
Panama (2003)	68.7	54.1	49.3	45.1	36.5	50.8

Source: Zezza, et al., 2007.

investments and income; greater employment of complementary inputs (labor, in particular); enhanced opportunities for grazing for pastoralists; and more broadly, increased spending on non-farm inputs and products and associated employment and impacts on the local economy. Third, there is broad-based evidence of an inverse relationship between farm size and productivity, implying the land redistribution to smallholders will, in many settings, help improve farm productivity. Fourth, there is strong cross-country evidence of a link between land distribution and economic growth (Deininger, 2003). As shown in Figure 2.3, the more egalitarian the initial land distribution, the more rapid the rate of overall economic growth across a large set of countries between 1960 and 2000. Finally, in instances where countries undergo truly transforming political upheavals and social revolutions, this is sometimes accompanied by a major transfer of economic and political power through state-led land reform.

For all these reasons, state-led land reform and land redistribution programs were common in many countries during the latter half of the 20th century. The list of countries that have instituted state-based land reform program is lengthy, particularly across Latin America and East Asia, as well as selected countries in other regions. A detailed review of the global experience with land reform programs is outside the scope of this paper; this experience has been reviewed extensively elsewhere (de Janvry, et al., 2001; Deininger, 2003; Quan, 2006). The results of these programs in Asia (Japan, Korea, the Phillipines, Taiwan), Africa (Egypt, Kenya, Zimbabwe), and to some extent in Latin America (Bolivia, Brazil, Chile, Peru) have shown that land reforms have significantly improved the livelihoods of millions of rural households (Deininger, 2003). Land reform programs have been particularly successful in the case of the transformation of landlord estates to family farms (Deininger, 2003).

Figure 2.3: Initial land distribution and economic growth.



Source: Deininger, 2003.

Despite their use in numerous countries and some successes (in fewer countries), state-led land reforms have been characterized by many problems (Quan, 2006), including:

- coercive expropriation of land and compensation below market prices leading to landlord opposition and legal contention;
- inefficiency as a result of inclusion of inappropriate lands in reform programs;
- financial difficulties and failures to recover costs;
- slow pace, poor sequencing and ineffective coordination of land transfers;
- high administrative costs, often due to state centralization;
- creation or maintenance of imperfections in land markets; and
- creating disincentives for commercial investment due to contested land ownership.

Latin America has been the region most affected by state-led land reform programs, primarily in the 1960's and 1970's. Notwithstanding their many limitations, these programs resulted in the redistribution of millions of hectares to hundreds of thousands of poor people over the years. The impacts in specific countries included the following (IFAD, 2001, citing various sources):

- Mexico: redistribution of 64 million hectares between 1918 and 1968;
- Ecuador: redistribution of 809,000 hectares to 134,000 families (including newly colonized land) beginning in 1964;
- El Salvador: 80,000 households gained access to expropriated large landholdings since 1980;
- the Dominican Republic: 83,000 hectares redistributed to 32,275 private parcels, and 30,000 hectares to cooperatives since 1961;
- Peru: 8.6 million hectares expropriated and redistributed to 375,000 beneficiaries in 1969-1980 (cooperatives and associations later privatized);

- Chile: 600,000 hectares remained in reform (public) sector in 1986, following 1972 reforms; much land later reverted to original owners or private sector;
- Brazil: 2 million hectares of land redistributed between 1998-2001 (other lands before and after under different types of land reform programs).

Overall, however, the results of Latin American land reforms are widely considered to have been disappointing. These reforms have often led to only limited additional land access by the poor, while inequalities in landholdings have widely persisted; beneficiaries have often not been able to access the best quality land; and following these reforms, land has frequently been consolidated or reconcentrated (IFAD, 2001). The current consensus view of the empirical evidence is that the experience with large-scale, state-led land distribution programs has been mixed; further, that these programs, particularly those involving expropriation of land, are no longer consistent with political realities (Quan, 2006).

As a result of the above limitations and the mixed empirical evidence on the past results of state-led land reforms, so-called market-based or *market-assisted approaches to land reform* (Deininger, 2003) have been increasingly promoted by international agencies such as the World Bank and other development institutions. The main focus of these reforms is typically on improving the efficiency and effectiveness of land markets and transactions in local markets through short and long-term leaseholds, land sales, and other forms of land transfer. These approaches can be large-scale, such as in the case of Brazil, Colombia, Guatemala, South Africa, and India (de Janvry and Sadolet, 2005; Quan, 2006), or smaller-scale, at the community level. Direct involvement of local communities and beneficiaries is typically a key element of this approach, as contrasted with earlier "top-down" state-led land reforms.

Market-assisted land reforms and land transactions have been asserted to possess many benefits (Deininger, et al., 2003; Carter, 2003, Quan, 2006):

- improving the ability of smallholders to pay for land out of own revenues;
- voluntary participation by landlords and self-selection of beneficiaries means less political contention and greater feasibility compared to expropriation measures;
- greater flexibility in choosing an optimal farm size and mix of land and capital;
- decentralized and more transparent operations and less political controversy (compared to state-led land reforms) make transactions quicker, more efficient, and entail lower administrative costs;
- high rate of cost recovery and flexibility of financing arrangements; and
- less potential for corruption.

The criticisms of this approach are also many (Reidegger, et al., 2002; Carter, 2003; Quan, 2006). They include the lack of availability of high quality land to potential beneficiaries at affordable costs, particularly for growing high-value products; basic competitiveness issues often facing small-scale producers in a commercial market setting, particularly their frequent inability to generate adequate revenues to repay land debts and the potential for long-term indebtedness and/or a concentration of land sales among the poor; asymmetries in information, bargaining power and underlying local power structures between smallholders and landlords; and imperfections in local credit markets. The underlying, more fundamental critique of market-based approaches, however, is that they fail to address underlying structural inequalities in land distribution attributable to historical inequities and injustices. With this as background, we briefly review recent experiences with several aspects of market-based approaches to assuring land access.

Under private property rights, *land sales markets* have frequently been a mechanism by which the most efficient producers and those with adequate capital can achieve access to land (de Janvry and Sadoulet, 2005). At first inspection, land sales markets might be thought to hold many potential benefits for the poor: making land available for permanent use by farm households; increasing the incentives for making land-related investments, and thus increasing the long-run productivity of farm land; making land available for use as collateral, which improves farmers' access to formal credit markets and in turn improves incomes and productivity; and encouraging the broader development of financial markets (Deininger, 2003; Quan, 2006).

There is evidence that indeed in some places land sales have led to increased land ownership by small-holders. In Guatemala, a boom in the production of high-value crops led to a transfer of large holdings to smaller holdings (Barham, et al., 1995). In Uganda, sales and rental markets for land are active and have led to more egalitarian land-holdings (Deininger, 2003). In Vietnam, recent evidence suggests that land sales are not concentrated among the poor (a common concern), and that sales of land by less productive producers (not necessarily smaller-sized producers), have had a demonstrable effect in improving overall farm productivity (Deininger and Jin, 2003).

One interesting innovation is the Farm Worker Equity Share (FWES) program instituted in the Western Cape Region in South Africa in the early 1990's[13]. In this program, grants are offered by the Department of Land Affairs which can be pooled together by labor tenants to buy equity shares in the agribusiness in which they were employed (and lived), thus enabling them to become co-owners as well as co-workers. As of 2001, more than 60 of these schemes had been initiated. Initial results have been encouraging (Knight, et al., 2003).

Overall, land sales are constrained by a number of important factors which together reduce its usefulness as a broad-based mechanism for improving land access for the poor. The most of important of these limitations are the basic availability and costs of capital needed by the poor to purchase land. Other constraints include: the overpricing of land (above its productive economic value) due to speculative investments and land's common role as an inflation hedge; high transactions costs associated with land purchases (legal fees, surveying costs, taxes, etc.); and the lack of divisibility of land into small units able to be purchased by the poor (de Janvry and Sadoulet, 2005; Deininger, 2003; Quan, 2006).

In attempting to surmount these and other obstacles, governments have frequently intervened in land markets with policies aimed at influencing land sales and transfers. These interventions have resulted in imposing restrictions and ceilings on land ownership size, fixing prices, forbidding the sale of land (at least for a period of time) gained through previous land reforms, limiting land ownership to non-nationals, and restricting the subdivision of land to discourage fragmentation. Overall, although there is some indication that loose restrictions on maximum farm size may sometimes be effective, the World Bank's 2003 report on land policy concludes that restrictive policies on land markets have been largely ineffective in terms of improving access to land on the part of the poor.

Increasing access to land through well-functioning *land rental markets* can address many of the limitations encountered with land sales markets. Land rental, particularly due to the lower

[13] For further discussion of the Farm Worker Equity Share program, see Case Study A in Section III).

capital requirements it entails compared to land purchase, can create conditions of favorable land access for rural households that are abundant in labor but constrained in capital (Carter, 2003). In addition, land rental markets have other advantages: flexibility in operation and contract terms – holding size, type and length of contract, etc.; low transactions costs; the potential to improve productivity through transferring land among producers; allowing the smoothing of consumption patterns in response to shocks; and as an intermediate step to facilitate the transition to larger landholdings and non-farm economic sectors (Deininger, 2003). Overall, land rental markets have been viewed as capable of overcoming many of the market failures present in labor, credit, supervision and management (de Janvry, et al., 2001).

The experience with land rental markets is diverse, much of it dependent on the institutional environment, and often the colonial legacy, of different countries. In *Sub-Saharan Africa*, numerous West African countries have had active land rental markets. Recent estimates are that the proportion of households renting in or sharecropping land reaches 20 percent in Ghana and 15 percent in Malawi (Zezza, et al., 2007); both are similarly widespread in Sudan (Deininger, 2003). Land rental is pervasive in irrigation schemes in Mali, Niger and Senegal (Platteau, 1995), although these conditions bear little resemblance to the less-favored lands where which most farm households live.

Land transfer and use are governed under diverse customary transactions in many countries, and often provide adequate security of tenure to permit well-functioning rental markets (Quan, 2006). Customary systems also provide the basis for a wide variety of sharecropping arrangements (see below). In East Africa, land rental markets are relatively scarce in Kenya (Platteau, 1995), but are active and have been shown to be allocatively efficient and to have enhanced the land access of the poor in Uganda and Ethiopia (Deininger and Mpuga, 2002; Carter, 2003; Benin, et al., 2005). In Southern Africa, land rental is relatively rare due to the abundance of land resources and the legacy of subsistence producers using land in native reserves (Deininger, 2003). It remains to be seen whether the experience with land restitution programs since 1996 will lead to more active and efficient land rental markets in South Africa.

In *Asia*, renting in land and sharecropping are important mechanisms by which the poor obtain access to land. Cross-country evidence from FAO's RIGA base indicates that renting in land and sharecropping reach 27 percent of households in Bangladesh and 15 percent of households in Pakistan (Zezza, et al., 2007). High land tenancy rates exist in the Phillipines, moderate rates in Indonesia, and low rates in India and Thailand (Deininger, 2003). The restriction of tenancy in India in part accounts for its low rates and has led to inefficiencies and exclusion, although tenancy has continued in practice (Quan, 2006). Land rental has had differential effects in Pakistan, improving land access primarily in less commercialized regions (Carter, 2003). Land rental markets have started to emerge in China (Benjamin, et al., 2000) and Vietnam (Deininger, 2003) in the wake of economic liberalization.

The experience with land rental markets in *Latin America* is also mixed. Participation in land rental markets in general is limited by high net land availability, an historical legacy of restrictions on land rental, weak property rights and lack of effective conflict mediation mechanisms (Deininger, 2003; Quan, 2006). There is little evidence in countries like Mexico and Honduras that land rental market liberalization has led to significantly improved land access for the poor (Carter, 2003). In Nicaragua, more recent evidence suggests the situation may be improving. There are diverse patterns of land rental behaviour, with evidence of small-holders renting from each other in Nicaragua, from large landholders in Honduras, and

mid-sized farmers and poor farmers with adequate access to capital benefiting from land rental markets in Mexico (Carter, 2003).

Despite this evidence, and despite the considerable potential for land rental markets to improve livelihoods of the rural poor, the constraints associated with land rental markets are many. In many countries, rental markets are thin, market imperfections are many, and rental markets tend to facilitate access for those farm households who face relatively few capital restrictions, while addressing the resource needs of the extreme poor to only a varying extent (Ciamarra, 2004). As agriculture becomes more capital-intensive in many developing countries, there are natural incentives and scale economies existing for larger landowners, such as access to credit, that can be expected to make rental markets an increasingly difficult vehicle for the rural poor to escape poverty (Sadoulet, et al., 2001).

Expanding access to water

The challenges of increasing access to resources that are prone to common property and open access problems – including water, forests and fisheries – present many commonalities. In each case, increasing population growth, expanding demands on resources, and resulting increasing scarcity problems create major challenges to increasing access and enhancing the security of access. This is particularly true in customary tenure systems, where rules are typically not formalized through statutory law. In settings where customary systems are weakening, the likelihood of conflict over resource use is even greater. In the case of these common pool resources, central governments (e.g. the state) often retain a great deal of ultimate regulatory authority over the management and use of resources and in allocating the different strands of individual resource access rights. Nonetheless, as described in more detail below, an important trend of the past 20 years has been in the increasing devolution and decentralization of resource management to private individuals and local communities.

Perhaps in no area are the resource access problems more complex than in the case of water resources. To begin, the "bundle of rights" has many strands; the different "sticks" in the bundle are often overlapping and conflictive. In many countries, water is considered a public good, and either customary practice or statutory law may guarantee access to water for drinking, and sometimes for small-scale use in irrigation or commercial purposes; in other cases, water rights may be required for the latter (Matthews, 2003; IWMI, 2007)). Often access to water is tied to access to land; but not always. A mix of public and private rights exists in many settings. In Africa, private water rights are typically confined to wells and water available from small dams. In Asia, as much as 95 percent of groundwater use for irrigation is from private tubewells, and this sustains an active market in groundwater (Dubash, 1998). Poor people widely face problems regarding the extent to which they are protected by statutory water law and the uncertainties regarding their ability to exercise rights to water access (IWMI, 2007).

In this complex institutional environment, it is common for national governments to assert ownership and control rights to water resources – surface water, groundwater, even rainwater – for the benefit of the public as a whole (Hodgson, 2004). Water is, after all, one of the most basic and often scarcest resources. In the past, particularly during the 1960's to early 1980's, the responsibility of the state was often been interpreted as a mandate for direct government intervention through publicly-financed large-scale irrigation systems and controlling the management of these systems, dams and reservoirs, drinking water supplies, and to serve other needs (Bruns and Meinzen-Dick, 2000).

As in the case of land reform, however, the record of highly interventionist state-led water management has been poor. There have been successes, notably in the development of irrigation systems which have often helped the poor successfully address food security and livelihood needs (IWMI, 2007). But state-administered water policy and management has failed to address, and has often worsened, many of the challenges facing the poor in accessing water: the needs of the poor in rainfed areas, basic inequities in water supplies; the needs of local water user groups, and deteriorating environmental conditions that impinge on water availability and access. In response to these problems, many governments are in the process of reconfiguring and devolving state water rights in innovative ways in order to improve access and efficiency in water use.

In assessing how access to water may be expanded, and how the associated obstacles and challenges may be surmounted, it is useful to recall the distinction in identified in Section I between irrigated land and rainfed land. In the case of *irrigated land*, a great deal of public investment has been made in irrigation schemes since the 1960's in order to expand access to irrigation water, increase agricultural productivity and food production. Many irrigation schemes have achieved these goals and had other pro-poor impacts, notably lower food prices. Large-scale irrigation projects have often had other benefits, many of which benefit the poor and help reduce poverty: increasing employment, including among the landless; increasing the demand for non-tradable goods and services (which, in turn, increases labor demand and aids in reducing poverty); and in general, through a high economic multiplier effect stemming from extensive linkages with the agricultural and non-agricultural economies, serving as a catalyst for rural poverty reduction (IWMI, 2007).

Since the 1980's, however, the situation has changed. For a variety of reasons – decreased incentives created by lower food prices (until recent years), the increased role of trade in meeting food needs, and concerns about the environmental and human toll of large irrigation projects – the rate of growth of irrigation has fallen over the last 25 years (IWMI, 2007). Projections are that the rate of growth of irrigated land will be only on the order of 0.6 percent annually between 1997/99 and 2030 compared with 1.6 percent annually during 1960-1990 (FAO, 2003). Yet, as the International Water Management Institute's recent *Comprehensive Assessment* (2007) of global water resources suggests, the need for continued expansion of irrigation remains. Climate change promises to alter patterns of precipitation and local water supplies, increasing the risks faced by farmers and requiring greater degree of management control over scarce water resources. The productivity-enhancing and price-moderating effects of irrigation are no less important now than in the past, particularly if recent increases in global food prices continue and threaten the food security of the poor. And, irrigation has a demonstrated impact in serving as a catalyst for local poverty reduction, for the reasons indicated above.

In the future, expanding access to water in irrigated areas will, argues IWMI's *Comprehensive Assessment*, focus on different directions that in the past. As over the past two decades, a continuing priority will be on devolving responsibility for water management from central governments to private water users and to local institutions. Past successes in this devolution has been reported in an array of countries, including Armenia, Australia, China, Colombia, Malaysia, Mexico, Peru, and Turkey. So-called "third party" mechanisms to expand access can be expected to grow, wherein farmers access irrigation water through public-private partnerships, water user groups, and other organizations. This has occurred in countries as diverse as Chile, China, Iran and Vietnam. As explained in further detail below (this Section,

Challenge 4), the experience of Chile is often held up as a notable story of successful devolution, although the conditions that have obtained there have been unusually conducive to devolution, particularly the fact that the water companies were largely self-financed prior to privatization.

In the future, rather than focusing on constructing large-scale irrigation systems, most central governments can be expected to play primarily allocative and regulatory roles, including establishing frameworks for allocating limited water supplies among competing uses, assuring that externality effects of irrigation (pollution, declining water tables, etc.) are adequately addressed, and helping establish legal frameworks for adjudicating disputes over water (IWMI, 2007). A key role for government remains assuring equitable access rights of the poor to water. Many aspects of irrigation management, including pricing and the recovery of the full costs of irrigation maintenance and distribution systems, can expected to increasingly be in the hands of local user groups and private decision-makers (see further discussion below).

Increasing water access in *rainfed areas* is also critically important to improving rural livelihoods and decreasing poverty. A majority of the world's poor are dependent on rainfed agriculture for growing food, generating incomes, and livelihood security (IWMI, 2007). *It has been estimated that a 1 percent increase in agricultural yields is associated with a 0.6 – 1.2 percent decrease in the number of absolute poor* (Thirtle, et al., 2002). Yet it is precisely in these areas in developing countries where yields have, for various reasons, typically not kept pace with yield growth in irrigated areas or in rainfed areas in industrialized countries. The IWMI *Comprehensive Assessment* is unambiguous on this score: "Yield increase is the key to future food production from rainfed agriculture"(2007, p. 318). It is no coincidence that the region of the world with the poorest record in terms of crop yield increases – Sub-Saharan Africa – is also home to some of the most severe rural poverty (and a region with chronic water scarcity problems).

Among the most important answers to addressing rural poverty in rainfed areas, especially where water is the limited resources, are improving water access, making more effective use of existing water resources, and alleviating water stress in agriculture (IWMI, 2007). Many of the most effective and affordable mechanisms to improve water access at the farm and household level involve small-scale technologies and improved management practices – water harvesting, supplemental irrigation, evaporation management, *in situ* techniques to concentrate rainwater, etc. These are discussed further below in connection with Challenge 3 ("Improving Sustainable Management"). Other measures to increase agricultural productivity that have long proven to be effective include improved infrastructure to get inputs to farmers and outputs to market, use of high-yielding seed varieties and expanded use of other off-farm inputs, reducing market imperfections, and improving soil fertility, all of which have positive impacts that complement those of improved water management.

Expanding access to forests

As with water resources, forests have come under increasing pressure globally due to growing demands for timber and other forest products as well as the livelihood needs of those living in and around forests. As in the case of water management, in most countries, the state plays a major – very often, a dominant – role in forest ownership and managing use. Estimates are that state forest ownership extends to 75 percent – and, in Africa, as much as 95 percent – of forestland, and state authority often extends to the small proportion of forests not strictly owned by the state. In the past, much of access that has been provided to large tracts of forest

land was done through logging concessions. Of 16 sample countries[14] in a comprehensive global review of global forest ownership which together comprise 23 percent of the world's forests, 396 million hectares was allocated to private forest concessions, far more than was allocated to or reserved for local communities and indigenous groups (White and Martin, 2002). In eight of the 16 countries, public forest concessions accounted for more than half of all publicly owned forests.

Given the many problems associated with private forest concessions – deforestation, frequency of illegal logging, the concentration of economic benefits, widespread corruption, and, in particular, the common exclusion of local communities and indigenous groups – there have been increasing trends over the past 20 years toward the decentralization and devolution of forest management to local stakeholders. The goal of this devolution process has been to try to better expand forest access to local people to address problems stemming from both the failures of state management as well as the prevalence of open access problems. Expanding access and forest use has meant increasing the involvement of local communities, the private sector and individual households in forest management (Scherr, et al., 2002; FAO, 2005). Mechanisms to expand access and assure greater security of tenure and use rights have included community and indigenous forest concessions, increasing private forest ownership, and devolution of management from the state to local user groups. These are discussed further below.

The many forms of state authority and devolved rights over forest resources can be illustrated by the case of Africa, where the state is involved, at least nominally, in all levels of forest ownership and use, from exclusive control and not granting any extraction rights (16 percent of forest area), to the granting of user rights and permits to hunt and gather forest products (61 percent of area), to joint forest management with local communities and the granting of community timber concessions (3 percent), private logging concessions (13 percent), community forest use concessions (2 percent), and private use concessions (4 percent) (Romano, 2007).

As shown in Table 2.9, the effects of the trend towards increasing private forest ownership have been widely variable. By 2000, private forest holdings only accounted for an estimated 13 percent of global forested area, although this is up from 11 percent in 1990 (FAO, 2005). In Africa and most of Asia, private forest holdings amount to less than five percent of forest land. Only in parts of Latin America (particularly Central America) and the Pacific Islands is private forest ownership important in the aggregate. There has been a growing allocation of forests to private households in selected countries such as Vietnam and China, significant growth of plantation forestry in the Philippines, and large increases in forests in Uruguay due to successful afforestation efforts (FAO, 2005). Few of these efforts involve smallholders to a significant extent, thus there is little evidence of private rights in forestry having had a significant impact on rural poverty reduction.

[14] The countries are: Bolivia, Canada, Guatemala, Peru, Surinam, Venezuela, Central African Republic, Cameroon, Republic of Congo, Democratic Republic of Congo, Equatorial Guinea, Gabon, Cambodia, Malaysia, Indonesia, and the Philippines. Together these countries account for 895.7 million hectares of forest land (White and Martin, 2002).

Table 2.9: Ownership of Global Forest Area, 2000

Region/ Subregion	Information availability			Private ownership		Public ownership		Other ownership	
	Countries reporting	Forest area (1,000)	% of total forest area	1,000 ha	%	1,000 ha	%	1,000 ha	%
Eastern and Southern Africa	14	203,816	86.7	7,057	.5	193,751	95.1	3,008	1.5
Northern Africa	12	126,452	93.0	2,124	1.7	124,209	98.2	119	0.1
Western and Central Africa	12	222,058	78.0	771	0.4	221,288	99.7	0	0
Total Africa	**38**	**552,326**	**84.3**	**9,951**	**1.8**	**539,248**	**97.6**	**3,127**	**0.6**
East Asia	5	225,663	100.0	18,875	8.4	206,788	91.6	0	0
South and Southeast Asia	17	297,379	100.0	8,835	3.0	285,478	96.0	3,066	1.0
Western and Central Asia	22	43,346	99.6	619	1.4	42,578	98.2	148	0.3
Total Asia	**44**	**566,388**	**100.0**	**28,329**	**5.0**	**534,845**	**94.4**	**3,214**	**0.6**
Total Europe	**39**	**998,071**	**100.0**	**99,631**	**10.0**	**897,059**	**89.9**	**1,380**	**0.1**
Caribbean	9	3,669	64.3	536	14.6	3,061	83.4	72	2.0
Central America	5	16,645	69.8	9,343	56.1	7,073	42.5	230	1.4
North America	4	677,971	100.0	198,645	29.3	452,343	66.7	26,982	4.0
Total North and Central America	**18**	**698,285**	**98.7**	**208,525**	**29.9**	**462,477**	**66.2**	**27,284**	**3.9**
Total Oceania	**11**	**204,933**	**98.5**	**48,575**	**23.7**	**125,527**	**61.3**	**30,831**	**15.0**
Total South America	**7**	**136,240**	**16.0**	**23,528**	**17.3**	**103,379**	**75.9**	**9,333**	**6.9**
World	**157**	**3,156,243**	**79.1**	**418,538**	**13.3**	**2,662,534**	**84.4**	**75,170**	**2.4**

Source: FAO, Global Forest Resource Assessment, 2005.

Expanding access to fisheries

Fisheries, likely more than any other natural resource, suffer from chronic problems of open access. The livelihoods of approximately 200 million people depend on fisheries – an estimated 41.4 million of these are full- and part-time fishers, 20 percent of whom earn less than $1 (U.S.) per day (FAO, 2006; World Bank, 2008). As reviewed above, a large proportion of the world's fisheries are already heavily exploited. It has been recently estimated that 25 percent of the world's marine fish stocks are over-exploited and another 50 percent are fully exploited, while the number of people involved in fishing and fish farming (e.g., aquaculture) has quadrupled since the 1950's (FAO, 2006; World Bank, 2004).

