



“Summary of article by Michael Lipton: Accelerated Resource Degradation by Agriculture in Developing Countries? The Role of Population Change and Responses to It” in Frontier Issues in Economic Thought, Volume 6: A Survey of Sustainable Development. Island Press: Washington DC, 2001. pp. 134-137

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What is the relationship between rural development patterns and resource degradation? People are usually rational, and do not seek to destroy the resources on which they and their communities depend. However, there are national and international pressures which may lead them to do so. At the national level, these pressures include population increases and declines in common property resources. At the international level, forces such as interest rate changes and technology transfers can affect resource use. The international forces are dealt with elsewhere (by Lipton in Chapter 11 of *Sustainability, Growth, and Poverty Alleviation*, and in Part 7 of this volume). This article addresses the relationship between population growth and resource degradation, including a consideration of how population growth interacts with management of common property resources.

Population Growth and Environment

There is a broad academic consensus regarding causes and effects of population growth in developing countries. It is generally accepted that most couples act rationally in setting family size norms, subject to societal pressures. However, individually rational decisions may not lead to socially optimal consequences. As Sen has pointed out, poor couples who have more children in the hope of eventual higher incomes may find that overall labor supply increase drives down wages, leaving them worse off. Lack of information, low levels of female education, and poor employment prospects for women can all contribute to fertility levels which are higher than is socially desirable.

The discussion of the population/resource relationship starts with Malthus. While Malthus did not deal explicitly with issues of resource degradation, he saw both diminishing returns in agriculture and wage-lowering labor surpluses as leading to immiseration. He acknowledged extensive and intensive agricultural expansion as possible responses, but believed that both would have limits. In his later work, he placed greater hope in willingness to restrain fertility in response to economic growth and educational opportunity. However, both he and his modern successors give insufficient attention to incentives, and to changing patterns of behavior, including migration and innovation, in response to population change.

Extensification and Migration

In many countries low-potential marginal areas are showing faster population growth than areas of high agricultural potential. The Rajasthan Desert in India, for example, has experienced a population growth rate significantly higher than India as a whole, with cultivation being extended onto fragile arid areas where water scarcity limits yields. This is a seemingly paradoxical trend, since one might expect more outmigration to more fertile areas. But in practice rural-to-rural migration to Green Revolution areas, such as the Punjab in 1967-73, is often not sufficient to prevent big rises in real wage-rates. This induces more use of labour-displacing methods (tractors, threshers, reaper-binders, etc.) And a shift of land from small labour-intensive farms into bigger, mechanized, labour-displacing farms - both by amalgamation, and as landlords resume sharecrop tenancies. So demand for labour migrants in Green Revolution areas, often falls off later. In the longer term, rural-to-rural migration involves net movement towards fragile areas, as displaced rural workers and smallholders search for new land. Other examples of labor movement away from Green Revolution areas towards extensive margins include migration from southern to northwest Brazil, and in Bangladesh from Comilla to the Chittagong Hill Tracts.

Incoming migrants may come into conflict with local populations who use land more sustainably, but lack clear property rights systems. Intensification in the receiving areas often results in lower elasticity of employment with respect to output, so that poverty reduction from intensification is lower than might be expected. Extending cultivation can thus lead to a socially and environmentally unsustainable situation.

These negative impacts can be moderated by government support for appropriate technologies and price incentives for conservation techniques that 'substitute employment for environment,' e.g. by planting and maintaining tree cover; terracing; or erecting vegetative or contour-plowing barriers against erosion. Investment in communication, innovation, and research on sustainable techniques are also important. While these are not strictly public goods, they are unlikely to be adequately provided by private enterprise.

Land redistribution in the more fertile areas can also be a major remedy for excessive pressure on marginal lands. This has been true in many parts of Asia (including China, Taiwan, Kerala, and West Bengal) as well as Africa (Kenya, and currently possibly Zimbabwe and South Africa). Rural-to-urban migration, in contrast, has a rather small impact on net resource and farmland availability; any increase in per-capita farmland supply is balanced by the tendency of urban growth to pull land and water into non-farm uses.

Intensification and Technical Progress

Intensification can raise farm output per person, both in currently farmed areas and on the extensive frontier. However, the production increases resulting from intensification may or may not be sustainable. Population growth may engender Boserup-type responses, in which innovation and investment raise per person output, or Hayami-Ruttan-Binswanger (HRB) responses, in which increased labor availability serves as an incentive to labor-using technical change. But empirical evidence indicates that HRB responses to rural population growth in parts of South Asia are weak, and Boserup responses are very weak in sub-Saharan Africa.

These problems are related to the need for appropriate early rural investment, for example in water management. Such investment may or may not be forthcoming, and the role of price and technology incentives is crucial.

"Intensification can lead to eroded dust bowls -- or to the use of fertilizers and composts to regenerate depleted soils. Extra labor can repair bunds and plow along contours -- or harvest more and more high-yielding cassava until the soil is destroyed." (86) If population growth creates heavy pressure to raise agricultural yields in the short term, longer-term conservation goals are likely to be neglected.

Fertility Responses to Population Growth and Economic Growth

The changes in income, incentives, and information linked to rural modernization eventually lower fertility rates, but evidence from India suggests that this can be a long process. HRB-type technical progress raises the returns to child and adolescent labor well before better opportunities for women, which create an incentive for lower fertility, become available. Only at a later stage in the development process do the benefits of education for women and their children predominate over the income-generating and income-security effects of larger families.

It is not necessarily clear that eventual slower population growth will lead to less resource degradation. The process of earning extra income may degrade local resources faster than simple population growth. Forest products, for example, have income elasticity greater than one, meaning that demand for forest resources will increase disproportionately with income growth. It is important to understand the relationship of income growth and resource depletion rates. This relationship will be determined by relative prices and available technologies, which will tend to be more exogenous ("imported") rather than endogenous (locally created) as communities become more integrated into the national and global economies.

Common Property Resources

Common property resources (CPRs) are important in developing countries, especially in arid and semi-arid areas. In India, CPR's have declined in area and productivity since the 1950's, to the detriment of the rural poor. Population growth is positively correlated with CPR decline for two reasons. First, an increased number of claimants to the CPR decreases benefits per person and makes rule enforcement more complex. Second, more people living near a CPR increases the likelihood of poaching or illegal use. While it is definitely untrue that CPRs necessarily lead to the "tragedy of the commons", some resources may be better protected if there is a shift to other forms of ownership.

The structure of property rights, however, is not the key issue. Rather, the crucial variables are prices, technology, and incentives, which can lead to the use of resource-degrading or of resource-conserving techniques. It is the combination of higher population and incentives for short-term resource management which poses a threat to sustainability.