

## Rangeland and Poverty Alleviation

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**Abstract:** This paper focuses upon rangeland degradation control and poverty alleviation, for a better understanding of the relationship between rangeland management and poverty alleviation. Research results have shown no clear and unequivocal link between poverty and environment degradation. Different understandings of link between poverty and environment lead to different policy implications on poverty alleviation and environmental degradation control. It is important to understand what factors drive households' behavior and then to focus effort on these on a local level. Part of evidences show that agricultural intensification may contribute rangeland degradation control. Combination of rural development policy and implementation of rangeland conservation regulation is an effective way to promote simultaneously rangeland conservation and poverty alleviation in developing countries.

**Key words:** Rangeland management, poverty alleviation, rangeland conservation regulation, agricultural intensification.

Rangeland involves about 70% of the world's land area and most of it is in semi-arid and arid regions. It plays a critical role in providing humankind with various goods and services needed for survival, such as food, fiber, fuel, maintenance of atmospheric quality, control and amelioration of climate, regulation of freshwater supplies, origin and maintenance of soils, detoxification and degradation of wastes, natural control of pathogenic and parasitic organisms, pollination of cultivated and wild plants, purification of air and water, renewal of soil and water fertility, and so on (Daily, 1997). The utilization of rangeland in livestock grazing provides the livelihoods to local populations. Unfortunately, however, conversion of rangeland to other uses during

the last 20 years has become an issue of important management concern (Holechek, 2001). Rangeland degradation is increasingly regarded as one of the most threatening environmental problems in the world, especially in developing countries. Large areas of rangeland are facing reduced productivity or are degraded and abandoned as a result of overgrazing, deforestation, over-exploitation of vegetation and industrial activities.

Poverty remains also an outstanding issue, like rangeland degradation, challenging governments of many countries and international organizations, although notable achievements have been obtained in poverty reduction in the past few decades. The world has deep poverty amid plenty. Of the world's

6 billion people, 2.8 billion - almost half - live on less than \$ 2 a day, and 1.2 billion - a fifth - live on less than \$ 1 a day. Among 1.2 billion people living on less than \$ 1 a day, most live in Asia. 43.5% live in south Asia, 23.2% in East Asia and Pacific, and 24.3% in Sub-Saharan Africa (World Bank, 2001).

Asia and Africa have large areas of rangeland, which are intensely affected by degradation and are also the home for the local rural poor. A number of studies have found that environmental degradation or fragile ecology and rural poverty are often closely linked. For example, in China, absolute poverty in western region affected over 13 million people in 2004, or half of the total poor people in China (NBS, 2005). And almost one-half of all counties in China that are involved in heavy land degradation and can be described as ecologically 'fragile' are located in this western region. Poverty more commonly occurs in counties having 'fragile' environments in the western region than it does in less ecologically 'fragile' environments in eastern and central China (Liu and Li, 2001). The link between environment and poverty is often mentioned in the "sustainable development" debate, but until now there is much controversy surrounding the poverty-environmental degradation nexus. Development agendas in recent years have sharpened the focus on poverty reduction and on circumstances in which environmental goals may take precedence over production considerations.

This paper reviews the studies on the linkage between environment and poverty, with a particular focus upon rangeland degradation control and poverty alleviation,

for a better understanding of the relationship between rangeland management and poverty alleviation. Section 2 gives an overview on environment-poverty links and section 3 focuses on poverty alleviation and environmental degradation control. Rangeland characteristics and its management are described in section 4, with a brief conclusion in the last section.

### **Environment-Poverty Links**

Since environmental degradation and poverty are pressing issues attracting much attention from governments, international organizations and related agencies, there are tremendous amount of literature about environmental degradation and poverty, their links, and solutions to these problems. The link between poverty and environment usually begs the questions of causality: Does poverty cause environmental degradation, or does environmental degradation lead to poverty? Does poverty mitigation lead to environmental improvement, or does environmental improvement makes it possible to mitigate poverty? Research results during the past decade have shown no clear and unequivocal link between poverty and environment or natural resource degradation. There is much controversy surrounding the poverty-environmental degradation nexus (Duraiappah, 1998). On these poverty-environment linkage, population growth also impacts in complex ways. The conventional school of thought argues that there is causality between poverty and environmental degradation. Poverty can be both cause and effect of natural resource and environmental degradation. Another school of thought argues that a direct link between poverty and environmental degradation is too

simplistic and the nexus is governed by a complex web of factors.

