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Rural Development and Natural Resources
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Introduction
Brazil is a global player in the production and export of agricultural commodities, with a huge potential to expand agricultural area and increase market share in the coming decade. Agriculture and related sectors are critical to the Brazilian economy, accounting for about 27 percent of GDP when agro-industry is included. About 33 percent of Brazil's exports are agricultural, and some 23 percent of employment is tied to agriculture, with another 10–15 percent of the workforce employed in agro-industry.

The next generation of Brazilian policymakers faces the challenge of simultaneously addressing multiple issues across all sectors affecting rural development. They need to find ways to help rural people exploit opportunities in the non-farm economies of small towns and rural centers, while supporting commercial and small-scale agricultural growth as a central component in broad economic growth. Only coordinated, integrated policies and actions can capture the synergies that spell results in poverty reduction and natural resources management.

Consistent policies, equitable access, decentralized application and decision-making, and stronger institutions are key ingredients of the broad strategy for improving rural development and protecting natural resources in Brazil. Education and training are the sine qua non.

This chapter provides both the substance and the direction for policymaking in selected areas. It is supported by examples of successful, cost-effective models of community-based land reform and rural development, provision of basic infrastructure and services, and Integrated Natural Resources Management. These programs could be applied in flexible...
ways in various parts of Brazil, as long as attention is paid to how they are scaled up and out. Suggestions for enhancing rural development and protecting the natural resource base are presented below and discussed in this note.

Alleviating rural poverty, particularly in the Northeast

Alongside this dynamic commercial sector exists another rural Brazil. Widespread poverty and deprivation affect millions of rural people in small-scale and subsistence farming households concentrated in remote, isolated, and sparsely populated areas with scant infrastructure, low productivity, and degraded lands. The modest cities and small centers of this region offer few opportunities.

While poverty is found in many parts of rural Brazil, including the Southeast, it is most severe in the Northeastern states, especially the vast, semi-arid Sertão region, which shows steady economic, social, and environmental decline despite decades of public programs intended to reverse it. The semi-arid region of the Northeast supports some 45 percent of the total population of the region and the largest concentration of rural poor in Latin America. Growth of the livestock and cotton sub-sectors in recent decades was the basis for significant agricultural expansion and diversification, but this growth has faded.

The obstacles to a better life in the Northeast—and thus the challenges for policymakers—are formidable. Millions of people are trapped in poverty by a weak and degraded natural resource base, drought, low labor productivity, highly skewed patterns of landholding, population pressures, and severe deficiencies in basic infrastructure and services, including financial services. High illiteracy and poor-quality education hinder successful migration or improved rural livelihood. Inadequate water supply, sanitation services, and water resources management, including drought mitigation efforts and pollution control, adversely affect the health and productivity of the rural poor, requiring coordinated efforts.

Reversing the degradation of the natural resource base

Accelerated expansion of the agricultural frontier for crops and pasture in the past 30 years combined with deficient land management policies and practices have caused Brazil to lose the equivalent of R$3.2 billion of topsoil a year to erosion and to suffer incalculable losses in biodiversity. While progressive farmers have increasingly adopted sustainable practices and environmental awareness and public intervention on behalf of the environment has grown, most croplands and grasslands continue to be managed using traditional or conventional methodologies, causing continued erosion and degradation.
Soil degradation by runoff erosion is universal and pervasive. Even in the semi-arid areas of the Northeast, heavy, erosive summer rains cause devastating losses to farmers' productive base, particularly in the small-farm sector. As both a cause and a consequence of rural impoverishment, soil degradation leads to diminishing yields and incomes, promotes further land clearing, and perpetuates negative effects on the water cycle and biodiversity. The tendency for public policy not to counteract the bias of market developments in favor of more technologically advanced and sophisticated producers means that small and semi-subsistence farmers face major obstacles to finding and adopting suitable practices to boost productivity and sustainability, and to arrest decline.

Reorienting social spending

Under the Millennium Development Goals, Brazil committed itself to cutting poverty in half by 2015. Doing so will require economic growth, social spending, and a major review and restructuring of a broad range of social programs to improve their cost-effectiveness, coverage, and efficiency. Between 1981 and 1999 annual social expenditures of about R$35–R$40 billion would have been required to eradicate poverty in Brazil. During this period federal, state, and local governments spent about R$100 billion a year, well in excess of those levels, but only 13 percent of those expenditures reached the neediest; most investments in education, health, and social security went—and continue to go—to the middle class and wealthy. Poor targeting and coverage of public expenditures is thus a crucial factor perpetuating poverty in Brazil.