In this environment, the critical issues of access are more ones of trying to assure better *security of access* to marine and inland fisheries, and less one of expanding access to a resource that is already under enormous pressure. A recent World Bank review on the current global fisheries crisis states unequivocally that, "the root cause of this crisis is poor governance" (World Bank, 2004, p. 23). Conflicts over marine and inland fishery resources are endemic, in large part due to its typically open access nature, weak institutions and enforcement. These problems have increased over time with the growing scarcity and higher prices of fish and seafood products and continuing degradation of coastal and inland resources.

As a result of these problems and the growing pressures on fisheries worldwide, there has been growing acceptance of the principle of "rights-based management" of fisheries. Effectively addressing the open- access nature of fisheries, given increasing conditions of scarcity, means in many cases that access has to be limited and some must be excluded.

Rights-based fisheries management can take different forms, but is based on the principles of security of title, exclusivity, permanence and transferability. The number of different allocable rights in fisheries is striking: catch limits, size limits, area fished, season, methods and gear, tenure, aggregation limits, minimum quota holdings, foreign vs. domestic ownership, and transferability (Edwards, 1999). These are discussed further under Challenge 2 ("Increasing security of access"). Although the ultimate goal of introducing these mechanisms in fisheries management is to expand the sustainable access to fisheries, in the short run, this typically means limiting or rationing access to fisheries, whether through regulatory or market-based measures.

Expanding access to crop genetic resources

The crops and varieties that farmers plant in their fields are a key determinant of their well-being, through the production of food for consumption, generating income from sales, as well providing cultural and social benefits. Farmers' choices of which crops and varieties to plant are driven by their access to crop genetic resources. These resources provide the fundamental mechanics of transforming soil, water, and sunlight into agricultural products of value to humans (Day-Rubenstein, et al., 2005). Crop genetic resources are embodied in the seeds farmers use to plant their crops (Smale, 2005). These genetic resources are the genetic coding that expresses itself in the genotypic and phenotypic characteristics of crops – the length of the growing season, drought tolerance, yield potential, etc. Crop varieties are defined by their crop genetic resources and are distributed in the form of seeds. They can be produced via farmer-based selection as well as through formal sector plant breeding and biotechnology programs. They also can be produced via farmer-based reproduction as well as through commercial seed marketing channels. Crop genetic resources are a quasi-public good; one farmer planting a variety does not preclude another from planting the same. However, seeds are private goods – two farmers cannot plant the same seed. This divergence between the two means that the issues of access also differ.

Access to seeds and the crop genetic resources they embody is a function of both the *demand and supply* of varieties and seeds. The seeds that farmers demand depend on the crops and varieties they choose to grow, which in turn are dependent on their specific production and consumption characteristics, as well as their ability to acquire (via exchange or other means) these resources. Farmers essentially demand traits from their crop varieties, such as drought resilience, good cooking value, high yielding, early maturation, etc. Varieties embody several traits but they often involve tradeoffs such as high yields but low resilience. The set of traits demanded by poor farmers has been found to be significantly different than that of wealthier ones in several studies (Smale, 2005; Bellon et al., 2005). Reducing risk, meeting food consumption requirements and a lower prioritization of complementary input costs (compared to wealthier farmers) are factors that are likely to affect the demand of poor farmers for crop genetic resources (Lipper et al., 2005).

The seed supply system determines the set of crop genetic resources that farmers can obtain to meet their demands. The range of crops and varieties on offer from all potentially viable sources, as well as the costs associated with acquisition from any one of those sources, constitutes the supply of crop genetic resources available to farmers. Seed supply sources are generally divided into two main categories: formal and informal sectors. The former includes improved and certified seed varieties produced through national or international systems of plant breeding, seed release and distribution, while the latter refers to local varieties (also known as landraces or farmer's varieties) obtained via saving of their own seeds from

harvested production, exchanges along social networks or through local markets. In the formal seed sector, farmers generally access seed via some form of purchase, although subsidies and transfers via emergency seed relief programs are also a means of access.

In the informal seed sector, in-kind exchanges and gifts as well as cash purchases are all present. Recent evidence indicates that cash purchases in local markets are becoming an increasingly important source of seed in the informal sector, particularly for poor farmers as a source of seed renewal in response to loss of seed associated with disasters (Lipper et al., 2007). In a recent study of pigeon pea seed marketing in Kenya, two major reasons for the frequent uses of local markets as seed sources were identified: 1) to replenish seed stocks depleted through drought, and 2) to source new variety types (Nagarajan et al., forthcoming). In another recent study, village markets were found to provide a source of millet and sorghum seed as a final resource in risky production environments where no alternative sources exist (Smale et al., 2008).

The accessibility that any farmer has to crop genetic resources is thus a function, on one hand, of the crops and varieties that they would like to obtain, and on the other, the resources they have, together with what is available and the costs of seed acquisition through informal and formal seed systems. So how can the access of poor farmers to crop genetic resources be increased? Several dimensions need to be considered. First, access not only to genetic resources but also seeds, is an issue. In the first case, the primary concern is ensuring that the varieties that meet poor farmers needs are being generated – either in the formal or informal sector. For the second, the concern is how well seed distribution networks function. One indicator of seed distribution networks is the range of varieties that are available in relation to farmer demands. Another is the information that is made available about the genetic content; this can be done by labelling, packaging (keeping varieties separate versus mixing) and seed certification, as well as direct observation (seeing plants in the field) and communication among farmers. The cost of obtaining seeds is a third important indicator. This includes the costs associated with plant breeding as well as costs of seed multiplication, certification, transport and marketing. We need to consider both demand- and supply-side approaches, since both affect access. We also need to consider the potential role of both the formal and informal seed sectors.

To improve poor farmers' access to crop genetic resources, an adequate flow of varieties that meet the current demands of these farmers as well as varieties that provide the potential to improve their livelihoods are required. Recent decades have provided important experience in this regard with respect to the Green Revolution, which involved the farmer adoption of improved crop varieties developed and disseminated by plant breeding programs. The approach was successful in some areas, but not others; understanding why the Green Revolution failed in some areas is key to developing a strategy for improving poor farmers' access to crop genetic resources. Lipper and Cooper (2007) note that the focus of the Green Revolution has had three broad characteristics:

- breeding focussed on productivity rather than resilience (even though there has been substantial investment in breeding for resistance to biotic and abiotic stresses);

- focus on varieties with broad-scale adaptation rather than specific adaptation (both to markets and production environments); and

- centralization of decision making by plant breeders rather than farmers.

The focus on varieties adapted for high potential production areas with the heavy use of complementary inputs (irrigation water, fertilizers, pesticides) and broadly adapted varieties means that areas with variable, heterogeneous and marginal production conditions where poor farmers are often found were often left behind. In such areas, the environmental conditions are such that the full benefit of the improved genetic resource is not expressed (known as G x E interactions). These interactions have often resulted in poorer performance of improved varieties over local or farmer varieties (Ceccarelli, et al., 2001). The focus on productivity rather than resilience does not address the demands of many poor farmers who have little means of insuring against crop failures and whose food security is vulnerable to variability in production. Adopting high-yielding but high-risk varieties thus presents inherent problems to poor farmers, whose adoption of improved varieties would be better facilitated by the development and diffusion of varieties that better meet their needs.

Increasing the access of poor farmers to the crop genetic resources they require thus requires better linking of formal plant breeding systems with the traits, varieties and crops that poor farmers demand. Facilitating the flow of a broad range of locally adapted varieties, including both improved and local materials, is also important to improve access in highly heterogeneous production and marketing situations. Increasing interactions between formal and informal seed sectors is one way to support this desirable flow of diversity. Bellon et al. (2005) found that "creolized" varieties of maize, which are crosses between improved and local varieties, meet an important source of demand for low-income farmers in Mexico.

One way better linking farmer demands to plant breeding is the use of participatory plant breeding (PPB) methods that incorporate a broad range of approaches to improving crop varieties, primarily through increased interactions between scientists and farmers, and between the formal and informal seed sectors. While there is much variation in PPB models, this approach prioritizes interactions between scientists and farmers in plant breeding research where the final users have a research role in all major stages of the breeding and selection process (Sperling et al., 2001).

PPB strategies are considered particularly effective in exploiting genotype by environment (GxE) interactions, and in considering traits of importance to farmers. The accessibility to farmers and specificity to local conditions are important strengths in improving farmers' access. Strengthening the formal plant breeding sector by improving capacity to develop locally adapted varieties using conventional as well as biotechnology is another strategy (Lipper and Zilberman, 2005). This strategy essentially involves the development and dissemination of improved varieties as well as improving input markets (AGRA PASS, 2007; World Bank, 2007). Improving plant breeding capacity in both formal and informal sectors is needed to improve poor farmers' access to crop genetic resources; the strategies are complementary rather than substitutes. Much depends on the reproductive nature of the crop (open-pollinated, self-pollinated, hybrids or clones) as well as the final use of the agricultural product (subsistence uses, locally marketed or marketed in highly commercialized value chains). Improving plant breeding capacity also depends on the availability of local knowledge about genetic resources and the capacity of the formal breeding system.

Payoffs to public investments in less-favored areas

One of the chief mechanisms by which public policy can improve the livelihoods of the poor is through increasing public investments in physical infrastructure – roads and bridges, ports,

irrigation systems, public water and sanitation – in public services (public education and public health systems), and in research and development capacity, including in agriculture. As discussed in Section I, a large proportion of the world's rural poor live in less-favored areas in developing countries. These are areas that are often characterized by poor agroecological resources (soils, water availability, steep slopes) and limited access to infrastructure, public services and markets (Pender and Hazell, 2000). In the past, public investments have mostly been directed toward favored areas, both because of their greater population, their higher population density (and thus scale economies in reaching the poor through public investments), and because the returns on those investments – in roads, irrigation systems, agricultural research, etc. – have typically been thought to be higher.

More recent research on the returns to public investments in less-favored areas in India and China is instructive on this score, because it illustrates that the past conventional wisdom may be in error, or at least may have overlooked the significant potential impacts of increasing public investments on agricultural production and poverty reduction in less-favored areas. This research (summarized in Fan and Hazell, 2000) examined the impacts of public investments in research and development (China), high-yielding varieties (India), rural telephone systems (China) and in irrigation, roads, education, and electricity in both countries. District-level data from India (1970-1995) and province-level data from China (1970-1997) were used. Three types of regions were identified in each country: two high-potential areas (in China, the Coastal and Central regions; in India, irrigated and high-potential rainfed areas) and one low-potential area (the Western region of China; low-potential rainfed areas in India).

Empirical results from both countries were similar. In India the highest marginal returns from each type of public investment occurred in one of the two rainfed areas; irrigated areas ranked second or last in each case. In China, all investments had their largest effects on poverty reduction in the low-potential Western region, and most had their greatest marginal effects on production in either the West or the mid-potential Central region. As the authors suggest, the implications of these results may not extend to Sub-Saharan Africa, where much of the investment in high-potential areas has not yet occurred. Yet, these results are important in helping guide future public policies by demonstrating that the less-favored areas where many of the rural poor reside may present significant potential opportunities for poverty-reducing investment in infrastructure and services.

Increasing women's access to land and resources

One of the principal factors limiting access to natural resources by the poor is associated with gender differences. Women play many key roles in many aspects of natural resource management (FAO, 2008b) – they have a central role in agriculture and conserving soil fertility through crop rotation, fallowing, intercropping, mulching and other soil conservation practices; they are most often the principal collectors, users and managers of water in the household, as well as farmers of both irrigated and rainfed lands. They play a central role, and provide much of the household labor, in animal husbandry and marketing. They have a central role in the collection and use of non-timber forest products, including fuelwood, fodder and medicinal products and in the processing and marketing of these and other forest products. In small-scale and artesenal fisheries, women are particularly heavily involved in fish preservation, processing, and marketing, and have an especially key role in aquaculture production.

Increasing research-based evidence also supports the importance of women's roles in rural household livelihood generation and in influencing household patterns of consumption and human capital investment. For example, numerous studies have shown that in households where women control higher levels of assets (including land) at the time of marriage, they spent more on food and children's education, often resulting in higher educational outcomes (Carter, 2003; many studies cited in Deininger, 2003). Since improved nutrition and higher educational attainment are both associated with improved livelihoods and economic development more generally, the implications of increasing womens' access to and control over land seem clear-cut.

Notwithstanding these key roles played by women in managing natural resources, resource access by women and their associated rights to and control over natural resource use are highly constrained in most developing countries. Women's physical access to land and other resources is often available, although this access is frequently derived from and mediated through men via a range of customary arrangements, informal concessions, and established practices. Although women often – though certainly not universally – have legal and constitutional rights to land ownership, the difference in practice can be striking. A 2001 survey of households in Pakistan found that although in 67 percent of the sampled villages women had the right to own land, in practice, their ownership was limited to less than three percent of the plots (Mason and Carlsson, 2004). In Ethiopia, a recent study of women's roles in Southern Tigray and Northern Shoa regions is illustrative of the challenges faced by women in rural areas: female-headed households accounted for 80 percent of malnutrition in the project areas; had a 35 percent probability of being in poverty (versus only 8 percent for male-headed households); were far more likely to be landless; when they did have access to land, sharecropped 70 percent rate of the time; and had poor access to plant resources due to widespread soil erosion, deforestation and overgrazing (FAO, 2006).

Women's ownership and control of land are often constrained at all three levels by which ownership and permanent access can be effected; inheritance of property, land purchases, and transfers from the state (land reform and rettlement programs, etc.) (ICRW, 2005). At the root of these limitations in many societies are entrenched patriarchal systems of control over land and assets, and the pre-eminence of male property rights dominating kinship and inheritance practices (Quan, 2006). In South Asia, for example, women are commonly excluded from both land ownership and from land access through tenancy and leasing. In Sub-Saharan Africa, customary practice often gives women the means to cultivate land, but they are often excluded from land ownership by both formal and informal property rights systems. The impacts of the HIV/AIDS epidemic in further increasing the role of women in agricultural production has raised the stakes for many African countries in terms of facilitating women's access to land. Only in Latin America have women made major advances in formally establishing rights to land, with many countries now statutorily guaranteeing women's property land rights. Even here, though, progress has been slow, with empirical evidence showing only a small share of land owners (11-27 percent in five countries surveyed) to be women (Deere and Leon, 2001).

There are many mechanisms by which women's access to resources can be improved (Quan, 2003). Legal and statutory reforms are often needed to codify women's rights to land ownership and transfer. Where these reforms have already been achieved, improved implementation of constitutional and statutory law to strengthen women's property rights is often required. This includes improving local access to, and reducing transactions costs associated with, land registration and titling systems. Education, training, awareness-raising

and public education efforts are needed to better inform public officials responsible for implementing land law at the local levels. Targeted programs can also be used to enhance women's land rights.

Before turning to issues concerning improving the security of resource access, it is useful to note that expanding access to natural resources entails numerous issues of scale. Two issues in particular deserve mention. First, it is always tempting to want to "scale up" local-level experiences and interventions that have successfully addressed access and poverty goals. One challenge to the potential for scaling-up is, as we have seen, the enormous diversity of agroecological, economic, social and institutional conditions facing the poor in terms of accessing natural resources. Second, although a view of rural poverty alleviation that stresses the empowerment of local men and women may tend to focus on local-level changes in access, rights, and institutions, it must be remembered that it is national-level (and in some cases, international-level) policy changes that, in many cases, have the greatest potential for creating the enabling conditions for enhancing local access. Although national-level policies and institutions have, in the past, often not delivered their promised impacts on behalf of the poor, changes at these levels nonetheless often have the greatest scope for potential effects not only due to their greater geographic level of inclusiveness, but because it is typically at this level that the underlying legal frameworks for increasing rights of access and supportive regulations, policies and institutions must change.

<u>Challenge 2:</u> ***Increasing security of access*** **to natural resources, in the context of changing institutional and market conditions.**

Regardless of the specific type of property right or rules of access in given instances, it is assuring *security of access* that is often the central challenge facing poor rural people. This is particularly the case in the many country settings in which access to resources is governed by customary tenure and use systems, where these systems have not been formalized by statutory law, and where these systems (and the underlying resources to which they apply) are facing immediate threats. Security of access is a particular obstacle in the case of open access resources – water, forests and fisheries – where use and access may be increasingly problematic. There are countless examples of insecure natural resource access and tenure confronting the poor, some of the most important of which are discussed below: the many settings in which customary rights to land are challenged due to growing populations, in-migration and increasing land scarcity; overlapping rights to water, a resource to which access is particularly constrained in many regions; the devolution of forest access rights from central states to local communities and user groups; and the severe problems characterizing marine and inland fisheries, resources facing some of the most immediate threats.

Assuring secure access to natural resources has many positive outcomes; these have been documented widely in the literature and among development practitioners. Among the benefits of secure resource access are the following (Carter, 2003; Deininger, et al., 2003; IFAD, 2007):

- *Inducing higher investments in land.* This is a particularly important result of secure access. Greater tenure security has been estimated to double the investment in land and increase land values between 30 and 80 percent (Feder, 2002). Given the severe constraints on the availability of new agricultural land in most countries (FAO, 2003),

it is primarily through increasing intensification on existing parcels that households can grow more food. Most farmers are reluctant to make long-term investments in land improvement without the security of knowing that they will able to reap the benefits of those investments in the future.

- *Income and productivity benefits*. Through increasing security of access and the increasing investments in land that are thereby induced, agricultural productivity can be improved and incomes increased, thus increasing the likelihood of sustainable livelihood generation. There is widespread evidence across many empirical studies in many countries of the links between secure access and investment, income and productivity effects. Evidence is from many countries including China, Pakistan, Vietnam, Thailand, the Philippines, Ghana, Niger, Malawi, Nicaragua, Brazil, and others (Deininger, 2003).

- *Safety net effects*. As discussed in the previous section, one of the distinguishing characteristics of poor households is their exposure to multiple sources of risk and uncertainty and the vulnerability that consequently results from that exposure. Increasing security of resource access reduces that vulnerability and enables households to better withstand the environmental and economic shocks that inevitably arise.

- *Improving access to credit*. This is important because credit limitations are often the key constraint limiting the investments that farm households make on their land. In such cases, improved credit, most typically through formal land titling, can enable poor households to improve their livelihoods because transferable ownership rights enable that land to more easily serve as a source of collateral.

- *Reducing the likelihood of eviction*, and assuring that owners will not have to spend time and resources defending their claims to land (and other resources).

- *Income distribution benefits* over time, when an improved distribution of resources sets the stage for more equitable income growth in the future.

- Non-economic benefits include the *empowerment of poor rural households* and enhancing their ability to achieve higher incomes and improved food security, once resource access is assured.

The empirical evidence most strongly ties these benefits to private land ownership (de Janvry, et al., 2001). Although this is generally the most permanent and secure form of assuring access[15] (Deininger, 2003), security of access does not necessarily require establishing formal title to land. A wide variety of customary rights and rules also provide the framework for assuring security of access over natural resources under diverse circumstances. These are discussed further below.

[15] As Jacoby and Minten suggest, many of the claimed benefits of *land titling* are in fact attributable to increase *land security*, and the two should not be conflated.

Increasing security of access to land

In terms of increasing security of access to land, whether as part of state-led land reform programs or contemporary market-assisted approaches to increasing access to land, the introduction of *land registration and titling systems* can greatly enhance security of access and strengthened private property rights. Land registration and titling programs have been shown in the empirical literature (Feder and Nishio, 1999; Deininger, 2003) to have widely positive effects in terms of generating such benefits as:

- leading to higher investments in land (Thailand, Vietnam, Costa Rica, Brazil, Honduras, Jamaica, Ghana);
- enabling better access to formal and informal credit (Thailand, Honduras)
- generating higher outputs and incomes (Costa Rica, Brazil, Ecuador, Paraguay, Thailand), and
- leading to higher land values (Thailand, the Philippines, Indonesia, India, Honduras, Brazil, Peru).

However, the evidence is far from universal that the simple introduction of land registration and titling will have these effects. Numerous counter-examples are also available in the literature. The consensus is that formal land titling systems will have their greatest effect where 1) indigenous tenure systems are weak, thus customary systems don't provide a viable alternative; 2) where the return on investment is high, and thus incentives to incur the costs associated with titling exist; and 3) where collateralized lending is common, thus direct incentives exist to title land and thereby achieve access to credit (Jacoby and Minten, 2006). In addition, formal titling systems will be most effective (Feder and Nishio, 1999) when: well-functioning credit markets exist; when there are clear incentives to increase output per unit area; when an enabling regulatory framework exists, particularly realistic and transparent procedures for registration and dispute settlement; where overly strict regulations for land transactions are absent; and where the administration of registration and titling systems minimizes adverse social impacts.

These favorable criteria and conditions have, in the past, been most commonly present in Asia and Latin America. As mentioned above, it is from these regions that most of the empirical evidence on the positive effects of land titling systems comes from. Elsewhere in the developing world, particularly in much of Sub-Saharan Africa where few of these conditions are present in many settings, the formalization of land rights into private property regimes may be ineffective or may even decrease tenure security (Firmin-Sellers and Sellers, 1999). In countries where long-term possession of land by the poor lacks formal recognition – and, as a result may increase uncertainty and lower investment in productivity-enhancing improvements and its collateralization for credit – governments may permit certificates of usufruct to protect and formalize access (Deininger, 2003). This has occurred in Brazil and India. In other cases, especially where indigenous tenure systems are strong, customary systems may provide an alternative approach to assuring greater security of tenure and may be more effective than the imposition of formalized titling systems.

As stated in Section I, customary systems that govern tenure and use of natural resources are commonplace in many developing countries. The customs and traditions have evolved over a lengthy period of time to adapt to the diverse resource base, economic and social conditions and needs extant among indigenous societies (Deininger, 2003). For many years, customary systems were not acknowledged by statutory authorities in many countries and there was

great pressure to convert public lands to privatized tenure systems, very often with mixed results. Over the past 20 years, however, there has been an increasing legal recognition of customary land rights and many attempts to amalgamate these rights within the context of more formal statutory systems. This presents a challenge because the formalization of customary rights by statutory law is not a straightforward process. Customary access to land, often involving reciprocity and traditional exchange relationships, is particularly important in Sub-Saharan Africa, as cross-country evidence from FAO's RIGA data base makes clear (Zezza, et al., 2007). For example, in Ghana, almost 60 percent of landless households nonetheless had access to communal land under customary access. Customary access was also shown to be important in Malawi and Madagascar.

In West Africa, particularly well-documented examples illustrate the tremendous diversity of customary land tenure arrangements and thus the illusory nature of "one size fits all" solutions to assuring land access (Lavigne Delville, et al., 2002). This seven-country case study examines customary arrangements that provide delegated use rights ("derived rights") to land either within family groups or, more commonly, to those outside the family. Particularly in the latter case of access by outsiders, this often involves negotiating complex temporary use rights which vary over different types of ecosystems, crops (annual and perennial), factors of production employed, and institutional contexts, particularly those pertaining to conflict mediation mechanisms.

Table 2.10 summarizes selected examples of different land access mechanisms encountered in these seven countries[16]. Seven different general types of access mechanisms are identified, which vary across many different criteria: the extent of rights granted (type, duration, renewal); the contributions of each party; the division of responsibilities in production; forms of renumeration and how they are paid; whether arrangements are based on convention or contract; use of verbal versus written procedures; the openness of agreements for subsequent renegotiation during its duration; and systems for monitoring and ensuring coordination.

In many countries where customary systems have traditionally been strong, they are being continually weakened. There are many reasons for this: globalization and modernization, population growth, growing pressure on resource availability and use, the growing powers of centralized national governments, and other factors which have encouraged the individualization and privatization of resource ownership and management. For example, in the West African cases cited above, the central governments of Burkina Faso, Senegal, Mali, Ghana have continued to assert their authority over local communities, and customary systems which determine access over natural resources are being weakened (Lavigne Delville, 2006). In other cases, customary systems have not only been maintained but have been strengthened through working with (or co-opting) local and state governmental authority (northern Cameroon, Guinea, Côte d'Ivoire). Three important cross-cutting themes identified in these selected case studies are: 1) the growing pressure on natural resources in these countries stemming from multiple sources; 2) the widespread prevalence of conflict over natural resource access and use; and 3) the prevalence of insecurity of tenure, whether under customary or hybrid-type tenure regimes. The diversity of these tenure regimes is illustrated in Table 2.11 for the same West African countries.

[16] Note that these are *selected* examples of customary systems in these countries; the full scope of diversity of these systems is, of course, much greater.