*The conventional thought: A vicious circle theory and its contrasting view*

One important school of thought argues that a vicious cyclic relationship between poverty and environmental degradation prevails in developing countries. The assumption of a vicious cyclic relationship between poverty and environmental degradation was first launched in the report of the World Commission on Environment and Development, which incidentally has been accepted as the blueprint for environmental conservation. "Many parts of the world are caught in a vicious downwards spiral: poor people are forced to overuse environmental resources to survive from day to day, and their impoverishment of environment further impoverishes them, making their survival more difficult and uncertain" (WCED, 1987). It is explicitly stated that poverty is a major cause of environmental problems and amelioration of poverty is a necessary and central condition of any effective program to deal with environmental concerns. The assumption has later been echoed by a wide range of organizations. The World Bank explicitly stated in its World Development Report 1992: Development and the Environment, "poor families who have to meet short term needs mine the natural capital by excessive cutting of trees for firewood and failure to replace soil nutrients" (World Bank, 1992). Along similar lines, Jalal (1993), the Asian Development Bank's chief of the environment department argues, "It is generally accepted that environmental degradation, rapid population growth and

stagnant production are closely linked with the fast spread of acute poverty in many countries of Asia." The literature describes the vicious cyclic relationship from the two viewpoints, representing different processes with different policy implications.

In the first case, the view is that worsening degradation contributes to lower incomes and deepening poverty, and farmers, pushed by population growth and poverty, extend cropping onto fragile marginal lands, degrading them. The latter reduces yields, which further impoverishes farmers (Dasgupta and Maler, 1994; Pearce and Warford, 1993). The hypothesis of vicious cyclic can be traced back to Thomas Malthus in 18th Century, who predicted disaster in a world with static production technology, a fixed land resource, and rising population. The neo-Malthusian pessimists focus on the 'too poor to invest' hypothesis, arguing that population growth without prosperity precludes productivity-enhancing investments, undermining future productivity and leading to a downward spiral, with ever worsening poverty and resource degradation (Mink, 1993). Thus, poor people are seen as both victims and agents of environmental degradation. The implication of the assumption of the vicious cyclic of poverty and degradation is that poverty alleviation will necessarily reduce degradation of the environment, and it's inverse, that arresting and reversing environmental decline will help the poor (Cleaver and Schreiber, 1994).

However, the disaster predicted by Malthus has not occurred. A contrasting and more optimistic view holds that the vicious cyclic can be broken when population pressure rises to the point that

labor becomes less costly relative to land, generating a process of induced innovation whereby communities invest in agricultural intensification and improvement of natural resources (Boserup, 1965). For example, in many Asian societies, growing population pressure led to investment in the terracing and leveling of cropland, to the construction of elaborate irrigation systems, and to the use of composting and manures. The efficiency of this process depends on the type of technological changes induced, potentially boosting crop yields and farm resource productivity, including farm labor. Following Boserup, several authors cite agricultural intensification as the reason for non-occurrence of disaster, where rising population density has stimulated productivity-enhancing technological and behavioral changes (Tiffen *et al.*, 1994; Pender, 1998; Templeton and Scherr, 1999).

*Recent schools of thought: Complex relationship*

There is, however, a rising trend in the economic literature which disputes the conventional vicious cyclic theory and argues that a more complex set of variables comes into play and that simple generalization of this multidimensional problem are often erroneous and may miss many important points. These studies point out demographic, cultural, and institutional factors as important variables in the poverty-environmental degradation nexus. An intricate web of these factors plus feedback loops from environmental degradation to poverty make the process of identifying causality links, if any, between these two phenomena a non-trivial exercise (Duraiappah, 1998).