Message 1. Focusing on all sectors affecting rural development, not just agriculture

Extreme poverty in Brazil is concentrated in rural areas and small towns. Reducing poverty in these areas requires sustained efforts in all sectors that affect rural development, not just in agriculture. Efforts must target the entire "rural space," made up of rural areas as well as secondary towns where 50 percent of the poor are employed in various forms of non-farm activity. Increasing incomes within this space is critical, but improvements in other areas are also needed. Changes include consolidating a more open and transparent rural society; increasing the accountability of rural institutions; implementing broad-based, pro-poor policies that foster rural growth by linking commercial agriculture and poverty reduction; increasing employment and enhancing competitiveness; increasing the poor's holdings of land, water, and natural resources and their capacity to manage them sustainably; and improving access to education, health, and finance.
Context
Brazil competes globally as a producer and exporter of agricultural products, including coffee, soybeans, maize, sugar, bananas, manioc, orange juice, and meat. Agriculture and related sectors and activities are critical to the Brazilian economy and to the rural sector. Agriculture accounts for about 11 percent of GDP (US$4.5 billion annually) and as much as 27 percent of GDP (US$15.2 billion annually) when agro-industry is included. About 33 percent of total exports are agricultural (US$16–US$17 billion annually) and some 23 percent of employment is tied to agriculture (33–47 percent including agro-industry). The employment creation potential of commercial agriculture is large and underexploited, especially in the Northeast region. With the world’s largest remaining tracts of virgin land, much of which is readily convertible to agriculture, and vast pasture lands suitable for grain and oilseed production, Brazil is one of the few countries with an expanding agricultural area and real potential to increase its global market share.

This remarkable performance and potential stands in stark contrast to the “other” rural Brazil. Of the 23 percent of Brazil’s population living in extreme poverty, the bias is strongly rural. Poverty is worse in both relative and absolute terms (that is, the poverty rate is higher and the number of poor greater in rural areas). Poverty and deprivation are widespread among small-scale, subsistence-sector farm households concentrated in remote, isolated, and sparsely populated areas with little infrastructure, low productivity, and degraded lands.

Poverty continues to disproportionately affect the Northeast, where about 17 million of Brazil’s total poor and about 9.5 million of its rural poor live. Millions of people—45 percent of the total population in the Northeast—struggle to survive in the vast, heterogeneous, semi-arid region (the sertão), which is in steady economic, social and environmental decline (see Message 2). The obstacles to a better life in the rural Northeast are formidable: a weak and degraded natural resource base, frequent drought, low labor productivity, high illiteracy and poor quality and coverage of education, grossly inadequate access to basic infrastructure and services, highly concentrated landholding, and weak rural financial markets. Opportunity-based out-migration is continuous. Poor transportation links, under-developed roads, and inadequate communications infrastructure hinder market access. Lack of investment in human capital is trapping millions in poverty.

Focusing policymaking on the “rural space”. With extreme poverty in Brazil concentrated in rural areas and small towns and with 50 percent of the rural poor now employed in some form of non-farm activity, policymaking must address the “rural space.” Reducing rural poverty and spurring economic growth require policymaking in a
variety of sectors, including agriculture, agro-business, natural resource management, rural education, infrastructure in villages and secondary towns, and financial services and municipal development. Agriculture-based rural economies are increasingly tied to non-farm activities. According to Ferreira, Lanjouw, and Neri (2000), the incidence of rural poverty is typically higher in small urbanized centers whose economies are more likely to be linked with rural economies, than larger urban areas.

Linked, simultaneous actions are needed to reduce rural poverty. They include increasing the income and spending of the poor; improving access to productive and social assets, services, and facilities; empowering the poor to participate in political and social processes and to promote change; and reducing the vulnerability of the poor to risk. Success depends on sustained, consensus-based political commitment; the strong management and implementation capacity of state and local governments; and an understanding of the nature, causes, and dynamics of poverty to analytically underpin policy formulation and implementation.

**Supporting Growth in Agriculture.** Rapid growth in the overall economy, with rapid urban job creation and expanded domestic demand for farm products, would significantly reduce rural poverty. But the type and structure of growth is as important as growth itself. Growth within agriculture— that is, growth of labor-intensive agricultural output and small-scale enterprises linked to the rural economy— not the shift of labor and capital out of agriculture into large-scale industry is what accelerates rural poverty reduction. Agricultural yields are also crucial: a 33 percent increase can decrease poverty by about 25 percent. Brazil therefore needs a pro-poor growth strategy, with agriculture as a prime vehicle. Growth that excludes the agricultural sector hurts the rural poor by reducing the overall growth rate and doing little or nothing to reduce poverty. Agricultural growth reduces poverty effectively because it both generates income for poor farmers and creates demand for the goods and services easily produced by the poor. The benefits of agricultural growth are shown in table 1.
### Table 1. Benefits of agricultural growth