Table 2.10: Customary Land Tenure Systems in Western Africa

Type of Tenure Arrangement	Country, Arrangement	Access and Use Rights
Open-ended loans	Burkina Faso: *Singuily*	Cultivation rights to bush or fallow land
Fixed-term loans	Côte d'Ivoire	Loans for food production on small plots
	W. Burkina Faso: *dondonly*	Short-term loans, sometimes seasonal, for cereal and cotton production
	Sereer Siin area, Senegal	One-year loans for groundnut production
Land access for fixed fee or rental payment	Côte d'Ivoire (Kjimini-Koffikro area)	Fixed land rental payment over one crop cycle, food crops or pineapple
	W. Burkino Faso: *lallé*	Annual land rental, amount based on quality of land
	S. Benin: *zunda*	Tenant farming contract for 1-5 years; amount based on land quality and extent of forested area.
	Northeast Nigeria: *aari*	Rental contracts, renegotiated annually, irrigated or rainfed lands
Crop share contracts	Ghana: *abusa*	Share contracts for both annuals and perennials; % shares depend on crop, amount of work expended, and extent of equipment provided
	Benin: *lema*	Used for maize-cassava production, esp. in labor-scarce situations; also used in tomato production
	Côte d'Ivoire: *abunu*	Cassava production
	Nigeria: *noma mu raba*	Three-way sharecropping, often on irrigated land: landowner, labor provider, off-farm input provider.
Contracts with asset-sharing	Togo: *dibi-ma-dibi*	Long-term arrangement with food crops and trees; land access paid for first by food, then by share of trees
	Côte d'Ivoire: *troukatalan*	Tenant growing coffee or cocoa first provides labor; later plot split with owner.
Contracts providing land access against provision of labor	Senegal: *navétanant*	Cropping season contract for groundnut production, with labor sharing arrangements
	W. Burkina Faso: *séné dondonly*	Ploughing contract for 2-3 years; cotton, maize production
Pledging – providing credit with land and cultivation rights as collateral	Côte d'Ivoire; *guarantie*	Multi-year contract; landowner loses rights for duration; land use by creditor reimburses principal and interest; many variations
	Benin: *awoba*	Creditor entitled to cultivate and harvest palm; trees controlled by owner, who borrows from creditor.

Source: Adapted from Lavigne Delville, et al., 2002.

Table 2.11: Local Land Regulation Systems in Western Africa

Location	Land Regulatory System
Northern Cameroon	Hierarchical and hegemonic customary regulation; alliances with central and local governments
Gwendegué, Burkina Faso	Customary regulation with little government interference
Old Colonization Zone, Burkina Faso	Transitional (hybrid) system between weakened customary regulation and state regulation; increasing authority of village administrative chief and government administration
Makacoulibantang, Senegal	Eroding customary institutions, decentralized sectoral and government regulation, declining local control over forests
Timbi Madina, Guinea	Hierarchical customary regulation with capture of local government through election of rural community officials
Inner Niger Delta, Mali	Weakened customary regulation, competition with local governments and communes, increasing reliance on courts to resolve resource use conflicts
Bonoua, Côte d'Ivoire	Hybrid regulation based on "re-traditionalization", local associations and government support in formalizing new rules of access
Tamale, Ghana	Unaccountable and corrupt customary regulation, resulting in privatization of common land and resources

Source: Lavigne Delville, 2006.

In this environment of insecurity and conflict characterizing customary tenure systems, what can and will rural people to do improve tenure security? The dimensions of security are several (Deininger, 2003). They include *legal recognition of existing rights and institutions*. Recognizing customary land rights is key to improving tenure security; complications may arise in determining membership in collective groups, and establishing legal rules and mechanisms for conflict resolution. Also important is the establishment of *duration of rights*, which may range from short-term and seasonal rights to permanent ownership rights. The longer the duration of tenure rights, the more likely this is to be conducive to investment in the land, raising productivity and incomes (although this is not sufficient, in and of itself, to assure this). *Identification of property boundaries* is an early and necessary part of the process of gaining security. *Permitting group rights in land* is an important alternative to individualized rights, and may be particularly relevant when the transactions costs to achieving individual rights are high. Group rights require clear delimitation of boundaries (ideally corresponding with ecosystem boundaries), assuring that group members are better off than without rights, and allocating benefits proportional to effort of time and money. *Enforcement mechanisms* are a particular challenge in customary systems and one of the primary advantages of formal statutory systems where the enforcement authority of the state may be called upon. However, as a practical matter that enforcement ability is often absent, so customary tradition may provide an alternative. Another challenge in customary systems is *permitting change over time in property rights* as circumstances change. This can represent a significant obstacle to assuring security of tenure rights in customary systems.

To improve security of tenure, the evidence suggests that there are many types of investments that rural households make in customary tenure settings. These include clearing of land to demonstrate the intent to use it (and actual use); the marking of boundaries to delimit the extent of the holding; cultivation of crops; planting trees, often one of the most common mechanisms to be rewarded with tenure security; and building houses and sheds (Deininger, et al. 2003; Platteau, 2000; Otsuka and Place, 2001). As mentioned previously, there is a great deal of evidence of improved tenure security leading to productivity-enhancing investments in land and greater use of credit to surmount capital constraints.

Yet, there is a substantial gap between recognition of customary rights, the ability of land users to register those rights, and the actual implementation of these systems. Table 2.12 shows how far there is to go in actually implementing these changes in Africa. Of the 17 countries which, by 2002, either recognized customary tenure or permitted registry of these rights (individual or group), in only a small handful of cases was there significant implementation of these systems. Thus there is scanty empirical evidence of the success of these cases and their further impacts on key outcomes of interest such as investment in land, productivity impacts and income generated, and the security of land transfers.

Table 2.12: Status of Customary Tenure in New Land Laws, Selected African countries

Country	Recognition of customary tenure	Customary rights registrable interests	Commons registrable by group	Implementation
Burkina Faso	Permissive	No	No	n.a.
Côte d'Ívoire	Partial	Yes	No	n.a.
Eritrea	No	No	No	None
Ethiopia	No	No	Yes	None
Ghana	Yes	Yes	Yes	None
Kenya	Permissive	No	No	n.a.
Lesotho	Yes	Yes	Yes	None
Malawi	Yes	No	Yes	None
Mali	Yes	Yes	No	n.a.
Mozambique	Yes	Yes	Yes	Under way
Namibia	Yes	Yes	No	None
Niger	Yes	Yes	No	n.a.
Rwanda	No	No	No	None
South Africa	Yes	Yes	Yes	None
Swaziland	Yes	Yes	Yes	None
Tanzania	Yes	Yes	Yes	None
Uganda	Yes	Yes	Yes	Minor
Zambia	Yes	No	No	Under way
Zanzibar	No	No	Indirectly only	Pilots
Zimbabwe	Yes	Yes	Yes	None

Source: Alden-Wiley, 2002, cited in Deininger, 2003.

Increasing security of access to water

As discussed previously, the allocation of water resources is typically governed by cross-cutting statutory and customary tenure arrangements in most developing countries, and the allocation of water resources to individuals is typically subject to use rights, rather than permanent ownership rights. Unlike the case of irrigated land and other agricultural land, private rights to secure access to water, forests and fisheries are highly limited in most developing countries. Rights to water often hinge on the particular constellation of allocation mechanisms applicable in given instances. Table 2.13 shows one framework for these mechanisms, in which the alternatives for water allocation are user group management,

agency allocation, and water markets. Water rights are often overlapping and changing over time; the key policy challenge is often to determine the optimal mix, in any particular setting, of private, customary and state-based rights (Bruns and Meinzen-Dick, 2000).

Table 2.13: Types of water allocation institutions

	User group management	Agency allocation	Water markets
Key characteristics	Collective decision-making among water users, for example, an irrigators' association	Bureaucratic agency controls directly	Trading among users, temporary or permanent transfers
Advantages	Legitimacy based on custom Local knowledge and experience Adaptable	Standard procedures Technical expertise River basin perspective	Voluntary Prices reveal opportunity costs for users, create incentives to conserve
Disadvantages	More difficult if users do not know each other and lack existing relationships	Information intensive Difficult to customize to particular conditions	Risk of neglecting impacts on third parties If transactions rare or complex, then hard to establish prices

Source: Bruns and Meinzen-Dick, 2000

Customary rights involved in access to water are particularly complex in that water is a changing, shifting, dynamic resource that, even in a given watershed or irrigation area, may be subject to various types of public, private and group rights regimes. Customary rights of water user groups may originate with community norms, religious values, and historic practices which often conflict with state-sanctioned water rights or privatized rights to water use (Bruns and Meinzen-Dick, 2000). In the case of irrigation user groups, the irrigation infrastructure itself often becomes a cohesive force in water management and allocation (Dinar, et al.) Customary and user-group rights have certain advantages – their flexibility in adapting to local conditions, their incorporation of local knowledge and experience, their legitimacy to and acceptability by local people – but they also possess disadvantages: high transactions costs, difficulty in functioning when user groups don't know each other, and their ability to adjust to major external changes and demands on water resources (Dinar, et al.; Bruns and Meinzen-Dick, 2000).

A particularly well-documented example of traditional water management is from Bali, Indonesia, where a system of community organizations (*Subaks*) control a complicated traditional irrigation system of distributing water from lakes, rivers and other sources to rice fields (*sawahs*)[17]. Irrigation water is distributed equitably across all *Subak* members, based on the principle of *ayahan*, wherein Subak members use available water in exchange for contributing to communal work efforts. All land users in a given rice-producing area have representation in the *Subaks*, which manage the irrigation system to provide fair and reliable water availability to members. *Subaks* are also responsible for the construction and maintenance of irrigation infrastructure, including canals, aqueducts and dams. The Subak system has been in existence for an estimated 1,000 years.

In many other customary systems, the institutional setting represents more of a hybrid of customary and statutory frameworks. Table 2.14 illustrates the complex, overlapping nature of water rights in one example, the Kirindi Oya water system in Sri Lanka, an irrigated region where water is used for widely diverse uses: domestic use, crop and livestock production, household gardens, and fishing. The system of water rights is further complicated by the presence of two types of irrigation systems, an "old system" several hundred years old, and a

[17] This example and discussion are drawn from Suarja and Thijssen (2003).

"new" system in which water availability is less reliable (Bakker, et al., 1999, and Renwick, 2001, cited in IWMI, 2007). As the table illustrates, rights to water and water use management in Kirindi Oya is extremely complex and the sources of conflict over water use are many.

Table 2.14: Multiple Water Users, Claims and Institutions, Kirindi Oya, Sri Lanka.

Type of Water Use	Users	Basis of Claim	Supporting Institutions
Field irrigation	Old area farmers	Customary use Recognized by gov't	Project Management Committee Farmer organizations
	New area farmers	Government allocation	Project Management Committee Farmer organizations
Garden irrigation	Mostly women	Well ownership Proximity	Well ownership Local norms
Livestock	Pastoralists	Historic use Not recognized by project	Cattle-owning farmer organization Divisional secretary
	Farm households	Needed for livestock	Local norms
Fishing	Mostly male farmers, part-time	Use over time Membership in fisher membership societies	Fisher Cooperative Societies (not in Project Management Committee)
Domestic	Old area households	Customary, necessary use Special allocations from reservoir	Project Management Committee reserves water for special water releases in dry season
	New area households	Reservoir allocations for water system Membership in standpipe committee Payment of fees.	National Water Supply and Drainage Board (not in Project Management Committee) Standpipe committees Local norms
Environmental	Wildlife		Department of Wildlife Conservation (not in Project Management Committee)

Source: Bakker, et al., 1999, and Renwick, 2001, adapted by International Water Management Institute, 2007, p. 214.

As with land, an important trend in assuring secure access to water is the growing legitimization of customary water rights. Codification of customary water rights has been implemented in many countries, including Ghana, Argentina, Nigeria, Guyana, Namibia, South Africa, and Indonesia (Burchi, 2005). In Guyana, incorporation of customary water rights in statutory law was accomplished in 2002, but the specific criteria to establish customary use ("ancient, certain, reasonable, continuous") were left undefined. Indonesia's new Water Resources Law (2004) statutorily recognizes "local, traditional communal rights" to water, but only as long as this recognition does not conflict with national interests and legislation. In Ghana (1996) and Argentina (2001), those asserting customary water rights were given one year to assert their claims, clearly placing the onus on rights-holders (and unavoidably differentially affecting those who might stake claims).

In reviewing these countries' experiences, Burchi (2005) notes several commonalities: 1) a high degree of interaction of customary rights with state-based statutory rights; 2) a low level of information and awareness of the legal and institutional requirements and high transactions costs on the part of local users, both of which interfere with attempts to legitimize customary rights; and 3) a trend toward the "decoupling" of water and land rights as customary rights

become more formalized and codified. The result is a high level of risk for those who have heretofore had customary rights to water use, especially those, including many of the rural poor, who are lacking access to information or the resources to register their claims. Water resources, like fisheries, have been the subject of a variety of innovative management and pricing approaches in attempting to simultaneously improve the security of, and regulate, access; this is discussed further below (Challenge 4 – "Use of Market-oriented Approaches").

Increasing security of access to forests

As mentioned previously, the dominant share of the world's forests are in public ownership, meaning that the state has a central role (at least nominally) in providing secure access forest resource. A relatively small proportion of forests (7 to 11 percent, depending on the definition) is under community ownership or management (Table 2.15). As with water resources, customary user rights to forests are complex, reflecting the wide diversity of forest resources. Different strands of forest access and use rights can pertain to the rights to harvest wood products, non-timber forest products, the right to gather dead wood, and the right to hunt wildlife (Romano, 2007). Customary forest tenure systems are well-established in much of Sub-Saharan African and Asia, although, like farmland and water resources, they have also widely been the subject of increasing pressure and conflict.

Table 2.15: Estimated distribution of forest ownership

	Expressed in percent of total			
	PUBLIC		**PRIVATE**	
Categories	**Administered by Government**	**Reserved for Community & Indigenous Groups**	**Community/ Indigenous**	**Individual/ Firm**
Global Forests	77	4	7	12
Developing Countries	71	8	14	7
Developed Countries	81	1	2	16
Countries with Tropical Forests	71	6	13	10
Top 17 Megadiverse Countries	65	6	12	17
Top 5 Roundwood Producers	80	7	6	7

Source: White and Martin, 2002.

Beginning in the late 1970's, and particularly since the late 1980's, there has been an increasing trend toward the strengthening of customary rights to forestland on the part of local communities and indigenous groups. One recent estimate is that roughly 380 million hectares of forest land is now under the ownership, management, or is reserved for community and indigenous groups in just 24 selected countries (White and Martin, 2002). (This estimate includes many of the countries with the largest extent of forested area, as well as the industrialized countries of Australia and the U.S.). The majority of this area has been transferred to new ownership or management status since the late 1980's. Most of this land is in Latin America.

Many countries are in the process of trying to reform and strengthen customary practice in forestry law and management. Table 2.16 lists reforms in some selected countries and illustrates the diversity of institutional and policy frameworks. As in the case of agricultural land, there is a great diversity of local arrangements, in many cases with "hybrid" arrangements reflecting a combination of public, community and private rights, typically the

outcome of complex negotiations processes. Overall, the types of forestry reforms are primarily three-fold: the recognition of customary rights and the reform of legal frameworks; the devolution of the management forest lands to community groups; and the reform of public logging concessions to enhance local community access (White and Martin, 2002; Burchi, 2005).

Table 2.16: Recent legal reforms strengthening community forest tenure in selected countries

Country	Year Enacted	Key Feature Legal Reform
Bolivia	1996	Ancestral rights of community groups have precedence over forest concessions holders where these rights overlap. Subsequent laws have strengthened community rights.
Brazil	1988	The Constitution recognizes ancestral rights over land areas indigenous groups and former slave communities traditionally occupied. Federal government is responsible for demarcating indigenous reserves on public lands and ensuring land rights of indigenous groups are protected.
Colombia	1991	Constitution of 1991 recognizes and outlines a framework for collective territorial rights for indigenous groups and Afro-Colombian traditional communities.
Indonesia	2000	New regulatory process recently established by which customary ownership can be recognized.
Mozambique	1997	Titles for customary rights are available.
Philippines	1997	Constitution of 1987 protects ancestral domain rights. Indigenous Peoples Rights Act of 1997 provides legal recognition of ancestral domain rights pursuant to indigenous concepts of ownership.
Tanzania	1999	Customary tenure is given statutory protection whether registered or not. Titles for customary rights are available.
Uganda	2000	2000 draft currently under revision. Government is embarking upon an ambitious program of devolution to district and local councils.
Zambia	1995	Recognizes customary tenure but with strong encouragement to convert to leaseholds and titles for customary rights are not available.

Source: White and Martin, 2002.

There is a great diversity of country experiences. One of the most successful examples is the case of Bolivia, where major reforms of the forestry sector resulted from passage of Forestry Law 1700 in 1996[18]. This entailed legal and institutional changes across all three types of arrangements mentioned above (and other areas) – improving forest access to community and indigenous groups, increasing transparency, and increasing local participation in forest management and decision-making. In less than a decade, seven million hectares have come under sustainable forest management plans; over 23 million hectares and at least 14 indigenous enterprise groups have access to 1.4 million hectares of forests; over 800,000 hectares of forests had been certified by 2001 (Contreras-Hermosilla and Vargas Rios, 2002). In Tanzania and the Gambia, village forest reserves have been increasingly titled to local groups through processes that have emphasized phased implementation, management plans, incentives for local participation, and training in management, marketing, evaluation, and technical and financial management (Romano, 2007).

However it is accomplished, increasing forest tenure security is clearly a centrepiece in the effective devolution of state forest management to local forest users, and to the effective involvement of private users and community groups in managing forest resources. Romano (2007) suggests several underlying principles for achieving greater security of forest tenure: 1) encouraging diversification of tenure systems, particularly where the state has weak management capacity; 2) clarifying tenure rights (ambiguity breeds conflict), 3) enhancing

[18] For further discussion, see the Bolivian forestry case study in Section III.

forest users' administrative, technical and management capabilities, and 4) allowing adequate time for testing and monitoring new tenure and management processes and for allowing local ownership and responsibility to flourish.

Increasing security of access to fisheries

As reviewed previously, fishery resources are facing significant threats around the word. In no other area has the institutional and policy environment adapted more in recent years in an attempt to deal with these threats. National regulatory frameworks are highly heterogeneous and have changed over time as fisheries have become more highly exploited and more valuable (Shotton, 1999). As for other resources, numerous efforts have been made to formalize customary systems of fisheries management although, due to the nature of this resource, this presents many obstacles.

One notable example of the formalization of customary practices in fisheries management is the experience with locally managed marine areas (LMMA's) in Southeast Asia and the Pacific Islands – Fiji, Indonesia, Papua New Guinea, Samoa, Solomon Islands, the Philippines, Palau, and Pohnpei[19]. For instance, in Fiji, local communities work with the Native Fisheries Commission to sustainably manage traditional fishing grounds (including the imposition of restrictions on fisheries) where communities have long owned customary fishing rights (*qoliqolis*), but to which title is now formally held by the government (WRI, 2007). Fiji now has roughly 60 locally managed marine areas including 125 communities, covering 20 percent of the country's inshore fishery. In Samoa, 51 of the island's 230 coastal villages have LMMA's (see Section III, Case Study D).

While a detailed review of the institutional framework for fisheries is beyond the scope of this paper, it is important to note that in addressing fishery access and allocation problems, a variety of specific access and rights systems in fisheries have evolved (World Bank, 2004; FAO, 2007a), including:

- Allocation of community quotas
- Licensing fishers or vessels
- Individual transferable quotas or ITQs, (sometimes non-transferable), defined either in terms of inputs (gear and vessel restrictions) or outputs, typically determined as a proportion of total allowable catch (TAC)
- Territorial user fishing rights (TURFs or "zoning")
- Individual effort quotas (IEQs)
- Limiting fishing zones ("zoning"), often along with related restrictions.
- Taxes and royalties

The pro's and con's of ITQs, in particular, have been widely debated. In principle, their benefits are substantial – principally, the creation of secure property rights and of incentives to manage fisheries sustainably and not overfish, given that overfishing will decrease quota values. Indeed, in the industrialized countries that have used this approach (Australia, New Zealand, Iceland, Canada and the United States) there is considerable evidence that they have reduced overfishing and increased fishing industry efficiency (World Resources Institute, 2006).

[19] The example of Village Fisheries Management plans in Samoa is discussed in further detail in Case Study D, Section III.

However, the use of ITQs and other new institutional mechanisms in developing countries is fraught with challenges. These include: possessing the ongoing technical knowledge and institutional capacity to determine total allowable catch (TAC) and optimal ITQ's; determining the initial allocation of quotas; the high costs of monitoring, administration and enforcement; and conflicts within the industry between large-scale and small-scale fishers (as well as those between industrialized countries and developing countries). As a result, the experience with ITQs among developing countries is very limited (World Bank, 2004) – Chile (Patagonian tooth fish) and Namibia (hake in inland fisheries).

Security of resource access in conflict and post-conflict situations

Access to natural resources has long been at the heart of conflicts at local, national and international levels. In most cases, resource-related conflicts are part and parcel of the normal circumstances encountered by the poor in everyday life – dealing with conditions of resource scarcity due to high population growth and growing intensification of input use, the in-migration of new populations demanding access to resources, the increasing degradation of soils, forest, water and fishery resources, etc. Expanding access to natural resources by the poor (or any group) will, in an environment of increasing scarcity, almost inevitably lead to a growing opposition of interests,

In some cases, however, opposing interests in resources erupt into high-profile conflicts, even warfare. Sometimes it is unrelated events that precipitate conflicts into which clashes over resource use are drawn; in other cases, it is access to the resource itself that lies at the center of the conflict. The most severe of these conflicts can result in civil wars and other armed conflicts. Recent examples include diamond production and trading in Sierra Leone and other African countries, opium production in Afganistan, oil exploitation in Angola and Nigeria, and coca production and refining in Peru and Colombia. Just in 2001, an estimated 50 armed conflicts connected in some fashion with the exploitation of natural resources occurred (Bannon and Collier, 2003). In these and other cases, many of the rural poor are ultimately negatively affected by the resulting conflicts, often to the point of death.

Even without these major armed conflicts, "everyday" conflicts over resource use can be expected to become more severe in the future with current and emerging developments (Kennedy, 1998). Ongoing environmental degradation is widely making key resources on which the poor depend – soils, fuelwood, water for humans and animals – scarcer and reducing their quality. Climate change is expected to result in shifting patterns of natural resource availability, especially for water, soils and productive agroecosystems. For example, increasing water scarcity and drought in West African nations induced by climate change is expected to result in major dislocation and out-migration of many indigenous peoples (Castle, 2008). Higher energy demands and related commodity prices, as discussed above, can be expected to put further pressure on resource use in many regions.

The interrelations of poverty, conflict and natural resources are complicated ones but some broad principles stand out. Poverty engenders conflict for several reasons (World Bank, 2005): poverty and inequality imply large numbers of poor and disaffected people (particularly young men who can be mobilized for armed conflict); many poor countries have weak and undemocratic institutional governance structures which are not good at avoiding or resolving the conditions that precipitate conflict; finally, group-based inequalities – often centered on tribal, ethnic or regional affiliations – may be highly sensitive to politicization

and mobilization. In the case of natural resource-based economies, there are further dimensions that may spawn conflict (Ross, 2003). Paradoxically, resource-dependent economies tend to grow more slowly than resource-poor economies; in economies in which GDP actually falls – perhaps due to global commodity prices which are notoriously unstable – civil wars are more likely to result. Natural resource-dependent economies also have a tendency to under-invest in education and health care, two of the key "building blocks" of sustainable long-term growth. When economic circumstances turn bad – as is more likely in economies dependent on commodities with unstable prices – without these building blocks in place, societies are more susceptible to political instability and violent change; indeed, people may demand change. Governments in natural resource-dependent economies also tend to be weaker, less accountable, and more corrupt than governments of countries that are not so heavily dependent on natural resources.

The lessons emerging from experience on natural resource-related conflicts and how to avoid and deal with them are often summarized at two different levels. The first is at the local or community level at which development projects and local community initiatives usually occur. The second is at the macro or national level, which is appropriate given that it is at this level that key legal and political decisions having to do with natural resource governance – particularly as major conflicts may be involved – typically occur. We briefly review some of the key "lessons learned" from previous research at both levels.

In the first case, a useful synthesis of lessons learned in conflict management is contained in IDRC's 1999 *Cultivating Peace* volume which examines local conflicts over natural resources in a broad set of developing countries. The authors conclude that broad guidelines that assist in dealing with natural resource conflicts are "unlikely to emerge", and that "conflict resolution and local management of natural resources rely on locally specific solutions" (Tyler, 1999). Nonetheless, some of the general principles that can help avoid or manage conflict and improve governance of natural resources at the local level include:

- *transparency of information*, and the importance of collecting, validating, analyzing, and sharing information, all of which are "essential to building and maintaining the trust needed to identify mutual interests and develop consensus-based decision-making";

- *innovations in administrative management*, including the devolution of authority from central to local governments, innovations in local governance structures, and pursuing new state-local co-management strategies;

- *recognizing the legitimacy of the claims of multiple stakeholders* – especially rights to open access resources that may have many strands;

- adopting *new roles for government officials*, for example in helping facilitate, lead, and support community resource management efforts; and

- using *independent mediators* in helping to facilitate reaching solutions to conflicts in natural resource management.

Table 2.17 summarizes the recommended institutional and policy framework that emerges from these principles. The suggested elements may clearly assume very different forms in different circumstances.