Reardon and Vosti (1995) developed a conceptual framework to clarify the

poverty-environment relationship, in which they distinguish types of poverty corresponding to asset categories. They particularly emphasize income-generation and investment strategies of agricultural households as determinants of poverty-environment links. They show that the strength and direction of these links can vary depending on the asset mix of the poor in rural areas, the type of environmental problem, and the management and costs of production technologies. The conceptual framework of Reardon and Vosti serves as the base for a series of empirical studies (Scherr, 2000; Cavendish, 2000; Ravnborg, 2003; Agudelo *et al.*, 2003; Swinton and Quiroz, 2003)

Recent studies in poverty-environment link indicate that relationship between environmental degradation and poverty is not a direct causality, and give greater importance to rural household behaviors to transform the triggering conditions of the poverty-degradation cyclic. A common element among recent studies is that the links among poverty, rural household behavior and environment are conditioned by interactions among policy, technology, institutions, and natural resource characteristics. Not all environmental degradation in developing countries is linked to poverty. Hence, poverty is not the direct cause of environmental degradation; rather it is a mechanism that transforms survival motives into human actions causing environmental degradation. Different variables condition rural household behavior in different regions and contexts. From the theoretical complexity of these interactions emerges the imperative of using concrete empirical evidence to deepen the description

and analysis of how the poverty-environment relationship takes shape (Bahamondes, 2003).

### **Poverty Alleviation and Environmental Degradation Control**

Different understandings of link between poverty and environment lead to different policy implications on poverty alleviation and environmental degradation control or environmental conservation. The implication of the assumption of the vicious cyclic of poverty and degradation is that poverty alleviation will necessarily reduce degradation of the environment, and it's inverse, that is arresting and reversing environmental decline will alleviate poverty. However, for those whose livelihoods depend highly on local environmental resource, it is difficult to reduce poverty or reverse environmental degradation only by themselves. The thought of complex relationship between poverty and environment implies that it is imperative to empirically study variables that condition rural household behavior in different regions and contexts and then focus efforts on these variables to bring the poor on degraded areas out of poverty. Empirical studies on poverty, environmental degradation and poverty-environment links have suggested a number of poverty alleviation measures and environmental conservation, such as agricultural intensification, off-farm employment, education, government programs, and so on.

Following Boserup's hypothesis that agricultural intensification driven by population growth can lead to economic growth and sustained productivity increases, some authors argue that productivity-

enhancing technological and behavioral change makes it likely to avoid being trapped in a vicious cyclic of poverty and environmental degradation. Boserup (1965) argued that as population pressure grows and labor becomes less costly relative to land, then a process of 'induced innovation' occurs whereby communities invest in agricultural intensification and in improving their natural resources. The induced innovation model predicts increases in agricultural output and land productivity, enabling growing populations to feed themselves. But it does not necessarily predict that output per worker (or average labor productivity) will also increase, or that investments will be made in technologies that improve the long-term sustainability of resources. This will depend on the speed and type of the induced technological change. If average output per worker continues to decline, the induced innovation model can also lead to the same state of immiserization as the Malthusian model. It will just take longer to get there. But if technological change (whether induced or introduced) can raise labor productivity even as more workers are absorbed into the system, then per capita income will rise on average, and a process of sustainable economic development may be triggered. The rationale is that agricultural productivity follows a U-shaped curve in response to the abundance of land per work. Land productivity falls and then rises again as growing population reduces the price ratio of labor to land (Templeton and Scherr, 1999). As land becomes relatively scarce, farming technologies evolve away from those that saved labor and capital toward those that save land. This agricultural intensification process leads to greater land

productivity, often including investments in sustaining productivity over the long term.

Off-farm activities may play an important role, which are usually labor-intensive, with little use of capital, thus low entry barriers, such as, small commerce, portage, unskilled labor for construction, seasonal or permanent migration. Increased off-farm employment can have positive or negative implications for the environment (Reardon and Vosti, 1995). Where the poor successfully diversify into off-farm activities, they can become less directly dependent on land, hence less vulnerable to land degradation. Cash from off-farm activities can also be used to finance soil conservation investments and use of fertility-enhancing inputs (Bahamondes, 2003). On the other hand, resource conservation investments or allocation of labor to natural resource management may not be a priority use of investment funds or of own-labor for the poor household. Investments in off-farm activity can compete with investments in land conservation, a competition exacerbated by the poor's lack of investable cash or available labor beyond their subsistence needs. However, in many developing countries, especially environmentally fragile areas, rural labor is often abundant and the growth in labor supply will remain large for a long time to come (von Braun, 1995). Therefore, competition between allocation of labor to natural resource management and allocation of labor to off-farm activities will be little for a long time to come. Off-farm employment for superfluous rural labor has been expected to play an important role

in poverty alleviation and environmental conservation. Empirical studies have provided evidence on the impact of increased off-farm employment on agricultural inputs, improvement of rural income, poverty alleviation and sustainable development (Shi *et al.*, 2006).