Table 2.17: Elements of a policy framework for managing natural resource conflict

Element of framework	Objectives
Administrative coordination	Close linking of sectoral and local planning and administration to reduce potential for conflict. Involve other agencies, NGO's, specialists, and other groups as necessary.
Information-sharing and communications	Increase transparency, build trust, resolve issues of fact, help engage diverse stakeholders.
Stakeholder identification and analysis	Recognize the legitimate interests of various stakeholders and identify their interests as a basis for subsequent dialogue.
Engage legitimate intermediary	Outside mediators, without self-interests in the potential outcomes, can serve a key role in conflict management
Dispute resolution process	Process of conflict resolution cannot be generalized; key principles include transparency, information-sharing, and building trust. Build on customary processes and structures for conflict resolution where possible.
Strengthen local governments	Many local governments are not well-equipped to mediate local resource conflicts. Increased legitimacy, strengthened skills and expertise, clarified roles and mandates, and increased ability to enforce consensus-based solutions can all help increase local governments' capacity.
External support	External support can assist in information collection, validation and sharing; skills development; mediation; providing services, investment and monitoring capability; and in helping legitimize outcomes.
Research	Transparency and sharing of information can be facilitated by problem-appropriate research, such as in collection and sharing data, adapting tools for coordination, identifying and analyzing stakeholder interests, experimenting with various procedural innovations, etc.
Time	All the above steps require time; there are no shortcuts.

Source: Tyler, 1999.

An example of the application of the above principles is the legal and political process by which the legal regime governing the Ecuador's Galapagos Islands was reformulated in 1998. The revised law had the primary goal of creating a marine reserve to protect key fishery and biodiversity resources. The policy process that led to the law's passage focused on principles of improving sustainable management of resources, incorporating principles of increased devolution of governance and greater local decision-making power over resource control, and effective participation of fishery cooperatives that had been threatened by conservation-based restrictions (Oviedo, 1999). While there has continued to be conflict in the Galapagos, especially centering on access to fisheries, the process that led to the law's formulation conformed to many of the above principles.

Conflicts over natural resources can also be addressed by national-level mechanisms that address the underlying economic and institutional roots that lead to conflict. In a recent review of policy alternatives that address the linkage between natural resources, conflict and violence, the World Bank identifies several of these key mechanisms (Bannon and Collier, 2003):

- *increasing economic growth* through domestic policies, international assistance, increasing access to global markets, and other means (doubling per capita income has been estimated to cut in half the risk of civil war);

- *increasing diversification away from natural resources*, through economic growth, aid (especially devoted towards improving infrastructure), and changing policies;

- *decreasing exposure to price shocks*, thus addressing the volatility that can threaten economic and political stability; and

- *increasing transparency of natural resource revenue streams*, through improved private and public sector reporting requirements that increase accountability.

In addition, a number of recommendations address the need to reign in illicit activity that can either provoke conflict or finance it; these include: shutting rebel organizations out of commodity markets, such as through the Kimberley Certification Process Scheme for diamonds; imposing stricter rules and regulations that affect the financing of natural resource extraction and associated illegal activities such as extortion and kidnapping; tightening scrutiny on illicit payments made to public officials, such as that which has already been accomplished through the private banking sector; and efforts to attract legitimate companies to risky environments, such as the Chad-Cameroon pipeline model in which international financial organizations certify a governance structure as acceptable and thus provide "reputational cover" for international businesses to become involved (Bannon and Collier, 2003).

Another mechanism to address resource-related conflict is through international agreements that govern access to or management of natural resources. The number of international treaties and agreements that address natural resources has increased over time; some of the major ones include:

- *Montreal Protocol* (1987, effective 1989), phasing out production of a number of halogenated hydrocarbons that deplete the ozone layer;

- *Convention on Biological Diversity* (1992, effective 1993), whose objective is to encourage strategies and mechanisms for the conservation and sustainable use of ecosystems, species and genetic resources;

- *Kyoto Protocol* (agreed-upon in 1997, effective 2005) to the *United Nations Framework Convention on Climate Change* (1992), which requires reductions of greenhouse gas emissions in industrialized countries and specifies monitoring and reporting requirements in developing countries;

- *International Treaty on Plant Genetic Resources for Food and Agriculture* (2001, effective 2004), which addresses the conservation and use of plant genetic resources and provides for fair and equitable sharing of benefits derived from their use;

- *Cartagena Protocol on Biosafety* (2003), the objective of which is to ensure an adequate level of protection in the safe transfer, handling and use of living modified organisms resulting from biotechnology; and

- several voluntary international agreements under the auspices of the Food and Agricultural Organization of the United Nations that lay out regulations for the conservation and management of fisheries; these include the *Code of Conduct for*

Responsible Fisheries (1995), the *International Plan of Action* (2001) on fishing, and the *FAO Compliance Agreement* (2003).

While a detailed discussion of these agreements is outside the scope of this paper, it should be noted that these agreements have in common the attempt to establish voluntary or mandatory international guidelines and regulations to limit the degradation of natural resources. In some cases, the objective is to maintain the quantity or quality of resources that are international public goods (ozone levels, climate, plant genetic diversity) and in which inadequate incentives to avoid degradation exist. In other cases, such as international fisheries, the objective is to reduce the severity of cross-border (and within-country) externalities that result in resource degradation. In all cases, though, the intent of the agreements is to reduce existing and potential conflict by establishing an agreed-upon set of rules and guidelines. The need for these agreements stems from increasing demands for the underlying resources and the growing threats to their sustainable management. Increasingly, the governance of these (and other) natural resources must be accomplished at least partially within international frameworks as cross-border externalities increase in frequency and severity.

A paradox of these agreements relevant to the subject of access is that these treaties and agreements help establish frameworks for improved sustainability of resource use, but one of the principal means to accomplish that goal is to limit resource access. Thus these agreements can create "winners" and "losers". For example, the Kyoto protocol only requires emissions reductions on the part of 36 industrialized countries, while developing countries are exempted. In this case, poor countries are in an advantageous position[20]. On the other hand, international fisheries agreements and the growing acceptance of "rights-based" governance of fisheries give an advantage to those countries which have the scientific and technical capacity to establish total allowable catch and other technical standards. Thus it is difficult to generalize regarding the overall impact of agreements on developing countries, much less the impacts on groups within those countries.

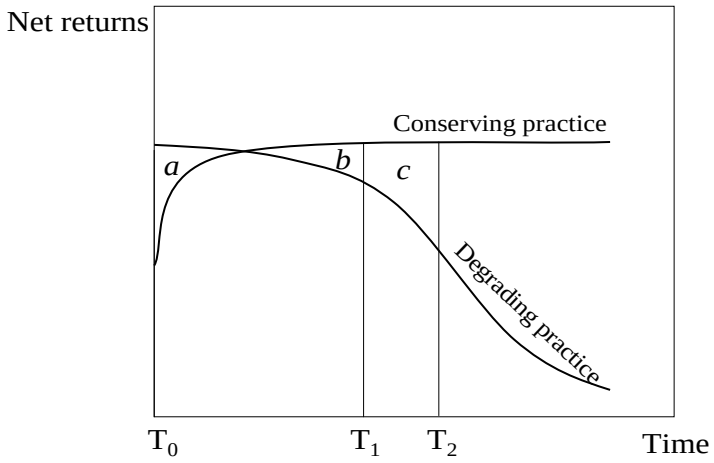
<u>Challenge 3:</u> *Improving sustainable management of natural resources*, including improved resource quality.

Addressing the sustainable management of natural resources is critical to the needs of the poor for several reasons. As discussed in Section I, the rural poor are disproportionately dependent on natural resources; thus sustaining their livelihoods depends on the continued availability and sustainable management of those resources. Moreover, as we have seen, these resources – farm land, water, forests, fisheries, and crop genetic diversity – are under increasing pressure from many sources, widely threatening their potential future availability and use. Sustainable development is, after all, concerned with "meet[ing] the needs of the present without compromising the ability of future generations to meet their own needs" (WCED, 1987), thus the conflicts and tradeoffs between meeting current versus future human needs constitute the central sustainability challenge. Since most of the continuing and emerging threats to sustainability are themselves human-induced – population growth, global climate change, agricultural intensification, deforestation, fisheries depletion, and the narrowing of the crop genetic base – then the main practical challenge for policy and management is how to alter current human behavioral patterns in such a way as to make it more likely that the path of sustainable resource use will be achieved.

[20] Of course, most developing countries have past emissions levels which are far lower on a per-capita basis than industrialized countries.

The relationships among the goals of improved livelihood, rural poverty reduction, sustainable resource management, and achieving food security are many-sided and complicated (see further discussion below). Addressing poverty is often most easily accomplished in the short run through rapid, though not necessarily sustainable, rates of natural resource extraction and exploitation. Altering that path to make it a sustainable one typically involves improving the management of resources to make their use more efficient and effective when considered over time, often entailing short-term sacrifices in consumption in favor of investments that can pay off over the longer term. In Figure 2.4, for example, agricultural practices that erode soils or otherwise result in soil degradation will lead to lower net returns over time as soils progressively degrade. Investing in practices or technologies that are soil-conserving may generate lower returns in the short run (a), when the investment occurs, but these can be offset in the medium-run (b) and long-run (b + c). Whether the farm household actually makes this investment will depend on the expected time path of future returns, the expected difference of returns with and without the investment, and the discount rate.

Figure 2.4: Private net returns from alternative agricultural practices



Source: Adapted from Wiebe, 2003.

Achieving short-term and long-term goals can sometimes be pursued in complementary fashion, but typically tradeoffs are involved. Since many of the rural poor are living in highly precarious circumstances in which making short-term sacrifices in consumption is difficult, understanding the implications of these tradeoffs can be critical. In addition, it is important to remember that improved resource management must occur within a broader context in which poor households make consumption, production, and investment decisions and allocate their time, money and resources across an entire portfolio of capital assets – physical, financial, human, and social – to which they have (often limited) access.

Discussions of sustainable resource management cover a very wide range of human needs, resource settings and socio-economic circumstances. In this section, we can only cover several illustrative examples of sustainable resource management to address poverty outcomes. Most of these examples deal with the challenges posed by open access and common property resources.

Sustainable agriculture and natural resource management

As a means to address food security, livelihood improvement, and land and resource degradation, "sustainable agriculture" (SA) technologies and related natural resource management (NRM) practices have often been promoted in both favored and less-favored landscapes. A formal definition often characterizes sustainable agriculture having five major attributes (FAO, 1989): it is resource-conserving (of land, water, plant and genetic resources), environmentally non-degrading, technically appropriate, and economically and socially acceptable. As a practical matter, these technologies, practices and systems are often considered to 1) use less external off-farm inputs such as fertilizers, pesticides, and mechanical inputs; 2) use improved management techniques, and 3) employ locally available labor and natural resources as well as externally purchased inputs in complementary and synergistic fashion (Altieri, 2002; Lee, 2005). Sustainable agricultural practices are often adopted by farmers as a means to address soil erosion, water scarcity, loss of forest resources, and other examples of increased natural resource degradation and scarcity. In doing so, sustainable agriculture practices often take advantage of key underlying ecological principles of agroecosystems (Reijntjes, et al., 1992): enhancing the recycling of biomass; improving soil conditions, through improved management of organic matter and soil biotic activity; minimizing energy loss; promoting the diversification of species and genetic resources; and enhancing beneficial biological interactions.

There are many examples of technologies and practices that are often included under the rubric of sustainable agriculture and natural resource management. Some of these are listed in Table 2.18. Many of these practices are developed for relatively narrow agro-climatic conditions and soil characteristics. As a result, one of the distinguishing features of sustainable agriculture is its heterogeneity, matching the heterogeneity of local conditions and the needs of local populations (Lee, 2005). Consequently, sustainable systems are often not widely applicable to broad geographical areas and not easily scalable upward. One major exception is conservation tillage (often called zero- or minimum-tillage), which has been adopted on more than 90 million acres[21] worldwide (Murray, 2005). This includes many smallholders, including more than one million rice-wheat farmers in South Asia.

The use and adoption of these practices is often motivated by the desire on the part of farmers to increase crop yields, improve incomes and reduce natural resource degradation. To cite just one example, the use of leguminous cover crops and green manures has been shown, under widely different agroecological conditions, to simultaneously create a number of important benefits for farm households, both agronomic and economic: 1) significantly improving yields through the incorporation of leguminous fertilizers, 2) substituting "natural" fertilizers for purchased fertilizers, thus decreasing farmers' costs, 3) reducing soil erosion by not leaving soils bare and exposed to rain and wind, 4) improving soil organic matter content, reducing

[21] Definitions of what constitutes "conservation tillage" or "conservation agriculture" vary. Broader definitions entail much higher global adoption in terms of total numbers of farmers and hectares.

Table 2.18: Sustainable agriculture and natural resource management practices.

Crop rotations, including grain-legume rotations	Soil fertility management
Agroforestry systems	Mulching
Intercropping and polycultures: mixed, row, strip, relay	Drip irrigation
Legume intercropping and rotation	Cover crops and green manures
Introduction of improved crop varieties	Weed management
Improved fallow management	Integrated pest management
Organic agriculture	Soil aeration
Hedgerows and live barriers	Contour farming
Alley farming	Improved drainage
Zero tillage, reduced tillage, minimum tillage, deep tillage	Windbreaks
Improved use and efficient of animal manures	Raised beds
Improved forage and grazing management	Improved agrosilvopastoral practices
Grass strips	Hedgerows
Trash lines	Terraces
Seed conservation and local seed banks	Stone and soil bunds
Aquaculture and integrated crop-aquaculture systems	Home gardens
Improved efficiency in utilization of irrigation water	Ditches
Complementary use of inorganic/organic fertilizers	System of rice intensification (SRI)
Crop diversification & high-value crops	Precision farming
Rainfall harvesting and storage, micro- and macro-catchments	

Source: Lee, 2005.

nitrate leaching and improving nitrogen cycling, thus increasing potential future yields, 5) under some (but not all) conditions, reducing spread of pests and plant diseases, and 6) through a combination of reducing input costs and increasing yields, improving farmers net revenues and livelihoods.

One example of the use of cover crops and green manures is from the north coast of Honduras, where, as elsewhere in Central America, the maize-*mucuna* (velvetbean) system has been adopted by many farmers since the 1980's. As with many of the technologies and practices listed in Table 2.18, this system is relatively easy to employ and uses few costly external inputs. However, by most estimates, it does entail more intensive short-run use of an input which many farm households have at their disposal, own labor. The productivity-enhancing effects of moving from traditional maize cropping to maize-*mucuna* (involving the production of fewer, but higher-yielding crops over a multi-year period) are well-documented (Neill and Lee, 2001). (In some areas, however, the rising opportunity costs of land and labor have led to the practice's widespread disadoption). While systems such as maize/ *mucuna* are relatively simple, other practices – such as integrated pest management, agroforestry systems, and integrated crop-aquaculture systems – are much more complicated and entail a relatively high level of knowledge and understanding about crop and nutrient management and the biophysical effects of management practices.

Improving the adoption of sustainable agriculture practices has been shown to be a function of various factors (Lee, 2005). Enhancing the security of land tenure, especially possessing title to land, often results in increased adoption by increasing the ability of the farm household to capture the future agronomic and economic benefits of making investments in land

productivity. Increasing technical information available to farmers through extension programs, non-governmental organizations, and other mechanisms typically results in higher adoption of these practices. Households' involvement with local organizations, such as farmers' organizations, also tends to increase adoption, both through improved information and the "demonstration effect" of observing the positive experiences of one's neighbors. Higher adoption is also associated with other factors such as larger farm and household size, higher levels of education, and greater levels of farming experience[22]. At the same time, however, there are numerous constraints which limit farm households' adoption of SA and NRM practices including: the need to develop these practices and systems for narrowly defined agroecozones, which limits their potential for scaling-up; the high levels of information and technical requirements, particularly for complicated management-intensive systems; their frequently high levels of labor requirements; and their uncertain economic feasibility in situations of high or increasing opportunity costs for land and labor inputs.

Water management in irrigated and rainfed areas

The fact that rural households commonly face problems of water scarcity means that perhaps in no other area are management improvements more important than in improving water management. As above, it is useful to distinguish between improved water management in irrigated versus rainfed areas. In irrigated areas, one of the key developments over the past 20 years has been the growth of "participatory irrigation management" (PIM) approaches to water management. This approach has emphasized the devolution of water management from central authorities to local user groups, improved water delivery and cost recovery, and, in the case of large irrigation schemes, higher productivity (IWMI, 2007). While country experiences may differ, Table 2.19 outlines the steps involved in one country's experience (Thailand) with participatory irrigation management. The objectives of this approach in Thailand were to increase farmers' "ownership consciousness" of the water management system as a cornerstone of developing sustainable management of the resource, to increase its efficiency and productivity, and to decrease conflicts between farmers and between farmers and government agencies (Rattanatangtrakul, n.d.). One of the most successful of Thailand's water user's associations, the Pagahalung Water Users' Group, was established nearly 35 years ago, in 1974.

The devolution of irrigation management to local user groups, including attempts to privatize water provision (see discussion under Challenge 4 below) has met with mixed success (IWMI, 2007). In those cases where these reforms have not been successful, the reasons have included: the need for reforms in legal, governance and agricultural policy to strengthen and complement reform in water policy and management; adequate support, interest and involvement by water users and public agencies; adequate support for training, capacity building and institutional strengthening, to complement traditional emphasis on infrastructure investments; and successfully dealing with cost recovery (this is discussed in more detail below).

[22] These are illustrative only; there are many exceptions to all these conditions.

Table 2.19: Summary of participatory irrigation management process in Thailand

Components of PIM Process	Objective and Activities
Public information	Inform all relevant interest groups (farmers, irrigation agency officials, local organizations, etc., of the PIM process, objectives, and roles.
Agreement to follow PIM process	Agreement among farmers to PIM process establishing their interest and willingness to follow the approach.
Establish water users' group(s)	Local water users' group(s) established, with election of leadership, management committee, and mutual agreement to regulatory and implementation procedures.
Strengthen local capacity	Meetings, workshops, etc., to exchange ideas and experiences in agricultural production, irrigation use, system maintenance, and other aspects of water management.
Upgrade to water users' associations	If achieve success at local group level, scale up to broader water users' association or cooperative level.
Establish Joint Management Committee	JMC integrates representatives of irrigation management agencies with farmer representatives on central committee responsible for key water management and system maintenance decisions.
Establish Irrigation Repair and Improvement Fund	Fund established to collect maintenance funds from irrigation users and non-farm water users (e.g. industrial users).
Contracting selected maintenance work	With approval from JMC, selected irrigation system maintenance work is contracted out to user groups, administrative agencies, and other organizations as appropriate
Water delivery and maintenance activities	Planning, scheduling, measurement, coverage and reporting of water delivery. Monitor and evaluate delivery and associated maintenance needs.
Evaluation of user groups	Self-evaluation of effectiveness of water user groups by farmers
Performance data collection	Collection of performance data, as needed.

Source: Rattanatangtrakul, n.d.

In the many household-level settings in *rainfed areas* where access to adequate water supplies is the main constraint to agricultural growth, increasing this access to water can be accomplished in a variety of ways. Among the most important mechanisms are improving plant water availability through reducing surface runoff and maximizing plant water uptake capacity (IWMI, 2007). This can be accomplished through practices and technologies that increase the productivity of existing water supplies (mulching, drip irrigation, improved crop management) and by capturing more water to begin with. Practitioners and development organizations have put a great deal of emphasis on the development and diffusion of small-scale water harvesting systems in enhancing access to water. Table 2.20 identifies some of the most promising technologies and practices that can improve water access on the part of poor farmers, and thus hold the potential to enhance their livelihoods. Many of these have been shown to have significant economic payoffs. For example, supplemental irrigation of maize-tomato farms in Burkina Faso and Kenya achieved net profits of $73 and $390 per hectare, respectively, compared to net income losses in traditional systems (IWMI, 2007).

As we have seen, water management is a heterogeneous and complex process, involving vastly different biophysical environments, technologies, practices and institutions. General principles of successful water management in a developing country context where poverty concerns are central to water use are summarized in Table 2.21, from IWMI's recent global water study (2007). It is important to note that many of the recommendations that relate to improved water management at the farm level begin with improvements to the broader institutional and policy environment in which local users' groups operate.

Table 2.20: Improved water harvesting practices and technologies

Strategy	Purpose	Management Options
Supplemental irrigation and rainwater harvesting systems	Mitigate dry spells, protect springs, recharge groundwater, enable off-season irrigation, permit multiple uses of water	Surface microdams, subsurface tanks, farm ponds, percolation dams and tanks, diversion and recharging structures
In-situ waterharvesting systems, soil and water conservation	Concentrate rainfall through runoff to cropped area or other use	Bunds, ridges, broad-beds and furrows, microbasins, runoff strips
	Maximize rainfall infiltration	Terracing, contour cultivation, conservation agriculture, dead furrows, staggered trenches
Evaporation management	Reduce nonproductive evaporation	Dry planting, mulching, conservation agriculture, intercropping, windbreaks, agroforestry, early plant vigor, vegetative bunds
Integrated soil, crop and water management	Increase proportion of water balance flowing as productive transpiration	Conservation agriculture, dry planting (early), improved crop varieties, optimum crop geometry, soil fertility management, optimum crop rotation, intercropping, pest control, organic matter management

Source: Adapted from International Water Management Institute (2007), p. 333.

Table 2.21: Principles of Successful Water Resource Management Systems

1. Publicly available knowledge about resource availability over time and space.
2. Policies establishing water allocations, rights, priorities, cost recovery, and governance.
3. Rules, laws, and regulations codifying how policies are to be implemented.
4. Definition of roles and responsibilities, for both formal and informal organizations, for implementation of the rules.
5. Infrastructure to deliver services, guided by rules and allocations.
6. Incentives to participate and invest in water management, especially in agriculture.
7. Capacity to adapt to changing circumstances based on lessons learned.

Source: International Water Management Institute, 2007, adapted from Perry (multiple sources).

Joint forest management

Forests, like water and fisheries, suffer from chronic open access problems. As discussed above, over the past 20-plus years (in some countries, much longer), efforts have been made in many countries to devolve forest management to private individuals and local community groups as a way of dealing with those problems. In many countries, the constraints associated with improving local management of forest resources have proved to be significant. Many of the lands that have been devolved to local community ownership are degraded, agreements tend to be short-term rather than long-term, resource managers and users are often not well-informed about tenure status and the accompanying changes in rights and responsibilities, and the pace of change seems to be slow (FAO, 2005).

Previously, we have emphasized the central role of improved tenure security in the success of devolution efforts. But in addition, there are other features of improved management that are also central to sustainable forest management. Many of the schemes for improved forest management involve some sort of joint management of forests in which both national governments, and their relevant forest management agencies, and local user groups and communities have shared management roles. The specific forms that these joint management arrangements can assume are diverse – devolved management of forest resources on private or communal lands, social forestry projects, and co-management on forest land or mixed forest and agricultural lands. In a recent review of major joint forest management experiences in five Asian countries (India, Nepal, Thailand, the Philippines, Korea), Arnold (2001) identifies four general categories that characterize successful joint forest management systems. These are summarized in Table 2.22.

Table 2.22 "Conditions for success" of joint forest management systems.

Condition	Features
Characteristics of the resource	• Are boundaries definable? • Are scale economies present in production and use? • Does the resource meet a substantial part of local users' needs? • Can the resource be managed easily? • Are the benefits equitably shared among local users?
Characteristics of the community	• Can the community collaborate effectively? • Do users share a commonality of interests and goals? • Are local user groups too large, too heterogeneous, and/or have interests that are too overlapping and inconsistent?
Local institutional capacity	• Do the interests of leaders of local institutions coincide with the interests of the members? To what extent is local JFM management built on existing institutions?
Macroeconomic context	• Is the local JFM arrangement sufficiently adaptable to deal effectively with increased commercial (versus subsistence) demand for forest resources, especially for high-value products? • Can the local JFM arrangement deal effectively with rising labor costs and lower labor availability?

Source: Adapted from Arnold, 2001.

Joint forest management systems tend to be most successful when they are characterized by: definable boundaries; the presence of scale economies in production and ease of use; when the resource is important to meeting local users' needs; when the benefits are shared equitably; when the local community is not too heterogeneous and doesn't have too many conflicting interests; when local leadership has self-interests that coincide with those of local

users; when the local arrangement is built on existing institutions; and when the local arrangement is sufficiently adaptable to respond to changing economic conditions, such as changing prices for outputs and increasing costs (Arnold, 2001; FAO, 2005). Specific systems that meet many of these conditions and that, notwithstanding some problems and limitations, have achieved success include: the Village Forest Assocations in Korea, begun in the early 1970's; forest Village Protection Committees in West Bengal, India; the *Van Panchayats* (village-level forest management bodies) in Uttar Pradesh, India; forest user groups, based on local *panchayats*, in Nepal, which have formed a national-level Federation of Community Forest Users; and the Integrated Social Forestry Program in the Philippines (Arnold, 2001).

In a cross-country study of forest and land management under state, communal and private property tenure regimes in seven Asia and African countries, Otsuka and Place (2001) reach several conclusions that are relevant to improved forest management in common property and community settings. First, they find that, in many settings (Sumatra, Uganda, Ghana), customary tenure systems reward the planting and growing of trees with strong, individualized land rights. Thus the growing use of individualized ownership and rights to private property, including for agroforestry systems, is not surprising[23]. Second, they conclude that community management can be effective for minor non-timber forest products – firewood, grasses, leaf fodder – where the costs of protecting and maintaining these resources would be extremely high if managed individually. Managed collectively, however, there are sufficient economies of scale for group management to be effective. Finally, they find that community management of high-value timber production is less effective because it tends not to provide adequate incentives to reward improved management, which can be highly effective in the case of timber production. These types of conclusions are helpful because they help narrow the scope in identifying situations where community forest management is likely to be successful.