A study on the semi-arid tropics of India indicates that farmer use more fertilizer as the depth of the off-farm labor market increases, implying that the off-farm labor market is important in smoothing income in the face of shocks to agricultural production, and that there are important complementarities between farm production and off-farm work. These complementarities suggest that policies that deepen the off-farm labor market may promote more intensive farm production and higher profits as well (Lamb, 2003). Studies on Latin America indicate that rural off-farm employment and incomes are crucial to Latin American rural households, averaging 40% of rural incomes (Reardon *et al.*, 2001). Research in China shows that rural income growth in the 1990s was almost totally dependent on off-farm work, and that off-farm employment significantly contributed to the poverty reduction. Migration, as the most dominant form of off-farm employment in China, is very important in contributing to the increase in household income and the improvement of small-scale livelihood, as well as can reduce pressure on land resources, thus leading to less intensified cultivation of crop land (Zhang, 2003). Since the mid-1980s, it has been recognized more and more widely that expanding employment is central to reducing poverty. Researches by International Food Policy Research Institute (IFPRI) reveal that

employment programs or labor-intensive public works in some countries, such as India, China, Botswana and Tanzania, have considerably contributed to poverty alleviation. Linking infrastructure improvement with jobs for the poor has considerable appeal (von Braun, 1995). When rural laborers in poor areas are employed to implement environmental conservation programs, employment helps to alleviate rural poverty as well as to halt land degradation and conserve environment base.

Other studies have suggested the impact of investments in education and infrastructure, government credit program, and so on (Fan *et al.*, 2002; Bahamondes, 2003; Sylwester, 2004). Although these solutions suggested by empirical studies to poverty and land degradation are very different and specific, the conditions to break the poverty cycle and bring the poor on fragile lands out of poverty, generally speaking, are overwhelmingly associated with more intensified use of existing agricultural lands and increasing rural-urban interactions (World Bank, 2003). Increasing agricultural inputs, introducing new crop varieties or/and animal breeds, as well as improving farm management, are possible options of agricultural intensification to reduce rural poverty. However, the environmental effect of agricultural intensification is uncertain, and is required to be investigated at the local level. Improving accesses to off-farm employment are also expected to play a role.

However, as pointed out by Nkonya *et al.* (2004), there are few 'win-win-win' opportunities to simultaneously increase production and household income and

reduce environmental degradation. Different instruments are needed to achieve different objectives. Just as no single solution exists to improve all outcomes simultaneously, different approaches are needed in different locations. As argued by Scherr (2000), due to the multiplicity of factors that affect the poverty-environment nexus, the results of any analysis are very specific, especially given the huge diversity of households and production systems they manage. There is no 'one-size-fits-all' solution to the complex problems of small farmers in the developing countries. An important implication is that the most effective way to reduce poverty and enhance the resource base is to understand what factors are driving households' behavior and then focus effort on these. Policies should aim at affecting household and community behavior with the aim of helping poor households to attain their main objective, while as much as possible maintaining or enhancing the resource base (Reardon and Vosti, 1995).

### **Rangeland Characteristics and Its Management**

As evidenced by empirical studies, links among poverty, rural household behavior and environment are conditioned by interactions among policy, technology, institutions, and natural resource characteristics. Resource characteristic is one of the important factors driving rural households' behavior. Rangeland, unlike cultivated land and forest, has its own unique characteristics, which help the link between rangeland and poverty alleviation to take shape.