Co-management in fisheries

The management of fisheries shares some of the same trends as land, water and forest management, but there are also some major differences. There has long been heavy involvement of national governments in fisheries policy and management, both in marine and inland fisheries. But nowhere has the failure of top-down state-led administrative structures been greater (WRI, 2004). The current global fisheries crisis as a result of severe open access-related problems is closely attributable to a crisis in governance (World Bank, 2004). As a result, there is a wide sense of urgency in reforming fisheries management. There remains significant interest in devolving responsibility for fisheries management to local communities, given the failure of past top-down administrative approaches to fisheries management. As discussed above, many of the most recent innovative approaches to fisheries management and enhancing access have occurred in developing effective co-management strategies (Kura, 2004). But there is still wide recognition that it will take an informed role of the state to make governance more effective. One key is a genuine sharing of powers, rights and responsibilities for decision-making between central authorities and the local groups that are on the front lines of the fisheries crisis.

Customary management in fisheries is widespread. As in the case of land and forest management, institutional changes over the past two decades or more have favored the devolution of fisheries management from centralized national authorities increasingly to local

[23] The planting and growing of trees can pose a threat to customary systems for the same reasons.

stakeholders. In the case of fisheries, however, the mobile nature of the resource, the prevalence and severity of problems related to open access, the difficulties posed by external forces shaping change in fisheries (global seafood demand, rapid technological change), and the widespread failure of centralized fisheries management systems has led to widespread acceptance of the value of a collaborative management, or "co-management" approach.

Co-management in fisheries management is a compromise between centralized, top-down resource management and a wholly decentralized, community-based approach (World Bank, 2004). Although co-management systems have only become popular since the 1990's, they have already been reported as having characterized as having helped lead to more sustainable harvesting strategies and have helped resolved conflicts in both industrial and small-scale fisheries in numerous countries. The successful principles of fisheries co-management have been articulated as follows (World Bank, 2004; FAO, 2005: WRI, 2006).

- an *enabling policy environment* that facilities co-management by clearly delimiting local communities' rights and responsibilities, harmonizes national law with local practice, and transfers management authority, where needed;

- *empowerment of local communities and stakeholders*, through providing adequate information to communities regarding the co-management scheme, assuring that social equity issues are addressed in the composition of local groups, and assuring that local stakeholders can actively participate in management of the fishery;

- *effective linkages among stakeholders* – information, wide promulgation of rules, communication mechanisms; and

- *adequate resources and support* to make the management process work: technical assistance, resources for monitoring and enforcement, etc.

Successful experience with co-management strategies has been reported in a number of diverse cases: in reducing illegal fishing on coral reefs in Indonesia; in small-scale fisheries management in India; in significantly increasing fish harvests among dozens of communities in Fiji, Samoa, and elsewhere in Southeast Asia and the Pacific Islands; in creating functional fishing zones in St. Lucia; and in helping address fisheries conflicts in Ecuador and Jamaica (World Bank, 2004; FAO, 2005; Ahmed, 2006).

Given the mobile nature of marine fisheries, international governance is particularly important in the management of this resource. With the deteriorating situations facing many fisheries, an important step was the adoption of the Code of Conduct for Responsible Fisheries (CCRF) in 1995, which formally incorporated ecological and economic management principles to set the framework for international fisheries management. Beyond this, most countries with major fisheries have a fisheries governance system in place that, while differing in specifics from country to country, includes the following institutional components (World Bank, 2004; WRI, 2006):

- a fisheries management system that establishes the basic regulatory framework;
- a monitoring, control and surveillance system;
- a fisheries judicial system – which may be formal or informal – to resolve conflicts;
- a system of decentralized decision-making and collaborative management; and
- definition of allocation and access rights.

Thus, even with effective co-management of fisheries, there is still a key role to be played by informed state.

In considering the management challenges arising with common property and open access resources overall – water, forests and fisheries, in particular – it is worth emphasizing that the critical issues involved in sustainable resource use and management are less often ones related to technology and more typically ones of governance and institutional management. As we have seen, in agricultural production, land management (in many cases) and water management in rainfed systems (where access to water is closely linked to land access), the central keys to sustainable use are often ones of technology, its adaptation and adoption, and how to most efficiently maximize productivity from a finite resource. In the case of common-pool resources, issues of technology and (narrowly construed) resource management are also important to achieving greater efficiency and productivity. However, the overriding management issues are ones defined at a broader level, in particular, how to construct and maintain local organizations and governance systems – typically involving co-management arrangements with the state – that are appropriate to the situation and that give users the right incentives and but ask them to assume concomitant responsibilities that yield sustainable management solutions. The greater challenge is how best to assure that these broad management and governance solutions can adapt to the threats and challenges posed by such developments as climate change and increasing commodity prices.

Decentralization of natural resource access and management

As we have discussed throughout Section II and with regard to common property and open access resources as a whole, one of the central themes is the widely acknowledged failure of top-down centrally administered approaches to resource management (particularly for common property resources). In response to these limitations, as we have seen, one of the key developments over the past two decades or more – and one pertaining to land, water, forest and fisheries management at all levels – has been growing commitment to the involvement and empowerment of private resource users and local communities in managing resources that have been heretofore allocated by the state or by statutory law. An estimated 80 percent of developing countries have pursued some type of devolution or decentralization of state authority in recent years, including 70 percent of Sub-Saharan African countries (World Bank, 2007).

The simple acts of governmental decentralization and the devolution of state responsibilities to local and community levels by no means guarantee a greater role for local people nor a greater effectiveness in allocating and managing resources. In fact, there is abundant evidence that decentralization efforts suffer many limitations. These have included: an incomplete transfer of power to the local level; the choice of non-representative and non-democratic local institutions to secure those powers; a lack of accountability of local institutions; and the undercutting of customary arrangements through "elite capture", by creating parallel political and administrative structures, and other mechanisms (Ribot, 2002, 2004; ILC and CAPRI, 2007).

With regard to natural resources management specifically, community-based natural resource management (CBNRM) initiatives have become more commonly accepted by governments and development organizations over the past two decades. As greater experience with CBNRM strategies has accumulated, so too has there been increasing criticism of community-

based approaches. Well-known examples of the failure of CBNRM approaches have been cited in the literature, as applied to inland fisheries in Malawi (Allison and Mvula, 2002), forest management user groups in India (Kumar, 2002), woodlands management in Zimbabwe (Campbell, et al., 2001), and other situations. Ellis and Allison (2004) summarize some of the criticisms that have emerged regarding these approaches: spatial exclusion (too focused on territoriality); assuming a homogeneity of interest among group members; sometimes excluding the interests of minority group members who may be dominated in group decision-making; male domination; and unclear equity impacts. So it is clear that devoted, community-based approaches are no panacea.

Ostrom (1990) has proposed what is by now a well-known set of core principles for the improved management of common property resources. These are given (as adapted by the World Resources Institute, 2005) in Table 2.23. These principles emphasize several key features: the clear definition of rights, rules and boundaries governing resource use; acknowledgement by the state of local users' rights; a balance of responsibilities entailed in resource use relative to benefits received; and active participation of local resource users in setting the rules governing resource use and the penalties associated with violations of permitted uses.

Table 2.23: Principles for the Successful Management of Common Property Resources

1. Clear definition of who has the right to use the resource, who does not, and clearly defined boundaries of the resource.
2. Perception of users that their obligations for managing and maintaining the resource are fair, relative to benefits received.
3. Rules governing use of the resource are appropriately adapted to local conditions.
4. Most individuals affected by the rules governing the management of the resource can participate in setting or changing them.
5. Use of the resource and compliance with rules governing resource use are actively monitored by users themselves or parties accountable to the users.
6. Those violating the rules are disciplined by the users or by parties accountable to them; penalties are imposed according to the severity and context of the offense.
7. Local institutions are available to resolve conflicts quickly and at low cost.
8. Government authorities recognize users' rights to devise their own management institutions and plans for resource use.

Source: Ostrom, 1990; adapted by World Resources Institute, 2005.

Perhaps equally useful are the conclusions and recommendations stemming from WRI's cross-country analysis of decentralization of natural resources decision-making in 14 countries in Asia, Africa and Latin America. These recommendations are summarized in Table 2.24. Most of these recommendations relate directly to three central criteria to making decentralization work in the case of natural resources management (Ribot, 2002): 1)

downward *accountability*, to increase the effectiveness of local decision-making; 2) assuring that local authorities have *meaningful powers*, both to assure their legitimacy and to effectively influence resource management; and 3) assuring that both local people and local authorities enjoy *secure rights* over those powers which are decentralized. These steps and criteria will not guarantee, of course, that community-based decision-making in natural resource management will succeed. But given the past failure of state-led approaches to resource management and the many practical difficulties of introducing private individualized property rights in many common property and open access situations, these principles provide a basis on which community-based initiatives can proceed.

Table 2.24: Institutionalizing democratic decentralization of natural resources management: Recommendations

1. Work with local democratic institutions as a first priority.
2. Transfer sufficient and appropriate powers.
3. Transfer powers as secure rights.
4. Support equity and justice.
5. Establish minimum environmental standards.
6. Establish fair and accessible adjudication.
7. Support local civic education.
8. Give decentralization time.
9. Develop indicators for monitoring and evaluating decentralization and its outcomes.

Source: Ribot, 2002.

Tradeoffs in sustainable resource management

As reviewed throughout this paper, a remarkably wide array of systems of resource access, tenure and management exists over land, water, forest and fishery resources in developing countries. Useful management recommendations and policy prescriptions that apply across-the-board are accordingly difficult to come by. But regardless of the tenure or management system in any given country, community, or for any specific resource, expanded and security access and improved, more sustainable management remain central to the options that poor rural people have and the choices they must make: consumption versus sale of home production; expending limited household funds on food versus other goods or services; whether to make expenditures for current consumption versus saving a share for investment and thus enhancing future consumption; and similar decisions.

It has been common in much of the development literature and among development practitioners to highlight "win-win" outcomes (higher household production and improved food security along with lower poverty), or even "win-win-win" outcomes (lower environmental degradation as well). A large literature has emerged in the past 15 years addressing the complementarity of development and environment outcomes at the macro level – that is, whether the so-called Environmental Kuznets' Curve (EKC) relationship exists, and if so, under what conditions and what does it look like. An elaboration of this extensive

debate is beyond the scope of this paper; however, the implications of this debate for addressing poverty versus environmental sustainability deserve brief mention.

Briefly, the EKC hypothesis posits that at low per capita country income levels, subsequent income growth and environmental degradation are positively associated in natural resource-based economies up to the point where a transition occurs to a manufacturing-based economy. At that point (the so-called "environmental transition"), incomes have increased significantly above subsistence agriculture levels, but the environment (soils, air, water) becomes highly degraded (compared to the relatively pristine environment characterizing low-intensity subsistence agriculture). Beyond the environmental transition, a country's "engine of growth" shifts from manufacturing to services and, later, knowledge and information sectors, all of which are generally "cleaner" and less environmentally degrading than manufacturing. This process leads to a hypothesized "inverted-U" relationship between measures of income growth and environmental degradation across countries of different income levels at one point in time, or over time for individual countries.

The EKC hypothesis is highly appealing because it suggests that a country can "grow its way" out of environmental degradation and toward environmental sustainability, since once higher income levels are achieved, they are associated with lower environmental degradation. The environmental degradation associated with manufacturing (particularly, heavy manufacturing) is thus viewed as a temporary phase in the long-term economic growth process which countries undergo. The EKC hypothesis has consequently, over the past 15 years, generated a great deal of empirical testing for different countries, different resources, and for different time periods. The empirical evidence on the existence of EKC-type complementarities between economic growth and environment indicators is conflicting. The evidence tends to confirm the existence of EKC-type relationships for some resources, notably for urban air quality, but in many other instances, for deforestation for example, the evidence is contradictory or inconclusive. Thus the empirical evidence, at the macro level, for the complementarity of achieving the joint social goals of poverty alleviation and environmental sustainability is, at best, mixed (Lee, et al., 2001).

At the household, community or development project level, the empirical record of clearly positive outcomes across all key development indicators – across food security, income generation, and environmental improvement indicators, for example – is also scarce. It is much more typically the case that tradeoffs, rather than synergies, exist among these various desired outcomes. There are some household-level natural resource-based systems that have been shown to be conducive to jointly achieving food security-livelihood-environmental sustainability goals; they tend to be centered on perennial crop production and agroforestry systems. There is a strong consensus regarding the types of management and policy changes that are most likely to lead to sustainable outcomes, particularly in the less-favored environments that present such immense challenges (Vosti and Reardon, 1997; Lee, et al. 2001; Kuyvenhoven, 2004). In addition to the central importance of enhancing the security of resource access and tenure, these include: addressing imperfections in factor and product markets; increasing public investments in infrastructure and human capital; facilitating better market access; making public institutions more accountable and more locally effective; enabling local organizations to better facilitate collective action and to complement formal government services; enhancing local participation in development strategies; and adopting prudent macroeconomic and sectoral policies.

This leads us back to the point made early in this paper that assuring access to resources is not enough. Adequate access to natural capital will rarely, in and of itself, generate sustainable household incomes and lift the poor out of poverty. What is required to address rural poverty successfully and sustainably is to simultaneously address complementary forms of access of the poor: access to *physical capital*, including improving the availability of technology, off-farm inputs and public infrastructure; access to *financial capital*, principally credit; access to *human capital*, often requiring public investments in education, health and nutritional improvement; and access to *social capital* in the form of social networks and local institutions that can provide improved information. Whether individually or together, these improved forms of access have great potential to enhance the capabilities of the rural poor to improve their livelihoods.

<u>Challenge 4</u>: ***Enabling the poor to take advantage of evolving markets*, including markets for environmental services.**

One of the means by which the poor can potentially improve resource access and sustainable management is through market-based mechanisms as they apply to land, water, forests and other natural resources. The growing interest in markets for natural resources and environmental services stems from several factors. First, as we have repeatedly mentioned in this paper, the limitations of top-down, state-led resource access and management policies have long since become apparent across a wide variety of natural resource contexts. Consequently, as we have seen, since the 1980's, there has been greatly increased interest in a variety of alternative decentralized voluntary mechanisms for improving access to natural resources and opportunities for improved management for the poor (and others); markets are one of those mechanisms.

Second, particularly with respect to common property and open access resources, the severity of the access and management problems has become increasingly acute as populations have grown, resource use has intensified, and resource scarcity has increased. The externalities associated with resource use intensification – air pollution and global warming, soil degradation, surface water and groundwater pollution, the disappearance of marine and inland fisheries, etc. – have increasingly reached crisis proportions in many countries. As a result, market-based mechanisms have been increasingly seen as offering an alternative mechanism for assuring that resource scarcity is properly reflected – via the prices associated with environmental services – in resource allocation and use. If prices adequately reflect a resource's scarcity value, then decisions regarding that resource are more likely to encourage its conservation and wise use.

Finally, market mechanisms are, in large part, self-regulating and thus provide an alternative to more "top-down" and bureaucratic and institutionally-based resource allocation mechanisms which are prone to arbitrary and inequitable decision-making, are influenced by the distribution of political power, and, in many cases, are dominated by graft and corruption. Of course, market-based mechanisms for natural resources suffer from at least one major limitation, in that access to the market is conditional on market actors possessing adequate purchasing power, as in any market. Thus there is an inherent cause for concern that the poor may be disadvantaged in natural resource markets. At the same time, market mechanisms can provide an alternative to bureaucratic decision-making over resource allocation, which as we have seen in many cases, has not served the poor very well in the past.

In the discussion of market-based mechanisms below, it should be stressed that markets are viewed as one option, not the only option, in resource access and management. We begin by considering payments for environmental services as a general tool for sustainable natural resource management and rural poverty reduction, and then consider several examples of environmental service and natural resource markets and pricing.

Payments for environmental services

Paying for the provision of environmental services is a recent policy innovation that is attracting much attention in both developed and developing countries. The innovation involves a move away from command-and-control environmental policies and towards the use of market incentives to obtain more efficient environmental outcomes, and rewarding providers of environmental services that did not receive compensation in the past.

The basic notion of payments for environmental services is that because producers of environmental services (farmers, forest owners, etc.) are typically not compensated for the environmental services they supply, these services will often be undersupplied or not supplied at all (FAO, 2007b). Payments for environmental services (PES) programs attempt to create incentives for both the suppliers and users/beneficiaries of these services that lead to compensating suppliers for the services they provide – either through the market or indirectly through government programs or other intermediary institutions – thus resulting in the provision of services that otherwise would be inadequately supplied. Examples include payments by corporations in developed countries to fund reforestation in developing countries to offset carbon emissions and mitigate climate change, payments by governments to farmers who change production practices to reduce soil erosion or water pollution, and payments by consumers for products (such as coffee) that are produced in ways that protect or enhance biodiversity.

Although payment for environmental service programs are not primarily a tool for poverty reduction, because the rural poor are disproportionately dependent on natural resources for their livelihoods and resource access and control are critical dimensions of rural poverty alleviation, the two are interlinked. How likely is it that the rural poor in developing countries will actually benefit from PES? This depends on where they are located, what type of farming system they are engaged in, and, critically, whether they have access to natural resources that provide the types of environmental services – carbon sequestration, water supply or purification, biodiversity conservation, etc. – that beneficiaries will value.

In order to better understand the potential of PES programs to help the rural poor, we need to understand the types of changes in farming systems required. This is critical for poor agricultural producers, who are more likely to face market failures for food, credit, insurance, and labor. Maintaining food security through their own production is an important issue for the poor and affects their ability and willingness to participate in PES programs. PES programs may restrict or bar traditional land uses, such as grazing and cropping, that conflict with the provision of environmental services. Without access to these or alternative income-generating activities, or service payments high enough to act as a primary income source, the poor are unlikely to participate (WRI, 2005).

There are two broad categories of land use changes that are suitable for PES projects: "working lands" where environmental services are generated from changes in the agricultural production process, and "land diversion" where environmental services are produced by

taking lands out of agricultural production. The quality of the land and its relationship to agricultural and environmental service productivity is a critical factor to consider when deciding which type of program is most suitable. Converting lands from agricultural to environmental service production on a site with land quality that is very poor for agricultural productivity but good for environmental service provision has a lower trade-off than on land of excellent quality for agriculture.

A key determinant of who can be viable suppliers of environmental services is the opportunity costs facing land users in making the changes required to supply environmental services. This is not simply a matter of comparing profits from different farming systems. Issues such as the degree of food security offered by a system, the timing and amount of labor required, and the size and timing of investments and returns are also important determinants of the opportunity costs producers face, particularly for poor land users.

One reason to think that PES programs could offer poverty reduction benefits is the high concentration of the poor in rural areas and their high reliance on natural resource management for their livelihoods. The World Bank (2007) estimates that 883 million of the poor are located in rural areas and most of these rely upon agricultural production for at least part of their livelihoods. There is also evidence that a substantial share of the poor are located in marginal areas like steep slopes of the upper watershed (Chomitz et al. 2007; Hazell and Wood, 2007). Indigenous groups and impoverished rural communities own or manage at least 22% of the world's tropical forests (White and Martin 2002). Particularly in less-favored landscapes, the areas owned or managed by the poor may be low in agricultural productivity, but may nonetheless be high in potential environmental service values, indicating the potential for PES programs to improve livelihoods of the rural poor. An example might include crop production on steep slopes in upper watershed areas where erosion has resulted in poor soil fertility. Annual crop production generates very low returns to the farmer, and at the same time generates negative impacts through erosion and siltation on watershed functions. Converting this land from agricultural production to watershed protection via the planting of trees will generate a higher return to both land and labor. One example of this situation is found in China's "Grain for Green" program which pays farmers to take steep uplands areas out of production.

Alternatively, payments for environmental services can also help overcome barriers the poor face to adopting better production systems and livelihood strategies. For example, conservation agriculture is a farming system that has often been found to generate improved agricultural benefits to farmers over time, and it also usually generates a net positive impact on environmental services such as soil carbon sequestration, biodiversity conservation and soil management. Even without payments for the environmental services, farmers would be better off, but barriers such as lack of credit, tenure, information and ability to insure against risk prevent them for making this transition. PES programs structured to overcome the barriers to adoption thus could be an important way for PES to contribute to poverty reduction while enhancing provision of environmental services. However until now, there are very few examples of these types of "working lands" PES programs. The RUPES (Rewarding the Upland Poor for Environmental Services) project and the World Bank/GEF funded Silvo-Pastoral project are two examples of this type of program[24].

[24] The RUPES project has sites in Indonesia, the Philippines and Nepal, and also works in China, India, Thailand and Vietnam. The Silvopastoral project operates in Nicaragua, Costa Rica and Colombia.

Access to land, and lack of it, is one of the biggest barriers the poor face in benefiting from PES. Pagiola, et al., (2005) found that tenure issues were critical for the successful participation of the poor in the PES program in Nicaragua, which involved land use changes requiring long-term investments, such as reforestation or adoption of silvopastoral practices. In Costa Rica, both Thacher, et al. (1997) and Zbinden and Lee (2005) found tenure-related variables to be highly significant in explaining participation in the country's current and preceding PES programs. In some cases, this barrier has been overcome by allowing PES contracts with holders of non-formal forms of tenure.

Even where the poor do have rights to natural resources, they often take the form of common property which also brings complications in terms of PES participation. Changing natural resource management on commonly held resources, such as pastures or waterways, requires group coordination, which is costly to the producers and in many cases difficult to achieve. One example of this type of situation comes from the Payment for Hydrological Services program implemented in Mexico. The program was implemented both on *ejidos*, or communally held lands, and on individually-controlled plots. On the *ejidos*, payments were made to the entire community, which could then either distribute to individuals or make investments for the good of the community. Questions about the effectiveness of this type of communal payments schemes to in providing incentives for changing land uses are under review (Muñoz et. al. 2005).

A final point worth emphasizing is that the introduction of PES programs *can create value* by creating new markets and new opportunities that distinguish new rights which were previously latent but undervalued or non-valued by society. In this way, PES programs can increase the value of the underlying resource and help mitigate externalities that result in resource degradation.

We now turn to several other related market-based approaches related to environmental service provision with respect to specific resources. It is important to note that previous attention was given in Section II to market-oriented approaches to agricultural land access and management in the discussion of *market-assisted land reforms* (land sales and land rental) under Challenge 1 ("Expanding access to natural resources"), and to *transferable quotas, fishing rights and licenses* under Challenge 2 ("Increasing security of access to natural resources").

Water pricing and water markets

As reviewed previously, water is a unique natural resource in many respects – due to its mobile nature, the extent to which rights to its access may (or may not) be tied to land, in the mix of public goods and private goods that its use entails, and in other respects. In the current environment facing many nations of increasing water scarcity due to expanding populations, rising food demands, increasing commodity prices and climate change, there is increasing interest in alternative mechanisms to solve chronic problems associated with water access, allocation and management (IWMI, 2007). This has led to growing interest in water pricing, water markets, and transferable water rights as mechanisms for more efficiently allocating and better conserving scarce water resources.

The introduction of *water pricing* typically has one of two primary objectives – increasing incentives for conservation by having the price of water reflect its scarcity value, and raising revenues for construction, operation and maintenance of water supply and irrigation systems

(IWMI, 2007). Actual pricing schemes typically focus on average cost pricing, often used in public water projects and water allocation in order to ensure cost recovery, and marginal cost pricing. Marginal cost pricing has a number of advantages and disadvantages (Tsur, 2004; Dinar, et al., n.d.). Advantages include the fact that marginal cost pricing should yield economically and socially optimal water use because marginal costs and benefits are equal, the difference between the total value of water supplied and its cost is maximized, and conservation is encouraged by pricing excess water use at a higher level. Disadvantages include the inability of most marginal pricing schemes to incorporate full-cost recovery, the incorporation of water quality aspects, the variability of marginal cost pricing under different situations (short-run versus long-run, temporary versus permanent demands, pricing when water demands and infrastructure costs increase), and the administration and information costs associated with volumetric monitoring, which is required for marginal cost pricing.

Water markets typically refer to the formal market-based exchange of water rights (as opposed to spot water markets which may be used to temporarily transfer water use among neighboring farmers or other members of a water users' group, for example) (Dinar, et al., n.d.). The effective functioning of water markets requires several key features: a clearly defined system of water rights, physical infrastructure with measurement and monitoring capacity, and laws and local institutions that are effective at facilitating and enforcing transactions (IWMI, 2007). Any or all of these may be problematic in many developing country settings. Like systems of water pricing, water markets have advantages and disadvantages (Dinar, et al., n.d.; IWMI, 2007). Their advantages (over administrative water allocation) include: the fact that their use should facilitate the transfer of water resources to their highest and most valuable use; conservation is encouraged by the fact that the scarcity value of water becomes reflected in market prices; direct disincentives for water pollution exist; and investments in water supply capacity should be reflected in the price of transferable water rights. Disadvantages include the abovementioned basic requirements for their effective functioning; the high number of operational demands concerning water measurement, monitoring, and enforcing withdrawal rules; third party effects; and the fact that, in existing irrigation systems, use rights are already capitalized into land values.

Both water pricing and water markets raise significant questions of equity, access and impacts on the rural poor. The underlying accessibility by the poor to water may be limited by high prices, either in situations of drought or temporary water scarcity, and problems of market entry due to inequitable initial conditions in situations where water prices are high if infrastructure costs are in fact capitalized into water prices. Additionally, externalities in water markets are pervasive (Dinar, et al., n.d.) – pollution, changes in water flow, waterlogging, and other effects that should, in principle, be incorporated in water markets but which, as a practical matter, are difficult to incorporate, and in doing so, may raise water prices to levels inaccessible to the poor. In addition, issues of agency are critical in water markets (IWMI, 2007): Who sets the rules in creating water markets? Who benefits from those rules, and who loses? Mechanisms to try to deal with these limitations include sliding scales for water prices, phased vesting of water rights, and improved regulatory management (ibid.).

The most commonly cited example of successful water markets is in Chile, where the government, in a succession of water policy reforms over the 1981-1998 period, granted private (and initially public) water concessions and ultimately has privatized much of its water supply and wastewater treatment system. The evolution of privatization and water markets in Chile has had some notable successes, but also some drawbacks (Hearne and

Donoso, 2005). Its achievements include the granting of property rights and economic incentives which lie behind the successful development of the irrigated agriculture sector; the performance of many water user associations, especially in the distribution of irrigation water; and a strong record of private investment in the water sector. Limitations of Chile's experience include the handling of rights and incentives for unused non-consumptive water uses; the need for improved conflict resolution over water rights and use; and improved environmental protection, with regard to assuring both minimum river flows and improved water quality (Hearne and Donoso, 2005). The state still plays an important role in water management – the public sector is part-owner of private water companies, and water provision to poor households is heavily subsidized through a national means-tested program. Moreover, water supply and sanitation in most rural areas is still handled by water cooperatives and water boards, under the administration of national authorities.

Forest certification and markets for non-timber forest products

As mentioned in Section I, it has been estimated that 9 of 10 of the world's rural poor depend, at least in part, on forests for their livelihoods (World Bank, 2002). This includes not only high-value timber production but on non-timber forest products, especially fuelwood and forest-based food products which together accounted for more than two-thirds of forest-based household incomes in a recent major cross-country study (Veveld, et al., 2004). Accordingly, there is widespread interest in promoting market development to support forest-based livelihood improvements in many countries. Increasingly, forest-based market development is focusing on small- and medium-sized enterprises whose principal stakeholders include forest-based communities and community forest enterprises, rather than large-scale industry (Donovan, et al., 2006). Two specific market-based strategies that have been widely promoted are forest certification and increasing non-timber forest product development.

Forest certification was developed as a strategy to address deforestation in tropical forests, but it is not a strategy *per se* to combat deforestation; rather, it is an instrument to promote sustainable forest management (SFM) and informed consumption of wood and other forest products (Simula, 2005). This is accomplished through certification of sustainable forest management, harvesting and processing practices through various certification organizations, the two largest of which are the Forest Stewardship Council (FSC) and the Pan-European Forest Certification Framework (PEFC); other important organizations exist in Canada, Brazil, Malaysia and elsewhere. These organizations develop criteria and principles for sustainable forest management, they accredit third-party auditors to verify SFM compliance through annual audits, and they issue Forest Management Certificates and Chain-of-Custody Certificates to certify the use of SFM practices to consumers (WRI, 2007). The private sector plays a dominant role at all levels of forest certification, including forest management, logging, processing and the actual certification process itself.

Forest certification has grown rapidly over the past decade. Just between 2000 and 2006, it is estimated that certified forest area has increased six-fold globally, to about 275 million hectares, accounting for approximately 7 percent of the world's forested area (WRI, 2007). Despite this rapidly growing interest, the vast majority of certified forests are thus far comprised of temperate forests in the industrialized countries of North America and Western and Central Europe. Among developing countries, involvement in forest certification is strongest among several Latin American countries (Bolivia, Guatemala), South Africa, and selected other countries in Africa and Asia.

As forest certification expands more rapidly in developing countries, there are various obstacles that will have to be overcome. These include: confusion, uncertainty and a certain lack of credibility in the industry and among consumers created by the profusion of certification schemes and organizations; strict certification standards (particularly through the FSC) have created inadequate incentives for many currently non-sustainable producers to adopt SFM practices; there is weak technical capacity and frequently weak institutional capacity at all levels (certification and accreditation services, stakeholders, enforcement, etc.), and the costs of certification are often prohibitively high for smallholders (Simula, 2005; Cashor, et al., 2006; WRI, 2007). Strategies for further extending forest certification to developing countries, particularly to smallholders include: stimulating export demand through "demand pull" efforts; curbing illegal logging, which is widely destructive of forests and undercuts the prices of certified timber; strengthening local capacity for SFM management and local understanding of certification and accreditation standards and systems, promoting "step-wise" or phased approaches to certification to ease the transition; and streamlining certification assessments and accreditation to reduce costs and increase incentives for smallholders (Simula, 2005; Cashor, et al., 2006).

Certification, in some countries, also extends to *non-timber forest products* (NTFP's) – forest-based food, fuel, construction materials and medicinals – on which the rural poor are often as (or more) heavily dependent than they are timber. Interest in market development for NTFP's has grown rapidly in recent years given the important role of these products in the livehihoods of the poor and the promise of achieving poverty reduction and forest conservation goals jointly (Marshall, et al., 2003). Efforts at both certification and the general exploitation of NTFP's are constrained by many factors, including (Pierce, et al., 2003; Marshall, et al., 2003): the primary role of household NTFP income as a "safety net"; the fact that NTFP's are accessed on state or privately owned lands by smallholders who lack formal access or tenure rights; and the lack of sustainable practices often used in NTFP harvesting (which is an impediment to certification). Constraints to market development include the lack of organization of households exploiting NTFP's, the unavailability of market values for many NTFP products, and the lack of the types of production and marketing support needed to enhance market development (credit, market information, management capacity, and infrastructure).

Initiatives to facilitate market development for NTFP's should address the specific obstacles encountered where they are produced and marketed; these vary widely across products, locations and markets. Recommendations for promoting NTFP market development include the following (FAO, 1995; Marshall, et al., 2003; Pierce, et al., 2003).

- *development of product guidelines and standards* to assure continuity of product supply, help promote familiarity and acceptance by consumers, and to promote industry association;

- *national and international policy support* to prevent deforestation and protect forest biodiversity – through such mechanisms as the creation of national forests and extractive reserves – as well as policies to regulate medicinals, and promote standards for sustainable harvesting and management practices.

- *provide improved market information* to facilitate improved transparency and functioning of NTFP markets;

- *training and development of improved management capacity* at all levels – production, harvesting, processing, storage, transportation, marketing and sales; and

- *promoting product certification* as one mechanism to help achieve better industry product standards and guidelines, conservation and sustainable management goals, and improved value-added to benefit smallholder producers.

Markets for seeds and crop genetic resources

To what extent are market-based approaches an effective way to improve the access of poor farmers to crop genetic resources? Increasingly poor farmers are integrating into agricultural markets for both inputs and outputs and market forces are having a growing impact on their use of crop genetic resources. Market-based approaches are having major impact on both the development of crop genetic resources, as well as the dissemination of seeds.

In recent years there has been a major shift in funding sources for plant breeding from the public to the private sector (FAO, 2004; Cooper et al. 2005). The public commons of genetic resources is being increasingly privatized through more clearly defining and implementing intellectual property rights (IPRs) on plant genetic resources. Intellectual property rights over plant genetic resources can take different forms, from patents over genes and gene constructs, to varying forms of plant breeders' rights which may or may not allow farmers to save and reuse seeds. One of the primary arguments in support of defining and enforcing intellectual property rights is the increased incentives these can provide to private sector breeders, thus generating a higher rate and range of new plant varieties (Srinivasan, Shankar and Thirtle, 2004).

It has been argued, however, that the increased use of IPRs has and will reduce the development of new varieties from the public sector, a sector which is more likely to produce planting materials important for poor farmers. Concerns have also been raised that IPRs result in non-competitive markets, as they grant monopoly rights over genetic resources for some defined period of time (Graff and Zilberman, 2005) How the implementation of IPRs on genetic resources will influence the flow of genetic materials through the seed supply system from public and private sectors is still being played out, but there is a fairly wide consensus that the public sector does have an important role to play, particularly in developing varieties that are not highly commercially valuable, but that have significant potential to improve the livelihoods of poor farmers. One important initiative aimed at overcoming barriers to accessing crop genetic resources is the multilateral system of access and benefit-sharing under the International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA). This system is designed to facilitate access to genetic materials of an agreed-upon list of crops on the basis of multilaterally accepted terms, which should increase the ability of plant breeders to access a wide variety of materials and stimulate more public sector production of varieties relevant to poor farmers. Development institutions and private foundations such as the Gates Foundation and AGRA fund are supporting capacity building for plant breeding and agricultural biotechnology as a means of improving access as well.

As mentioned above, recent studies have indicated that developing country farmers, including the poor, are increasingly accessing their seeds through marketing channels (Smale, 2005; Lipper et al., 2006). There are a wide variety of seed marketing outlets, ranging from petty vendors selling locally produced seeds to commercial outlets marketing certified seeds

(Lipper et al., 2006). Seeds from both the formal and informal sector (e.g. certified improved varieties as well as local farmer varieties) are exchanged in markets. The market for seeds is different from many product markets because the genetic characteristics embodied in the seeds are often not readily observable to the buyer; but this depends on the crop (Morris, Rusike and Smale, 1998). This creates a problem of information asymmetry between the consumer (farmer) and supplier of the seed (Morris, Rusike and Smale, 1998). Seed variety release and certification policies are one way to overcome this problem – however they can also create barriers to exchange since they involve high levels of standardization and uniformity, which are expensive to generate and not necessarily cost-effective. For example, strict seed laws requiring " all seed in the market" to be certified effectively ban sales of landrace and local varieties by farmers which limits the range of possible seed exchanges in markets (Louwaars and Tripp, 1999). Research has indicated that farmers have relied on social relations and reputation to provide some assurance of quality which can preclude their participation in markets (Badstue, et al., 2004). However traditional systems of seed exchange are undergoing rapid changes due to a variety of factors such as the prevalence of conflicts and disasters, migration, and integration into global markets, leading to the greater use of markets as seed sources. This highlights the need for alternative systems of facilitating information flows in the informal sector, particularly in markets. One potential candidate is "truth-in-labelling" standards which are more flexible and less costly than formal certification. Another strategy has been the use of "diversity fairs" where seeds and varieties are exhibited in rural communities, giving farmers a chance to observed a wide range of varieties and interact with suppliers.

It is also increasingly apparent that one important area of improving access for poor farmers is the management of market transactions for seeds in the informal sector (Lipper et al., 2007; Nagarajan et al., 2008; Smale et al, 2008). At present this is a largely unregulated sector, although as noted above, formal seed sector regulation can actually preclude these kinds of transactions. Yet farmer varieties and landraces are an important part of the demands that poor farmers have for crop genetic resources; they provide traits that are important to this group and which are not provided by the formal sector. The economic rationale for strict certification requirements for improved varieties (the variety must be distinct, unique and stable) is not valid for all crops; the costs of deriving a variety with those characteristics, together with the costs associated with certification, can be higher than the benefits the farmer derives from them, particularly for crops with low marketed value. This does not mean that no information or standardization of seed varieties is needed; however, it does suggest that flexibility in seed standards to meet a variety of demands from farmers – particularly the poor – is called for. Frequently, the vendors of seeds in local markets are women. One potential opportunity for improving access in local markets is gender-targeted programs to improve seed marketing in the informal sector. However, in many cases, some changes in formal seed sector regulation may be required before this can be realized.

III. Case Studies of Improved Natural Resource Access and Management for Rural Poverty Reduction.

The case studies presented here for further development in IFAD's 2009 Rural Poverty Report were identified consistent with the challenges outlined in Section II: 1) increasing access by the poor to natural resources (Case Study A); 2) improving security of resource access (Case Studies B and D), 3) improving sustainable management of natural resources

and resource quality (Case Studies C and D); and 4) enabling the poor to take advantage of evolving markets for environmental services (Case Study E).

In the summary of each case study given below, we follow the format suggested by IFAD in its broader "stocktaking" exercise used to identify and develop case studies for potential inclusion in the final RPR report. Supporting references and documentation for each of the case studies are provided in a separate section (organized by Case Study) at the end of this paper.

Case Study A: Expanding access to land – the Farm Worker Equity Share program in South Africa

Identification

A history of land dispossession, denial of access and forced removals rendered millions of Africans landless over many years. After the transition to majority rule, things began to change and, beginning in 1994, the South African government introduced major land reform laws to increase land access to those who had been dispossessed. A large part of this effort has been in providing land for farm workers and tenants, by supporting their participation in rural land sales and land rental markets.

This case highlights the opportunities posed by the market-based, but pro-poor government-assisted mechanisms that the South Africa Land Reform has offered to facilitate the access of the poor to land, focusing on an innovative approach – supporting farm workers becoming shareholders of the farms where they live and work. The South Africa case is also one example of the modern trend toward market-assisted land reform programs.

Improved practices or innovations

Under the Land Restitution goals, individuals who had previously been dispossessed could claim financial compensation or restitution of their land. Most of the claims were related to urban properties but by the end of 2002, over 500,000 hectares of rural land had also been given back to their former owners (ETU, undated).

The Land Redistribution aspects of the reforms are more related to rural areas, aiming to increase assess to agricultural land and housing. One of its innovative aspects was to provide land acquisition grants to poor landless rural workers. By the end of 2000, 484 grants corresponding to 55,383 hectares had been approved for groups coming together in production cooperatives. Beginning in 2000, grant applications could also be made for the purchase of individual land and to cover improvements in farm infrastructure and technical conditions. These must be combined with some degree of contribution from the beneficiaries, also though bank loans or the Land Reform Credit Facility (ETU, undated; Knight et al., 2003; Neto, 2004). The Land Tenure Reform has also strengthened the protection of rights of those entering into land rental agreements (see box below), although in areas of strong customary rule, renting land out can increase the risk of loss of land rights (Dengu and Lybe, 2007).

Reducing land renting risks for settlers – statutory reforms

Land Reform Act 3 of 1996: protecting the rights of labor tenants who live and grow crops or graze livestock on farms; they cannot be evicted without an order from the court, nor if they are over 65 years.

Extension of Security of Tenure Act 62 of 1997: this protects the tenure of farm workers and people living in rural areas, including their rights to live on the land and the guidelines for other rights such as receiving visitors, access to water, health, education, etc. The Act also spells out the rights of owners, and protects against arbitrary evictions.

Prevention of Illegal Occupation of Land Act of 1998: This act puts in place procedures for the eviction of illegal occupants and prohibits illegal occupations.

-- ETU brief (n.d.) on South African Land Reform Policies.

One of the innovative aspects of South Africa's efforts to increase secure assess of landless farm workers is the Farm Worker Equity Share (FWES), whereby the land acquisition grants offered by Department of Land Affairs can be pooled together by labor tenants to buy equity-shares of the agri-business in which they are employed (and lived), becoming owners and co-workers. The goals of the FWES program are given in the following box, and an example is given below.

Farm Worker Equity Share (FWES) goals

– redistribution of wealth and future benefit streams (Eckert et al., 1996; Kirsten et al., 1996; LCRF, 2001);
– empowerment of farmworkers through skills transfer and their formal inclusion in policy making (McKenzie, 1993; Eckert et al., 1996; DLA, undated);
– retaining or attracting quality management (McKenzie, 1993; Lyne et al., 1998);
– sourcing capital from the private sector to finance new investment, i.e. preserving or enhancing creditworthiness (Lyne et al., 1998; Kirsten et al., 1996; Pitout et al., 1998);
– improvement of worker productivity and labour relations (Lyne et al., 1998; Van Rooyen and Ngqangweni, 1996; Eckert et al., 1996);
– provision for the transfer of both ownership and control of commercial farms to previously disadvantaged workers in the long-term (McKenzie,1993)

Knight et al, 2003

Costs and Benefits

Though field interviews, Lyne and Graham (undated) found that for the workers joining equity-sharing projects, the main motivation lies in the opportunity to influence managerial decisions affecting wages, working conditions, housing and tenure security for their families

more than in the potential financial gains. In parallel with the opportunities of ownership offered by the FWES program, farmers entering into these kinds of agreements still are still left with obstacles to overcome. Workers are generally unable to pool enough funds to buy a sufficiently large share of the business to shift the decision-making power balance in the company. Among nine cases studies by Knight and Lyne (2004), equity shares varied from 3.5 to 50 percent. In addition, as with as with any business investment, buying shares into a farming business comes with an embedded financial risk and requires a thorough and well informed assessment, so that poor farm workers are not attracted into ventures that are less about sharing risk and more about sharing profit (see box below).

Several important obstacles remain that could significantly improve the social benefits of these schemes. Because shares are normally in the operating enterprise, shareholders do not get to own land itself and are still liable to lose their homes if the business is unsuccessful. When shares are owned by a workers' trust, these can not be sold in the open market, only to other trust members, and thus are not liable to be sold at a competitive market price (Hall, Kleinbooi and Mvambo, 2001)

Becoming shareholders in their life's business

Since 1979, the Bezuidenthout family and their farm workers have been built the Naftali/Monte Estate from six hectares in 1979 to over 500 hectares, 212 of which are planted with table grapes, which are exported to markets around the world.

In 2005, a partnership between the owners and their longstanding workers incorporated all the assets and activities of the farm, and the Rekopane Estate (which means "we have come together") was born, consolidating real ownership for the people who had played an important part in the development of the farm.

Though the Farm Worker Equity Share Scheme, the Department of Land Affairs contributed R6.5 million (about $ 800,000 (U.S.) to which a loan from the Standard Bank was added. Sixty-five of the farm's permanent workers now own 25 percent of the newly established company, through the newly formed Loretlhabetse Trust (which means "the sun has risen for us" in Tswana). A local NGO will be providing skills development and technical training to the group, investing R500,000 (or about $ 60,000 (U.S.) over three years.

Cape Argus News, 2005

--photo from the Rekopane Estate website www.rekopane-estates.com

Sustainability

One of the obstacles that land reform settlers have been faced with is the lack of technical capacity to set up and manage a new farm and market its products; this has prevented beneficiaries from maximizing benefits from their new land resources (Deininger, 1999). Through the Farm Worker Equity Share (FWES) program, despite its implementation problems, permanent farm workers get to know their business very well and are supported by the experience of the farmer owner's longstanding experience. So, in this sense, this mechanism may represent a sustainable mechanism to increase and secure land access.

An alternative view of FWES prospects

"The position of the Western Cape's agroexport sector has become increasingly precarious as it has opened to the global market. By 1999, prices for fruit had bottomed out due to competition from other countries such as Chile, Argentina and China, as well as increasingly tight margins due to multinational MNCs' power to transmit costs downstream. Additionally, the effects of structural adjustment in the agricultural sector, including the end of subsidies, have decreased South African farmers' ability to compete. In short, FWES have attempted to redistribute wealth within an agroexport sector that is failing. The result of this market trend is that FWES beneficiaries' economic and social security has not increased. In fact, beneficiaries' security may be decreasing. On the two FWES studied there had been no dividends realized by beneficiaries, and on one of these FWES beneficiaries' tenure security appeared to have decreased due to the possibility of loan default and bank reclamation."

Kenfield (2006)

Replication and scaling up

Knight et al. (2003) mention 50 farm worker equity share schemes initiated by 1998, mainly in the Western Cape[25] and add that, in 2001, the Land Reform Credit Facility (LCRF) approved 11 additional loans for the same purpose. The same authors state that at that point this kind of scheme was developing across all nine of South Africa's provinces, involving wine, fruit, vegetables, olives, poultry, cut flowers, dairy and eco-tourism enterprises.

Key message and lesson learned

The FWES schemes, without requiring reallocation of beneficiaries and the destabilizing of the farm's structure and activity, can allow for greater farmer access to productive land. But this can only be fully realized with appropriate information, negotiation support, and technical and managerial expertise provided to prospective shareholders, in order to minimize the risks associated with their investments and to maximize real benefit-sharing. Knight et al. (2003) gives a good overview of the institutional arrangements that should be in place to realize the FWES goals.

[25] This draws on Lyne et al. (1998).

<u>Case Study B</u>: Increasing security of forest access and sustainable forest management by local communities – changes in Bolivian forest policy

Identification

To illustrate how changes in policy can successfully increase security of access to natural resources, we examine the provisions in recent Bolivian forest policy to improve the natural resource base of poor communities, to encourage its sustainable management, and to improve the livelihoods of the rural poor.

Bolivia's forest resources used to belong to the state and were only used or managed under utilization concessions granted to the private sector. Rural communities could not legally use their local forest resources and were vulnerable to loggers exploiting forest resources. During the 1990's, various sustainable forest management projects[26] contributed to influencing the Bolivian government to reform its forest policies allowing for a wider and more sustainable use of its forest resources, especially through community forest projects.

Improved practices and innovations

The new forest policy, coupled with the parallel agrarian reform[27], legally recognized the ownership of forests belonging to the indigenous communities, thus protecting them from disputes with private logging concessions. The new policy encourages sustainable forest management (SFM) and supports the creation of community-based forest enterprises, capable of generating employment and improved incomes for Bolivia's poor rural communities.

With the reforms in the forestry law, indigenous communities are given legal and secure use rights to the forest resources within their territories (Indigenous Communal Land or *Tierras Communitarias de Origen* (TCOs)). At the same time, the forest law also devolves 20 percent of public forestlands to municipalities, in the form of municipal forest reserves which must be used for the benefit of local communities though local forest user groups (*Agrupaciones Sociales del Lugar* (ASLs)). ASL's can also be granted use of additional forest areas without having to go public bidding (Contreras-Hermosilla and Vargas, 2002).

In both cases, commercial uses of forest resources must be regulated under a sustainable management plan set up by the user groups. However, in most cases, these communities lack the technical capacity and financial resources to develop and implement the management plans and set up their forest-based business enterprises.

Costs and benefits

Many indigenous communities in Bolivia have a heavy dependence on their forest resources, thus the fact that this law opens the possibility of securing rights over forest resources is critical. BOLFOR's evaluation of the income levels of the communities with which it is

[26] These projects included the FAO Community-based Forestry Project in Chapare, the activities of APCOB/SNV along with several indigenous groups, the Swedish project in support of PROMABOSQUE, ITTO's Chimanes Program, and the activities of FAO/FTPP with the Yuracarés (BOLFOR website: http://www.bolfor.org/contenido/antecedentes.asp); also see Contreras-Hermosilla and Vargas, 2002.

[27] Ley Forestal (Ley No. 1700), July 1996; Ley del Servicio Nacional de Reforma Agraria (Ley No. 1715), October 1996.

working found that about 24 percent of household income is drawn from forest products (de Dios Matos, 2005)

The Guarayo community in Curucú, for example, has succeed in setting up a production association (*Associación Indígena Maderera de Curucú* (AIMCU)), and, in 2006, was able to generate nearly $ 40,000 (U.S.). These funds were invested back into the community, in the salaries of forest workers, in investment in the technical capacity of the Association, and in improvements in the village's infrastructure. (Guzmán, 2007). Since early 2007, the community has also succeeded in having a large part of their forests certified under FSC standards.

Ambrósio Yaboo, President of the Central Indígena, and Roger Macué, Coordinator of the community-forest project, show the "Smart Woods" diploma of voluntary certification (under FSC), received on May 1, 2007. They now have 26,000 hectares of certified forest, and carefully selectively harvest 400 hectares each year, to ensure enough time for natural regeneration to take place.

--adapted from BOLFOR, 2007

© Katharine Byrne/TNC

The Nature Conservancy has been monitoring the biological diversity of these forests and has found that "biodiversity found in managed Bolivian forests is higher than in non-managed forests subjected to unregulated hunting and logging" (TNC website).

In the case of local forest users'groups (ASL's), the Municipal Forestry Units (*Unidades Forestales Municipales*, or UFM's) are set up to provide them with support to promote biodiversity conservation, reforestation and agroforestry. Indigenous communities have received support from projects such as the USAID-National Conservancy project for sustainable forest management – BOLFOR – one of the most important projects supporting the design and implementation of forest policy. This is now in Phase 2 (2004-2009), and has provided tools and training in forestry administration, forest products marketing, accounting and improved harvest techniques. But, as Contreras-Hermosilla and Vargas (2002) suggest, "the management of forests resources for commercial purposes is not part of the indigenous community culture and therefore, until they gain knowledge and experience, indigenous groups will be ill equipped to deal with market demands".

Weaknesses in the institutional arrangements for the implementation of the forest policy – lack of financial and technical capacity in implementation, bureaucratic and lengthy administration procedures – and longstanding difficulties in clarifying and legalizing property rights (which are the responsibility of the agrarian reforms) were responsible for serious

Policy provisions for sustainable forest management

"Forestry professionals are responsible for creating and executing realistic forest management plans along with the annual operational plans. The law foresees the execution of 15-year audits, control of annual operational plans, surprise inspections by the Superintendence or third parties (civil society and local governments)...[and] implicit incentive[s] to become certified...20-year forestry rotation as a minimum. As a consequence, only 5% of the total concession area can be harvested in any given year."

Contreras-Hermosilla and Vargas, 2002

delays in implementation of the policy. For example, to set up a municipal forestry unit – the body responsible for providing support to municipal forest user groups – costs range from about $16,000 (U.S.) to $ 62,000, with annual operating costs of approximately $ 32,000. The members of the ASL themselves also face high costs in covering the costs of setting up management plans (performed by a technical expert) and also in achieving legal recognition (costing around $4,000 (U.S.) (Contreras-Hermosilla and Vargas, 2002).

Sustainability

Due to the similarities between the Policy's sustainable forest management requirements and those of international standards for forest certification, and the fact that certified forests are not required to be audited by the government authorities, Bolivia is currently the country with the largest area of certified natural forests among tropical countries. (Contreras-Hermosilla and Vargas, 2002). From the point of view of poor rural communities these two incentives for certification also open the opportunity for them to capture added value of selling certified forest products in international markets, as the Cururú community has done. Despite this, the Law has been in operation from over 10 years, and progress is being made in democratizing access to forest resources (see following box).