Rangelands in the context of developing areas can be construed as a type of common pool resource. A common pool resource has

two definite characteristics, those of being non-excludable and rivalrous, in the sense that one person's use of the resource reduces the availability of the resource to others. Rangelands have certain resource characteristics that make the exclusion of other users difficult. They are expansive in nature and used on a season basis, which makes the monitoring and enforcement of boundaries potentially problematic. Exclusion via fencing can be costly relative to benefits, given the low productivity of rangeland resource, or households may simply lack the financial resources to invest in it. Fencing may also impose other costs, including the prolongation of routes between different seasonal pastures and reduced access to watering points. In regions where fencing conflicts with social conventions, the fences themselves may need to be monitored and enforced, or they face the risk of destruction or exploitation by others. Exclusion is thus the first of two fundamental challenges facing common pool resources: the second is the challenge of creating incentives for legitimate users to invest in resources and utilize them with biophysical constraints.

Another characteristic of rangeland resources, other than their expansiveness and the related difficulty of exclusion, is their variability. In arid and semi-arid environments, where rangelands are usually located, variability in the temporal and spatial distribution of rainfall induces similar variability in rangeland resources. Rangelands in such environments are in perpetual ecological disequilibrium rather than gravitating towards an equilibrium state. Rainfall is the major determinant of grassland productivity in any given year. The range ecology thus challenges conventional wisdom about the link between

livestock numbers and rangeland degradation.

Take China's rangeland degradation as a case. It is widely perceived that the degradation of China's rangeland has accelerated since the introduction of rural reforms in the late 1970s. Policy makers and researchers have estimated that some 90% of China's rangelands, which account for 40% of its total territory, are now degraded to some degree, including 42% moderately to seriously degraded (SEPA, 1998). The popular explanation for this phenomenon has been that a 'tragedy of the commons' exists, as privately owned livestock are being grazed on common land. Policy makers and researchers perceive overstocking to be the principal proximate cause of rangeland degradation, and commonly attribute overstocking to a lack of clearly defined property rights in rangelands. Since the passing of the Rangeland Law in 1985, Chinese pastoral tenure policy has emphasized the establishment of individual household tenure as a necessary condition for improve incentives for sustainable rangeland management. This policy is predicted on the assumption that the establishment of individual household tenure will give pastoralists incentive to stock pasture within carrying capacity and invest in pasture improvement. However, household tenure has yet to be effectively established in many pastoral regions. This failure to establish individual household tenure in China's extensive rangelands over two decades contrasts sharply with the case of croplands, where household tenure was virtually established overnight. This failure originates mainly from rangeland characteristics. Evidence from northern Xinjiang, China argues that there is no

“tragedy of the commons” in the rangelands of Altry and that it is a characteristic of rangeland resources and the social environment that gives rise to the particular types of institutional arrangements (Banks, 2001).

Recent studies argue that agricultural intensification may contribute to control of rangeland degradation because it may foster more population with less area of cropland or grassland through raising its land productivity so that it brings a recuperation period to a large part of deteriorated rangeland. Improving farmers’ access to new technologies and credit service with implementation of rangeland conservation regulation may encourage households to adopt intensified agricultural technologies and to change land use towards rangeland conservation (Shi *et al.*, 2005). It leads a policy implication that rural development practices to improve access to new technologies and credit service may contribute simultaneously to poverty alleviation and rangeland degradation control, and it is important to combine implementation of rangeland conservation regulation with rural development policy in developing countries.

## Conclusion

The relationship between rangeland and poverty is involved in environment-poverty links. Environment-poverty link has drawn much research attention for decades. But research results have shown no clear and unequivocal link between poverty and environment or natural resource degradation. Among the controversy surrounding the poverty-environmental degradation nexus, the conventional school

of thought argues that there is causality between poverty and environmental degradation, while more recent empirical studies argues that the link between poverty and environmental degradation is governed by a complex web of factors.

Different understandings of link between poverty and environment lead to different policy implications on poverty alleviation and environmental degradation control or environmental conservation. Although previous studies on poverty and environmental have suggested a number of poverty alleviation and environmental conservation measures, it is of the most importance to understand what factors are driving households’ behavior and then focus effort on these on a local level, especially put emphasis on characteristics of environmental resources. Recently part of empirical research evidences that agricultural intensification may contribute rangeland degradation control. Combination of rural development policy and implementation of rangeland conservation regulation is indeed an effective way to promote simultaneously rangeland conservation and poverty alleviation in developing countries.

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