Replication and scaling up

Contreras-Hermosilla and Vargas (2002) highlight the fact that by mid-2000, fours years after the adoption of the new Law, "the Superintendence had approved management plans in TCOs for about a quarter of a million hectares...The better-known experiences with the application of the Forestry Regime to date are those involving the Chiquitano people in Lomerio, Monte Verde, TCO Yuracares, TCO Yuquis and Territorio Indigena Siriono, Guarayos and some Guarani communities...37 AFRM's in 60 municipalities have been identified, and applications for AFRM's totaling 2.44 million hectares have been filed before the Ministry of Sustainable Development and Planning...In June 2001, the government delivered to six municipalities the respective resolutions ratifying the Municipal Forest Reserve Areas (Areas Forestales de Reserva Municipal AFRM's)."

At the international level, BOLFOR (2007) emphasizes that the other members of the Andean Community – including Colombia, Chile, Ecuador and Perú – as well as countries like Indonesia, are looking to Bolivia as an example of where to learn from in improving their national forest policies.

The Bolivia Forest Law – progress by 2002

"Achievements to date are important. Seven million hectares of forests are under sustainable forest management plans and now the country is a world leader in tropical forest certification with some 800,000 hectares of forest resources certified. Advances in the institutional field are remarkable, with the replacement of a corrupt and inefficient public forest administration by a professional and transparent one and with significant advances in decentralization and devolution to rural communities of some of the responsibilities and decisions for forest resources management. The difficult process of confirmation of land ownership rights benefiting indigenous communities is well under way. In addition, at least 14 enterprises now have access to some 1.4 million hectares with clear property boundaries and ownership rights. Industrial organization is evolving towards an integration of its operations with forest operations thereby creating greater efficiencies in industrial processing, in diversification of species exploitation and the composition of exports with a higher added value. Undoubtedly, the achievements of the reform efforts are impressive."

(Contreras-Hermosilla and Vargas, 2002)

Key message and lessons learned

The alliance between a committed government and technical and policy guidance from cooperating agencies for progressive policy-making generated a more progressive, inclusive and environmental policy, but to maximize its effects on the ground, greater investments are needed to resolve underlying land rights problems and build capacity within the communities so that they can benefit from the new opportunities presented by the forest policy reforms.

Case study C: Harvesting the benefits of sustainable watershed management in India – Sukhomajri and its descendents

Identification

This case study illustrates successful responses to the challenge of improving sustainable management and achieving livelihood improvements. These experiences also show how it is possible for customary (in this case, communal) management of natural resources to generate self-reinforcing incentives for sustainable management and to deliver livelihood improvements. In addition, the community dynamics and institutions created to manage the schemes were accomplished in a participatory manner, contributing to the empowerment of local communities in negotiating with central decision-makers regarding the resources upon which they depend[28].

[28] As far as we could determine, this case was not part of an IFAD project and did not receive specific financial support from IFAD. It has, however, been mentioned in the IFAD Research Grant Strategy for Asia and the Pacific, as a case that demonstrates "very well how rainwater-harvesting can be used as an entry point for eradicating rural poverty by generating employment, reducing migration and broadening the local livelihood base. Rainwater-harvesting requires collective action to succeed, and this can be adopted as a starting point for reviving the neglected tradition of community-based local resource management".

Despite the fact that this is a well known case, it remains interesting and relevant to our purposes here, as it has been successfully replicated in many other villages, whose schemes are still ongoing with many of the same positive results. This case also shows how local ownership of rights over resource use and management can create effective incentives for their sustainable management. In addition, it documents the outcomes of the application of integrated watershed management and its ecological and economic rewards; the scheme has been active for 30 years and its results are well-documented.

In the late 1970's, agricultural expansion in the hillsides of Sukhomajri village had led to severe land degradation and increased soil erosion. Despite the heavy rains, the village had no water and agricultural production was meager. Downstream, Sukhomajri's poor land management had also led to the severe siltation of Sukhna Lake, the main water supply source for the city of Chandigarh. To address this problem, CSWCRTI (the Centre for Soil and Water Conservation Research and Training Institute), based in this city, began working with the farmers in the village of Sukhomajri – one of the many villages in the catchment draining into the lake – to regenerate the state-owned forests on the village's hillsides by limiting grazing and assisting natural reforestation with the planting of trees.

In return, the Centre built rain water collection dams and helped implement other soil conservation measures. The dams also created an internal incentive to maintain the watershed protection measures, in that the villagers could see that with the implementation of the soil and water conservation measures their dams didn't silt up as quickly, and neither would Sukhna Lake. The village created a village development committee to manage the watershed project, the Hill Resource Management Society (HRMS), with representation from each household.

Lack of water availability for irrigation and land degradation considerably limited the village's use of their own resource base. By adopting participatory and integrated watershed management, they achieved considerable improvements in the village's standard of living. In addition, their work has also benefited the water supply of the downstream city of Chandigarh, by reducing siltation in Sukhna Lake.

Partly due to changes in government policy in terms of taxation of the use of resources (grass and timber) from state-owned forest, where the main watershed management measures have taken place, Sukhomajri has since lost a large part of the incentive for maintaining sustainable management practices, and the scheme has nearly come to a halt (this provides a lesson regarding the unintended consequences of policy interventions). However, similar initiatives are ongoing in many other villages throughout Haryana state and other parts of India. Sukhomajri villagers are nonetheless still better off than they were 30 years ago, and this is widely attributed to improvements in agriculture productivity stemming from increased water availability (Shresth and Devidas, 1999; Agarwal and Narain, 1999, 2000; Kerr, 2002).

> Sukhomajri, a village in Haryana State, became a model of self-reliant development in the 1980s. Its journey from the depths of poverty to a level of prosperity that made it the first Indian village to pay income tax has been a source of inspiration the world over. What lay behind this incredible story was its success in managing its ecological wealth by creating a powerful and united village institution: the Hill Resource Management Society (HRMS).
>
> *Down to Earth* Magazine, 2007

Improved practices or innovations

Sukhomajri set up an innovative way of sharing the benefits of their common efforts- each family was given an equal share of the water that was collected in the village's dams. Those who didn't not land, or enough of it to use the entire endowment, had the possibility of selling to those who needed it.[29]


Agarwal, A. undated.

This generated a real incentive for all to comply with the watershed management rules agreed-upon, as all could share in the positive results. The village saw significant improvements in agricultural productivity as land that had been left fallow was put back into production due to the increased water availability, and increased availability of grass led to improved livestock production and extra income from sales to local markets.

The village committee (HRMS) managed water allocation and distributed revenues from common extraction of *bhabbar* grass from protected hillsides to all villagers. The grazing ban was enforced by reducing the water use rights of owners of cattle found grazing in the hills.

Costs and benefits

Agricultural productivity improved considerably with the increase in water availability and the siltation load in Sukhna Lake fell by 90 percent, saving the city of Chandigarh an estimated $200,000 (U.S.) annually in dredging costs (Chopra et al., 1990, cited in Agarwal and Narain, 1999).

DTE (2007) reports that the yields of wheat and maize increased 50 percent between 1977 and 1986. Production of fodder rose from 40 kg per hectare in 1976 to 3 tons per hectare in 1992. In the forest, the number of trees rose from 13 per hectare to 1,292 per hectare. With more fodder available, the number of goats fell from 246 to 10 from 1977 to 1986, while the number of buffaloes rose from 79 to 291. Milk production rose steeply as a result. The village committee (HRMS) earned over Rs 170,000, up from Rs 43,797 in 1986-87, the first year it earned revenues. Since 2002, however, it has struggled to make Rs 4,000 annually.

Nonetheless, Gurmel Singh, Village Development Committee President of Sukhomajri, states that the village is still well off compared to the previous years: "the annual per capita income has doubled from the 1990s and tripled from the 1970s...at Rs 15,000, villagers earned 2.5 times Haryana's rural per capita income in 2005. Almost every family owns a car. Close to

[29] Irregularity in water flows led to replacement of this system by a user fee system whereby the Hill Resource Management Society collects fees for water use and distributes the revenues to all villagers.

560 buffaloes and cows provide 3,000 - 4,000 litres of milk a day, sold at Rs 12 per litre" DTE (2007).

Sustainability

Given the village's economic performance, the village committee became liable to pay income tax when this law was amended in 1989 and the HRMS was liable to pay 15 per cent tax on its income. In addition, the society also had to pay a 10 per cent sales tax on *bhabbar*, which was imposed in 1993 with a retrospective effect from 1991, and a toll was imposed on *bhabbar* delivered to the paper mills in Himachal Pradesh at the rate of Rs 100 per carriage (Rainwaterharvesting website, n.d.). In addition, in 1990 the agreement with the forest department to harvest grass from the hills was updated and a 25 percent charge on the income from common extraction of bhabbar was introduced. By 1998, the sales opportunities for *bhabbar* dropped as the paper industry turned to wood pulp instead.

According to DTE (2007), the village society is now making only 5 per cent of 1997-98 income levels, and can no longer maintain its dams and pipelines. This led to a fall in earnings from irrigation from Rs 4,000 in 1994-95 to Rs 3,300 in 2006-07 (not adjusted for inflation). Given the reduction in infiltration from the obsolete dams and a return to relying on groundwater, water table levels have dropped to 90m (in 1981-2 they at 40m), nearly as low as when the scheme began; in 1976, groundwater was only found at 120m.

Over the years, the regenerated forests in the hillsides have created a valuable forest. However, since the forest belongs to the state, the villagers have do not have full rights over its use. In 1997, the village entered into a joint forest management program to share the benefits of their stewardship work over the past 20 years, since then they are entitled to 30 percent of the revenue, once the harvest is allowed. Given these drawbacks, the village members don't experience the benefits of their common action anymore and have stopped seeing the incentive in the joint sustainable management of the watershed. The village committee stopped convening.

> Under the Indian water acts, the state has the sole right to capture, harvest and divert water. In three of the cases described above, the villages strictly speaking are managing the common property 'illegally': they have appropriated control, and after considerable tension and conflict they have reached an unwritten understanding with the government authorities.
>
> Narain, 2006

Replication and scaling up

A few years after the work began in Sukhomajri, a similar scheme was set up in the neighbouring village of Bunga, which generated similar improvements in agricultural productivity. The Integrated Watershed Development Programme-Hills (IWDP), funded by the World Bank, replicated the Sukhomajri experience on a large scale in five states in the northwestern Shivaliks, including Haryana. The project ran from 1990 to 2005 and supported over 100 similar projects.

The total cultivable land in the village is 250 ha. Within a year of irrigation starting, in 1985, around 122 ha area received water. Now 170 ha is irrigated by the dam and tube wells irrigate around 40 ha. Replacing maize and arhar (*Cajanus cajan*), wheat and berseem (*Trifolium alexandrinum*), a water-intensive fodder crop, now cover the fields. Experiments with hybrid varieties were carried out on a 40-ha plot to boost yields.

The yield per hectare has jumped from 900 kg to 3,000 kg for wheat and from 800 kg to 2,200 kg for maize with irrigation and hybrid varieties. Farmers also introduced new crops: rice, sugarcane and cotton.

The livestock composition changed. The village had 800 cows, but later the number of buffaloes, requiring more feed and producing more milk, increased. The number of buffaloes, cows and bullocks has increased by 320, 47 and 33 per cent. Milk production has gone up from 1,100 litres a day to 4,000-5,000 litres. The surplus is sold at Rs 12 a litre.

Regeneration of the commons brings in more profits from *bhabbar* and fodder. "Our yearly per capita income has risen to Rs 10,000 from almost nothing since the construction of the dam and the development of the commons," says Bhikha Ram, a former HRMS president who owns 1.6 ha.

-- from DTE (2007)

Key message/lesson learned

Rights to natural resources are crucial; they determine long-term investments and can have major effects on agricultural productivity and improved resource management. In Sukhomajri, the villagers' efforts paid off while they were in charge of their own forest and water. This "win-win" outcome generated both higher returns to farmers and improved environmental outcomes. Once the forest department became more active in protecting its forest and the tax structure was changed, the villagers lost ownership and the incentive for sustainable watershed management. This shows the significantly negative effects that regulatory and policy changes can unwittingly precipitate when they are made without understanding local settings and the impacts of these changes on incentive systems.

In Bunga, the situation was more favorable since half the microcatchment area being treated there belongs to the village and the benefits generated from its sustainable management stay with its farmers. They continue to sell *bhabbar* grass as fodder, and the society earns Rs 60,000-70,000 annually. Additional income comes from water sales (Rs 10,000) and is generated from water and fish cultivated in the reservoir (Rs 12,000). Over the past seven years, the society has earned Rs 90,000 annually. They pay no taxes. Due to this increased stability, the village development committee was able to safeguard its arrangement when, in 1992, new legislation directed revenues from village commons to the village's local government office. The village won its case, allowing it to continue investing water revenues back into the management of the watershed. Since the incentive remains, the village development committee is more active and still today meets once a month to deliberate on the management of the village's crops and water use.

Bringing the Arvari River back to perennial flow

Water flow in the Arvari River had reduced considerably in the last decades, becoming either a temporary stream during the monsoon or remaining completely dry the entire year. Faced with increasing concern over future water supplies and indifference from Government, local communities, together with the NGO Tarun Bharat Sangh (TBS), began building *johads* (earthen structures built across a slope to retain run off and sediments) on their lands to collect rain and increase infiltration in order to recharge ground water reserves and eventually increase the flow of the Arvari river. Farmers contribute with up to 80% of the costs of the watershed treatment structures (mainly with labour).

Along with forest regeneration in upstream degraded slopes, these measures are reported to be responsible for year-round water supplies with the return of permanent water flow in the Arvari and Ruparel rivers and the rise of water tables, returning water to the wells in the region. In addition, the *johads* provide water storage closer to the villages, which has also reduced water fetching time has been reduced and women are able to invest more time on other economic activities.

This village also had problems in claiming the benefits of their watershed management when the state irrigation department rendered their johad illegal, as all drains and small streams are government property. The villagers did however manage to keep the structure in the end.

Shresth and Devidas. 1999; Agarwal and Narain, 2000; Narain 2006

For more details on this case see:

Website of the lead NGO: Tarun Bharat Sangh
www.tarunbharatsangh.org/programs/water/arvariparliament.htm

Kishore, A. Taking control of their lives. Eco-Economics section of The Ecologist Asia, Vol. 11, No. 3, July-September, 2003. Available at:
www.sanctuaryasia.com/features/detailfeaturescategory.php?id=558&catid=41

Case study D: Improving security of access and sustainable management in fisheries – putting management in the hands of the Samoa's coastal villages

Identification

In Samoa, 230 of the 326 villages are coastally located, and livelihoods depend mainly on nearshore fishing by canoe or on foot. Heavy exploitation of coastal waters and use of destructive fishing methods have led to past declines in inshore productivity[30]. In 1995, the Government of Samoa, with support from the Australian cooperation agency (AusAID), the Samoa Fisheries and Extension Project[31] began moving away from a centralized and nation-

[30] FAO Fishery and Aquaculture Country Profile: Samoa. Available at: www.fao.org/fishery/countrysector/FI-CP_WS/en

[31] Current involvement of AusAID could not be determined. From the literature available it appears that the government of Samoa is still supporting the expansion of this approach to other villages, much as elsewhere in

wide approach to inshore fisheries management and supporting the villages interested in devising a plan to manage their own fish resources. This was/is not a mandatory program. Other similar cases exist throughout the Pacific – notably in Fiji (see box below) – with similar positive results.

Improved practices or innovations

The Fisheries Division has demonstrated a workable management process in showing the benefits of local management and providing technical support services to each of the villages in order to develop its own Village Fisheries Management Plan. In designing village-level management plans, fishing practices and problems are analyzed and suggestions for improvement are laid out. Management options include fishing restrictions and conservation measures like banning the use of chemicals and dynamite to kill fish, establishing small protected areas in which fishing is not allowed and setting limitation in the size of the fish captured (see table).

According to Chester (1998), "as the program progressed and the sincere villages did set up proper fisheries management schemes, some of the villages, which were not interested at first, approached the Fisheries agents and asked if they could participate. After some 30 villages became involved in the program, other villages began approaching the Division rather than Fisheries officers approaching the villages".

Though this approach, the management of inshore fisheries is handled by Village Fisheries Management Committees. These committees are made up of three or more representatives from each of the titled men, untitled men and women's group (SPC, 1998)[32]. The village council has the authority to turn the measures in the fisheries management plan into bylaws, also applicable to non-residents and enforced by the fisheries division staff as well (Tiitii, Trevor and Kallie, 2001) For the residents, enforcement is done by the village's traditional authorities and can range from warnings to banishment from the village.

An additional interesting aspect of this is that the fisheries department offers support in the development of alternative sources of fish resources (like tilapia fish ponds) to help villages cope with the short-term shortage of food due to the introduction of resource use restrictions. In the long run, these restrictions are expected to allow the lagoons to recover from overexploitation, harmful fishing practices and environmental damage.

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the Pacific, but no specific references were found confirming this for Samoa in particular. To our knowledge, no IFAD support was involved when this project was originated.

[32] For more on the process of setting up the management plan, and its wide participatory base, see Kallie and Taua (1999) and Tiitii, Trevor and Kallie (2001).

Management measure	Percentage of villages using measure
Banning the use of chemicals and dynamite to kill fish.	100%
Banning the use of traditional plant-derived fish poisons	100%
Establishing small protected areas in which fishing is banned	86%
Banning other traditional destructive fishing methods (e.g. smashing coral)	80%
Organising collections of crown-of-thorns starfish	80%
Enforce (national) mesh size limits on nets	75%
Banning the dumping of rubbish in lagoon waters	71%
Banning the commercial collection of sea cucumbers (*Holothuroidea*)	41%
Banning the capture of fish less than a minimum size	41%
Banning removal of mangroves (in villages with mangroves)	27%
Restricting the use of underwater torches for spearfishing at night	21%
Banning the removal of beach sand	14%
Placing controls or limits on the number of fish fences or traps	<10%
Prohibiting the collection of live corals for the overseas aquarium trade	<10%
Banning the coral-damaging collection of edible anemones (Actinaria)	<10%
Protecting areas in which palolo worms, *Eunice* sp, are gathered	<10%
Offering prayers for the safe-keeping of the marine environment	<10%

Source; FAO, 2002.

> As part of the ongoing extension service, at least monthly visits are made to the village to discuss progress and problems, arrange training workshops, monitor the fish reserve, measure clam growth and mortality and collect records for outer reef slope fishing. The Fisheries Division assesses their management capacity at six-monthly intervals and provides feedback to the committee.
>
> Tiitii, Trevor and Kallie, 2001

Costs and benefits

Some early assessments of the impacts of these management plans have shown that "villages with management plans have the highest catch rate of 2.8 kg per person per hour, compared with coastal villages with no management plans where the catch rate is 1.8 kg per person per hour" (King, Passfiled and Ropati (2001), cited in FAO, 2002)[33]. Kallie and Taua (1999)

[33] In a similar management system set up in Fiji (see section on *Replication and Scaling-up*), the number and size of Kaikoso clams – a staple and primary source of income - increased so much in the no-fishing areas and adjacent harvest areas, that the community decided to keep the no-fishing ban indefinitely (Tawake and Aalbersberg (2003), cited in WRI (2005)).

state that, although not all villages have performed well (due low activity of the fisheries management committee or lack of enforcement of village rules), 25 percent of the villages at the time of their study were managing their own fisheries effectively.

This process has improved the cooperation between the fishing communities and the Fisheries Division. On one hand, the villagers rely more on the Fisheries Division as a provider of technical expertise and information on harvesting, processing, marketing and management of fisheries. On the other hand, villagers are increasingly recognized as important sources of the information and data needed by the Fisheries Division for resource assessment, management and development (SPC, 1998). Women have also benefited from this increased dialogue. While in the past they relied more on church groups or women's organisations for assistance in fisheries-related matters, they can now access this information from the technicians from the fisheries department, receiving advice and training.

AusAID (2000) reports that the project was very successful in "building on traditional management practices and providing village communities with the power to enforce regulations has resulted in a high level of ownership of the project, and a commitment to conservation in virtually all villages visited during field evaluation".

Sapapalii – an example of community-based fisheries management and development

"An example of broad community-involvement can be illustrated by looking at the village of Sapapalii on the island of Savaii. Representatives from Sapapalii first approached the Fisheries Division with a request for help in setting up a tilapia pond. From this the village became interested in the extension and training project and went on to develop and implement a Fisheries Management Plan for their village. The cost of hiring the excavator to create the tilapia pond was met by holding fund-raising activities within the community's raffles, dances etc. The Fisheries Division provided advice and, when the pond was completed, stocked it with tilapia fry. The whole community provided their skills for work on and around the pond, erecting and decorating buildings, establishing gardens around the pond for plants to feed the tilapia, and building fences. At the same time the village introduced bans on damaging fishing methods, marked out a fish reserve, brought in restrictions on harmful environmental practices and started raising funds to buy small aluminium boats for fishing outside the lagoon [to relieve inshore fishing pressure]."

SPC, 1998

While the information currently available does not allow us to judge the cost effectiveness of the improved management approach, since the scheme is mainly managed and monitored locally, it likely requires lower financial investment that a centrally-run operation. During implementation phase however, the number and mobility of Fisheries Division extension officers may increase costs. Workshops and awareness campaigns also require investment, which could amount to an estimated $ 3,000 (U.S.) in the first year and drop to $ 500 in the years after.[34]

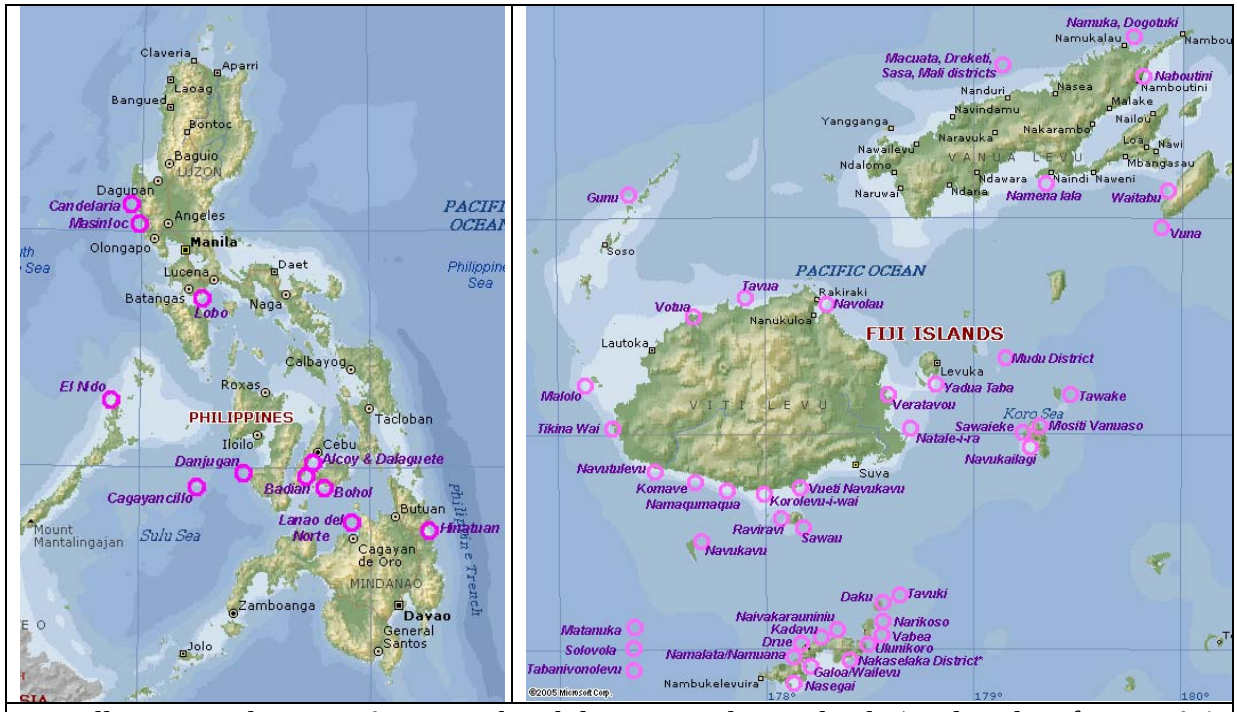
[34] These cost estimates are drawn from the Fiji example mentioned above (see section on *Replication and Scaling-up*).

Sustainability

Given current political will, increased health of the fishery resources, and social ownership and participation, the system appears to be a sustainable response, both in economic and environmental terms. Given that the available literature does not provide updates on the current status of this particular initiative, we could not determine how it is currently developing and whether or not it appears to be a long-term positive response. However, as described below, this is not an isolated experience and similar approaches with comparable success are ongoing in many other parts of the Pacific region.

Replication and scaling up

According to SPC (1998), by the middle of that year, 51 (of 230) coastal villages in Samoa had approved Fisheries Management Plans. Tiitii, Trevor and Kallie (2001) state that the Samoan experience is an example subsequently followed in other parts of the Pacific, where communities owning rights to their traditional fishing grounds have reinstated customary management practices to ensure the sustainable management of these common resources. These practices include fishing restrictions and protection measures such as the ones adopted by the Samoan villages.



Locally Managed Marine Areas in The Philippines and Fiji Islands (circles identify LLMAs)
Source: LLMA network website: *Where we work* http://64.78.32.149/Site_WhereWeWork.cf

Today, these measures are being institutionalized under Village Fisheries Management Plans such as the ones in Samoa. In other parts of the Pacific, these are also known as "locally managed marine areas" (LMMA's). In 2000, a regional LMMA Network became the link between the various community-based marine management projects springing up around the

Pacific (with initiative in Indonesia, Papua New Guinea, Solomon Islands, the Philippines, Palau, and Pohnpei).[35]

In Fiji – Adopting Fijian customs to the management of marine resources

The communities using traditional fishing grounds own customary fishing rights to these areas – the *qoliqolis* – which are accurately mapped, delineated, and bound by survey lines, with records maintained by the Native Fisheries Commission. Customary practices ensure the sustainable management of these common resources. These include temporary closures of fishing zones, limitations on the number of fishers or the amount of fish they can harvest, restrictions on using certain fishing practices, and the imposition of a *tabu*, or prohibition, on fishing for certain species. Today, these restrictions are being brought back and combined with modern techniques under the plans that govern locally managed marine areas (LMMAs).

Under current law the Fijian government holds title to the *qoliqolis*, as it does all marine waters. Now, as a direct result of the Fijian LMMA's work with local communities, there has been growing pressure for the government to return legal ownership of the country's inshore fishing areas waters) to their traditional owners – local chiefs.

To date, nearly 60 LMMAs involving 125 communities with *tabu* areas have been declared in Fiji, covering about 20 percent of the country's inshore fishery. The locally managed marine area approach spread within Fiji and other nations in the Asia-Pacific region through the creation of the LMMA Network, which now has members in Indonesia, Papua New Guinea, Solomon Islands, the Philippines, Palau, and Pohnpei.

--adapted from World Resource Institute, 2005

Key message/lesson learned

The overall lesson we can draw from the experience with village fishery management plans in Samoa, at this stage of research, is that, if well implemented, this approach can be very effective in increasing fish resources and habitat quality, and improving local capacity and engagement in common management objectives.

Assuming that appropriate investments in capacity-building and support for facilitation are made, communities can and will freely impose upon themselves a variety of fishing restrictions with a view toward protecting the long-term sustainability of the resource. Early results showed that this approach yielded positive returns in the medium-term. This is confirmed by the proliferation of similar schemes for fisheries protection and sustainable use thoroughout the Pacific region.

[35] For more on the network see www.lmmanetwork.org

<u>Case study E</u>: Enabling the poor to take advantage of markets for environmental services – the global carbon market and community forestry in Sierra Gorda, Mexico

Identification

Agriculture is involved in many ways in the global debate over climate change and carbon markets – in terms of its key role in contributing to climate change mitigation, its involvement in securing financial support for the implementation of land management options that may help reduce and offset emissions, and, of course, in improving the livelihoods of poor farmers. Nonetheless, the rural poor may face difficulties in accessing the global carbon market. This case illustrates the obstacles faced by poor rural communities accessing and benefiting from opportunities of new markets, and highlights the strategy used to overcome (and avoid) them.

This narrative provides a brief overview of the process, obstacles and alternatives explored by an NGO working to access the opportunities posed by the Clean Development Mechanism (CDM) as an additional source of funding for the sustainable management and conservation of Sierra Gorda Biosphere Reserve, in the Mexican State of Querétaro. This journey took seven years and, in the end, it was only the voluntary market "door" that allowed them into the global carbon market.


Source: Sierra Gorda Biosphere Reserved website

Improved practices or innovations

The Grupo Ecológico Sierra Gorda was created in 1987 to respond to local concerns regarding degradation of a very rich and ecologically varied region of central Mexico. Most of the inhabitants of the Sierra are subsistence farmers, with average plot size of about three hectares, often on very steep slopes. In 1997, Grupo Ecológico succeeded in getting the area designated as a Biosphere Reserve comprising 383,567 hectares. It secured funding from the Mexican government (with GEF and UNDP support) to implement its management mandate, combining conservation with improved rural livelihoods. The following year, Grupo Ecológico began working with a Canadian environmental consultancy to identify investors for a large-scale CDM forestry offset project. After four years, the project had finally passed all the design hurdles and was ready for investment. But the required interest and support never materialized. The project, as a CDM venture, never left the drawing board even because CDM

projects do not allow for investment from prospective buyers and the group, and the farmers it represented, could not finance the up-front costs needed to begin the reforestation project.

Following a lengthy and costly process to set up a CDM-eligible investment project, the NGO turned to the voluntary market, which is more flexible in allowing reforestation, has lower verification costs and also pays better. In the voluntary carbon market, 40 percent of the market value comes from forestry projects (including avoided deforestation); prices range from $0.45 (U.S.) to $ 45 per tonne, while in the regulatory market prices rarely rise above the $10 mark, with only one percent of the total $ 30 billion (U.S.) in 2006 originating in forestry projects (Hamilton et al., 2007; World Bank, 2007). These differences are, at least in part, because voluntary buyers of carbon credits are not necessarily only interested in buying the cheapest credits. The buyers of Sierra Gorda's carbon credits are also interested in supporting biodiversity protection, the livelihoods of the rural poor and the overall sustainable management of the Reserve. The first sale was accomplished in 2006 to the United Nations Foundation[36]. By the end of 2007, a second sale to the Foundation was about to be completed, and another to the European NGO, World Land Trust[37].

This experience has shown the Grupo Ecológico that "CDM rules are too high and too expensive to create a good deal for the people of Sierra Gorda" and that "to claim that the CDM is the perfect tool for fighting both abject poverty and environmental degradation in Mexico...seems a slightly dishonest form of green branding" (Pati Ruiz, Director of Grupo Ecológico Sierra Gorda, cited in Hawn, 2005).

Costs and benefits

In Sierra Gorda, participating farmers can participate in the carbon project by setting aside parts of their lands to natural regeneration, forest conservation (or avoided deforestation) and reforestation. These modalities are also in line with overall sustainable land management, and allow the group to bundle different environmental services for sale, reflecting the Sierra Gorda's rich ecosystems[38]. While we could not determine how much do farmers receive for their carbon sales, we can derive payment levels from those practiced by the national program, in which the Sierra Gorda carbon sellers are also participating. Through this programme, farmers are paid between $ 5- $ 10 (U.S.) per ton of carbon their project stores. In addition, farmers adopting agroforestry receive $ 93/ha/yr (U.S.) and up to $ 373/ha/yr for improvement of shade-grown crops (Diario Oficial, 2004).

Mexico has two nation-wide environmental services payments programs: the National Program for Hydrological Environmental Services (PSAH) and the Program to Develop Environmental Services Markets for Carbon Capture and Biodiversity and to Establish and Improve Agroforestry Systems (PSA-CABSA). The Grupo Ecológico succeeded in helping the farmers in the region participate in these programs; the table below gives the payment levels.

[36] See www.unfoundation.org/features/earthday2006.asp

[37] See www.worldlandtrust.org/projects/mexico.htm

[38] See map of the different priority areas for investment in environmental services in www.sierragorda.net/programas/conservacion.htm

Level of Payments in Mexican National PES Schemes

PSAH: well-preserved forest (with at least 80% forest cover); water protection of forest:

-- *Primary forest*: about $27 (U.S.)/ha/yr
-- *Cloud forests*: about $36 (U.S.)/ha/year

CABSA: reforestation and agroforestry

-- *Carbon sequestration*: about $5 (U.S.) per ton of CO_2
-- *Biodiversity protection*: up to $ 47,000 (U.S.) per project per year
-- *Conversion to agroforestry*: $ 93 (U.S.)/ha/yr
-- *Improvement of shade-grown crops*: $373 (U.S.)/ha/yr

Mexican Forestry Commission website: www.conafor.gob.mx

Sustainability

Considering the rise in demand – between 2005 and 2006, the voluntary offset market grew by 200 percent – the overall size of the voluntary carbon market ($91 million (U.S.) in 2006) (Hamilton et al., 2007), and the increasing consolidation of standards in the voluntary segment of the market, the scheme has a good prospect of being sustainable. Certainly many other factors will come into play, relating to pressures for land use changes, levels of payments received, monitoring to assure compliance and continued viability of the voluntary carbon market. However, given the lengthy experience of the Grupo Ecológico and their continued engagement in looking for ways of improving the livelihoods of the Sierra's inhabitants, the scenario for long-term survival and viability of the scheme looks positive.

Replication and scaling up

As experiences such as this one are shared and the opportunities offered by the voluntary market become more visible, it seams likely that other community-based carbon projects will turn to this segment of the market. This is likely already happening and is probably one of the underlying reasons for the fast growth of this market segment.

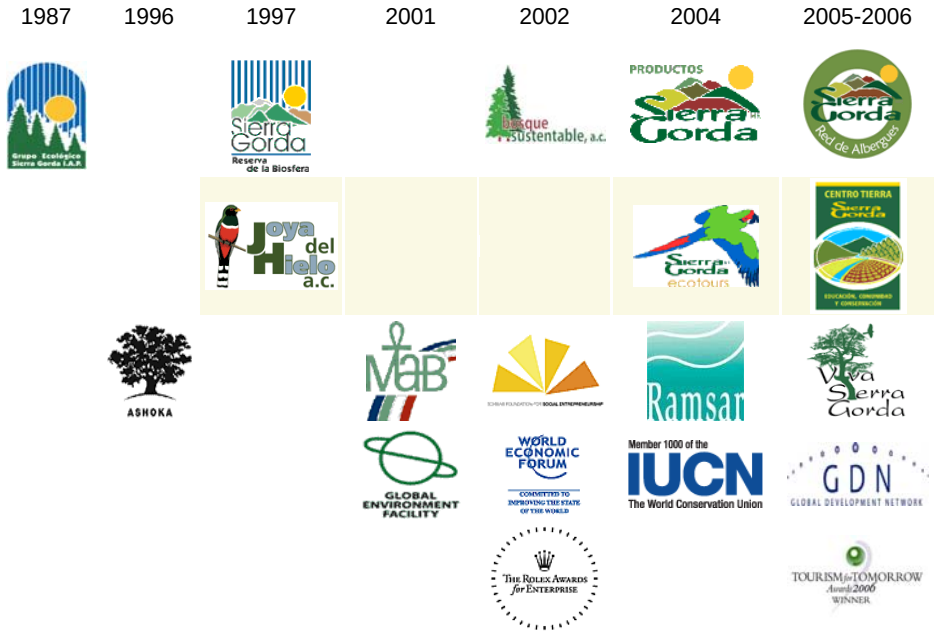
"If only someone could have told me seven years ago that my project wasn't right for the CDM, it would have saved so much time, so much energy, so much money."

Pati Ruiz, director of the Grupo Ecológico Sierra Gorda, in Hawn, 2005

Key message/lesson learned

One of the main lessons here is the vital role of a committed local institution that is willing to support local communities over the long term in addressing the many obstacles that arise in

implementing this kind of project. Another interesting aspect of this experience, is that, to cater for different needs and strengths of the communities in the Sierra, the group has aggressively branched out and created local partner organizations specialized not only in carbon projects but also in the marketing of local products and ecotourism. The image below conveys the growth and diversity of the organizations involved.



Source: Sierra Gorda Biosphere Reserve website, www.sierragorda.net/quienes/lineadetiempo.htm

IV. Key Lessons for Improving Resource Assess and Sustainable Management

The preceding discussion suggests a number of different lessons regarding how to enhance natural resource access by the poor and sustainable resource management, and, through these improvements, how to improve the livelihoods of the rural poor. The points below briefly summarize some of the lessons learned and their implications for management and policy. It is important to note that although the specific forms that these points assume differ by type of resource – land, water, forests, fisheries, crop genetic resources – many of the same overriding themes recur in each.

Natural resources and the poor

- The rural poor have long suffered because they *depend disproportionately on natural resources* for their livelihoods, but lack secure access to natural resources of sufficient quantity, quality and value to ensure adequate livelihoods. Improving access to natural resources is a critical element in – and in many cases, a precondition to – improving the livelihoods of the rural poor. But it is not adequate, in and of itself, to assure the generation of adequate livelihoods and the reduction of rural poverty. Access by the poor to natural resources must be enhanced along with access to other key forms of capital: physical

(technology, infrastructure), financial (credit), human (education, health), and social capital.

- Conditions of *resource scarcity* are increasingly characterizing land, water, forests, and fisheries. The reasons for this are many: population growth, migration, increasing food demands, resource use intensification and other factors, as reviewed in this report. In many cases, it is those resources facing common property and open access problems where scarcity is most acute and non-sustainable patterns of use are reaching crisis proportions, such as with many marine and inland fisheries and water resources. In these situations, the critical constraints to improved access and management are often ones of rights of access, tenure and governance.

- The many traditional challenges to natural resource access and management are compounded by numerous emerging challenges. By changing patterns of temperature, precipitation, disease and other variables, *climate change* will alter the quality, quantity, values, and levels of risk associated with natural resources. At the same time, increasing demands and higher prices for agricultural commodities, whether from increased food demand in some developing countries or increased *biofuel production* in some others, are raising the values of natural resources on which the poor depend, with resulting differential impacts on the poor. These challenges may prove to create stresses of such magnitude that incremental policy and management changes may be insufficient to improve rural poverty and/or environmental sustainability to levels desired by society. More radical changes may prove necessary to effectively address these challenges.

- The rural poor face a *tremendous diversity and heterogeneity of resources and environments* within which those resources are used. Similarly, there is a wide diversity of tenure regimes which apply to these resources: private property, customary systems, state-owned resources and a variety of "hybrid" systems. This heterogeneity of resources and tenure systems has several implications: 1) the "critical constraint" limiting improved access and management in any given instance will differ from that relevant in another setting; accordingly 2) there is a diversity of solutions, whether in the realm of tenure regimes, institutions, policies or management solutions; and 3) there is an attendant difficulty in the "scaling up" of these solutions to other environments.

Increasing access to natural resources

- Whether in accessing land, water, forest, fishery or crop genetic resources, *initial conditions matter* – initial conditions relating to agro-climatic conditions, to access to markets and infrastructure, and to effective institutions. A rural household cannot benefit from the many productivity-enhancing technologies in land and water use without access to the land and water resources on which to employ those technologies and practices. The benefits of access to credit typically require land ownership as collateral in order to receive credit to begin with. For these reasons, for many of the extreme poor and the landless, the key elements in reducing poverty are often ones of governance, tenure frameworks (statutory and customary) and institutions, e.g. those elements that influence rights to access.

- *Centralized state-led efforts* to improve resource access by the poor have had mixed, and in many cases, downright poor results. Accordingly, efforts to improve resource access and management, particularly since the 1980's, have increasingly stressed alternative strategies

– the *devolution of resource management* to local institutions, users' groups and individuals, the *empowerment of local people* to take a direct role in the improvement of their livelihoods, and an increased role for *private incentive- and market-oriented solutions*. The state's role remains a key one in many areas, including establishing appropriate legal and statutory frameworks to facilitate resource access, in improving the functioning of private property rights systems, in legitimizing customary tenure arrangements, in facilitating improved resource access by communities and user groups, and in creating an enabling and supportive policy environment in general.

- Recent trends in land reforms have emphasized *market-assisted land reforms*. Market-based land rental markets provide an important mechanism by which the poor can access land (though with some well-known limitations). Land rental markets can function under both formal titling and customary rental arrangements, although the latter, in particular, can create problems of insecurity and conflicts over land. The effectiveness and efficiency of land markets can be improved by avoiding constraints on land rental (in most situations), by reforms to reduce the prevalence and severity of market failures, and by an improved policy environment that backstops the functioning of these markets. In terms of their capability to increase land access by the poor, land sales markets face many more obstacles.

- Increasing access under tenure systems for *common property and open access resources* – water, forests, fisheries and crop genetic resources – faces highly varied institutional settings, and the role of the state versus that of local groups, institutions and individuals is diverse. For water resources, the state plays a key role in setting statutory law and the regulatory and institutional frameworks governing water allocation and use; however, local users' groups are increasingly involved in water management in irrigated areas, as are individual households in rainfed regions. With respect to forests, local communities and users' groups and the private sector are playing a growing role in both ownership and management, but central state authorities still dominate forest ownership and management in most developing countries. In fisheries, perhaps because of the magnitude of the crisis facing this resource, international and national treaties and institutions play an increasingly central function in establishing regulations and the "rules of the game" which guide fisheries management; however, private individuals and firms and local communities play a key role in managing the resource. For crop genetic resources, farmers and private firms retain the dominant roles in CGR management, seed production, marketing and distribution, but the public sector retains an important role in helping provide improved crop genetic resources for the rural poor, especially those in marginal production environments.

- Some of the poor, notably women, have been traditionally disadvantaged in accessing natural resources. Improving access on the part of these groups requires particular attention and through diverse mechanisms[39]: governmental reforms that legally recognize *women's rights in land*, individually, as groups, and through joint spousal land titling; increasing accessibility and transparency of land registration programs and land adjudication processes; and the targeting of programs, advocacy efforts, training and public education campaigns to raise awareness of resource access options for women.

[39] See ICRW (2007) and Quan (2006) for more detailed recommendations.

Increasing security of natural resource access

- A central key to achieving access is *assuring security of access*. In many case, this is often best achieved by private, individualized ownership. But security of access can be achieved in customary systems as well. Security of access provides many benefits, including 1) creating necessary incentives for the poor to invest in measures that may be costly in the short term, but that pay off over the long run and enable the poor to ultimately escape poverty, 2) enabling the poor to gain access to credit, one of the most reliable mechanisms to increase land productivity and income, and 3) creating incentives for the transfer of land through capitalizing productivity-enhancing improvements in land values.

- While not appropriate under all conditions, particularly when customary systems remain strong and effective and the costs of titling are high, *private titling* to land or forests is preferred in many instances, because it is most likely to ensure that landholders derive the benefits of increased security of ownership and use. Titling needs to be facilitated by: greater transparency in administration; participation of smallholders in the land registration process; assuring consistency with customary land and forest tenure practices; assuring access by women; effective monitoring; and assuring cost-effectiveness[40].

- Customary tenure arrangements can provide security of access to land, water, forests and fisheries in a wide diversity of contexts, but they are under threat from many sources. These arrangements should be better legitimized through *legal recognition and codification of customary systems* by central governments to help provide the required security of access for the poor. There are many means to accomplish this, including: establishing more defined terms of tenure and use rights (duration, property boundaries, etc.); permitting group rights in land (particularly with transactions costs to achieving individual rights are high); establish effective enforcement mechanisms; assure that tenure systems are sufficiently flexible to permit adaptations in resource use over time[41]. Particular emphasis needs to be given to securing access rights of women and indigenous groups.

- Knowledge concerning who has the rights to land, forests, water and fisheries – particularly for common property resources – is often widely lacking. Knowledge of (claimed) ownership and use rights by all parties is an essential first step to clarifying ownership and use rights, resolving disputes, and legally recognizing customary rights. Establishing or maintaining clear and secure access for the rural poor requires *identification of existing rights and boundaries, documentation of multiple and overlapping claims, and adjudication of conflicting claims*, whether in a customary property system or a private property system.

- One common mechanism for helping in the recognition and formalization of resource access rights under customary systems has been *decentralization and devolution of state authority to community and user-groups*. The process of devolution has been difficult in many cases, and is not a panacea. But it has been successful in many cases. Although there is no formula for success, enabling conditions for successful devolution and decentralization initiatives can include[42]: supportive changes in the policy and legal environments; assuring effective community demand; strong and effective monitoring and

[40] See Feder and Nishio, 1999, for further details.
[41] See, in particular, Deininger (2003) for further discussion.
[42] Shyamsundar, et al. (2005) address these facilitating conditions in detail.

enforcement; and technical, financial and institutional support by relevant external organizations (donors, NGO's, etc.).

- Conflict and disputes over access to natural resource are endemic in many (most) places. This is inevitable in that the underlying distribution of resources often reflects the outcomes of historical circumstance and past, sometimes stark, inequities in wealth, access and power. Open access resources, by their nature, especially tend to engender conflict. Thus a central focus of achieving security of access is identifying *mechanisms and institutions for conflict resolution* by which affected parties can seek to settle disputes and claims. This can include a wide diversity of both formal statutory and customary mechanisms (as well as "hybrid" mechanisms), and increasingly involves international treaties and agreements.

- In some instances, overlapping interests in resource access and use erupt into conflict. *Resolving and avoiding conflicts over resources* can be facilitated by a number of steps, including: assuring transparency of information to help build trust and the foundation for consensus-based decision-making; recognizing the legitimacy of the claims of multiple stakeholders, especially in the case of rights to open access resources; pursing administrative innovations such as devolution, strengthening of local governments, co-management strategies, and emphasizing more facilitative roles for government officials, such as in supporting community resource management efforts; and using independent mediators in helping to reach solutions to natural resource management conflicts.

Enhancing sustainable management of natural resources

- Improved resource access, in and of itself, is rarely enough to foster the generation of adequate household livelihoods. As resource scarcity increases in many settings, *making more effective and productive use of available (limited) resources* is an utmost priority. This is particularly for open access and common property resources, the uses of which are reaching crisis proportions for many of the rural poor.

- Sustainable resource management typically involves deferring current consumption in favor of making *investments to increase future resource productivity* and the likelihood of increased consumption by future generations. These can be private investments made at the household-level – for example, investments in improved land and soil fertility, tree planting, agro-forestry systems and improved forest management, and irrigation systems and other water management technologies – or they can be public investments that increase the supply of public and quasi-public goods, that, directly or indirectly, enhance the livelihoods of the poor. Many of these investments, however, will only pay off in the long run, which can be a challenge for the poor, faced with many current period needs.

- Improving sustainable management, under private, customary and state tenure regimes, will often require *improved resource measurement, monitoring and control mechanisms* as a key part of better management. These mechanisms are diverse and include: measurement and scheduling of water flow in irrigation management schemes; improved water control and harvesting practices at the household level; in the case of groundwater, monitoring water withdrawals and water table levels; better demarcation of land boundaries; assessing species diversity, forest structure and patch size in forest management; determining total

allowable catch and optimal quota size in fisheries; etc. These are just examples of the types of needs that arise in increasing the efficiency of resource use.

- *Co-management strategies*, involving the joint management of resources by both state authorities and local communities and user groups, are increasingly prominent in resource management, particularly for open access and common property resources. Participatory irrigation management, joint forest management, and co-management in fisheries are all examples of co-management strategies and "hybrid" institutional arrangements arising in many countries. Many of the same criteria for success are shared across these resources, including: clear definition of property rights and management responsibilities; effective communication and linkages among stakeholders; adequate resources and support in the form of technical assistance, resources for monitoring and enforcement; empowerment of local communities, users and stakeholders through assuring their active participation in resource management; and an enabling policy environment.

- Achieving better access to, and management of, scarce natural resources can be an expensive proposition. Whether at national or community levels, significant expenses are often entailed in identifying and documenting claims to natural resources, revising legal and regulatory frameworks, funding infrastructure construction and maintenance, and establishing conflict resolution and enforcement mechanisms. Rather than being viewed as simply "costs", these should be viewed as *public investments* that, through their role in achieving greater security of access, will create future benefits to the rural poor, and a more efficient and productive use of scarce resources. Accordingly, greater public sector commitment at all levels needs to be devoted to making these investments.

- Human capital development to help generate improved management capacity and capabilities is central to making the most effective use of resources. Improved management capacity is most effective when *complemented by improved access to other forms of capital*, including technology, infrastructure, credit, education, and other forms of human and social capital.

Enabling the poor to take better advantage of market-based approaches to natural resource access and management

- *Market-based mechanisms* for natural resource management are attractive for several reasons and are increasingly being explored as alternatives for policy and management. These approaches represent an alternative to top-down "command and control" resource allocation approaches (which have often failed in the past); they attempt to incorporate externality effects by better reflecting true resource scarcities through the pricing and valuation of environmental services; and they can be self-regulating and self-sustaining. They also have disadvantages, the most important of which are the limited resources and purchasing power of the poor which places them in an inherent disadvantage in many market settings.

- Market-based approaches to environmental service provision are highly diverse, and include an array of both formal and informal approaches, pricing schemes, markets, voluntary payments programs, and other forms. These different approaches are characterized by *different levels of accessibility by, and impacts on, the rural poor*. Poverty reduction goals need not coincide with environmental sustainability goals; that is,

different approaches and programs may be better suited to address one goal versus the other in specific settings.

- *Payments for environmental services* provide an example of an innovative incentives-based approach to valuing resources that were previously undervalued, and rewarding practices that were previously under-rewarded. Given the close link between poverty, access to natural resources and sustainable management of natural resources, the PES approach has the potential to enhance provision of environmental services while helping to reduce poverty – if designed and managed carefully.

- Like any incentive-based approach, the PES approach works best when buyers, sellers, commodities and rights are clearly defined and agreed on. In the case of environmental services, this requires *better scientific information* to link environmental service outcomes with changes in management practices, *better socio-economic information* to identify environmental service providers and beneficiaries, and *better institutional capacity* to monitor and enforce complex transactions.

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E. Case study E: Accessing the global carbon market – a community forest project in Sierra Gorda, Mexico

Although published literature documenting this case is still scarce, Grupo Ecológico Sierra Gorda has disseminated its experience widely though workshops, conferences and seminars worldwide. For further details, see www.sierragorda.net/reserva/intro.htm

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Note: The Grupo Ecológico Sierra Gorda can provide additional information to the IFAD Rural Poverty Report 2009 team. For more details, see www.sierragorda.net/socios/socios.htm, or contact:

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