<table>
<thead>
<tr>
<th></th>
<th>Farm economy</th>
<th>Rural economy</th>
<th>National economy</th>
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<tbody>
<tr>
<td>Higher incomes for farms, including smallholders</td>
<td></td>
<td>More jobs in agriculture and in the food chain upstream and downstream of the farm</td>
<td>Lower prices of food and raw materials, which raise real wages of the urban poor and reduce the wages costs of non-farm sectors</td>
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<td>More on-farm jobs as labor demand rises per hectare, the area cultivated expands, or frequency of cropping increases</td>
<td></td>
<td>More jobs or higher incomes in non-farm economy as farmers and farm laborers spend additional incomes</td>
<td>Generation of savings and taxes from farming, which allows investment in non-farm sector, creating jobs and incomes in other sectors</td>
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<tr>
<td>Rise in farm wage rates</td>
<td></td>
<td>Increased rural jobs and incomes, which improve nutrition and health, and increased investment in education for rural population, leading to better welfare both directly and indirectly through higher labor productivity</td>
<td>Higher foreign exchange earnings, which allow import of capital goods and essential production</td>
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<td></td>
<td>More local tax revenues generated and demand for better infrastructure (roads, energy, communications)</td>
<td>Release of farm labor, increasing production in other sectors</td>
<td>Second-round effects promoting rural economy</td>
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<td></td>
<td>Increased production chain links, generating trust, increasing information, building social capital, and facilitating non-farm investment</td>
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<td></td>
<td>Lower prices of food for rural inhabitants, who are net purchasers of food</td>
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*Source: Ira and others 2001.*

Market developments and government policies since the late 1980s (including trade openness, reduction of subsidized credit, vertical integration of processing and marketing, and deregulation of domestic marketing) have favored more advanced producers, with positive effects on commercial agriculture. These developments were necessary but insuf-
ficient to capture opportunities to link commercial agriculture to poverty reduction, and they had different effects on exported and imported products and on commercial agriculture and the poor. Indeed, existing policies have worked against low technology, small, and semi-subsistence farmers. The challenge is to find ways of assisting small farmers with the potential to survive in today’s more competitive environment without providing permanent subsidies. It is particularly challenging for poor rural populations in the semi-arid regions of the Northeast, where agriculture and the physical environment are declining.

Supporting rural non-farm employment. Rural families living adjacent to the urban perimeters of municipal centers, where non-farm jobs are concentrated, tend to be less poor. But among the extremely poor, only 30 percent of rural income is from non-farm sources, because isolation exacts a price. Establishing forward linkages to agriculture (processing, storage, marketing facilities) can stimulate rural, non-farm activities. Under a rural livelihoods approach, households diversify across a range of assets, activities, and income sources that usually include aspects of the non-farm economy. Such diversification can lead to more predictable incomes and is an effective response to inherent rural volatility (drought, labor uncertainties) and the complementary nature of home-based activities (farm or non-farm).

Policymakers face a massive challenge in developing diversified opportunities for non-farm employment in the modest cities and small centers of the semi-arid region. These areas, described by Maia Gomes (2001) as “economies without production,” are highly dependent on pension income, drought workfare programs, and income from family members in municipal employment. Industrial activity of any kind is scarce, the service sector is precarious, and natural resources are degraded. Rural, non-farm enterprises have economic advantage only in sectors that include natural resource-based extractive industries, traditional rural skills (artesanal), tourism, and any activity requiring proximity to the point of extraction, production, or cheap labor. These sectors act as rural exports, meeting urban rather than rural demand, and create rural growth. They can be the main engine of rural non-farm growth (table 2).

Providing poor households with productive assets. Poor families who remain in agriculture need more productive assets, especially land, which is particularly critical if labor demand does not grow substantially. But policymakers should recognize that the impact of land on farm productivity and income depends on simultaneous improvements in complementary productive factors (purchased inputs, machinery) and demographic
factors (age of operator, education level). The Bank and its Brazilian counterparts have substantial experience in community-based land access (with complementary investments) working through local land markets.

Almost all of the 16.5 million rural poor in Brazil belong to the 4.4 million households lacking enough land to subsist. Yet evidence strongly suggests that family farms can be more efficient and labor intensive than large farms, even in the Northeast. Skewed landholding depresses agricultural productivity and employment. Economic distortions that fostered land concentration (agricultural subsidies, inflation, tax incentives) were lifted in the 1990s, reducing the incentives to hold land as a financial hedge. Land supply increased and prices fell, especially in the Northeast.

Table 2. Strategies to support rural non-farm employment

<table>
<thead>
<tr>
<th>Strategy</th>
<th>Action needed</th>
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<tr>
<td>Remove general constraints to rural growth</td>
<td>Invest in transport, communication, education, and health</td>
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<tr>
<td>Facilitate urban-rural links</td>
<td>Facilitate the flow of migrants and remittances</td>
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<td></td>
<td>Increase the flow of market and price information to rural areas</td>
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<td></td>
<td>Establish regulations and standards that facilitate outsourcing and subcontracting</td>
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<td></td>
<td>Develop rural recreational amenities for the urban population</td>
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<td></td>
<td>Identify options for increasing access to social and business networks</td>
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<tr>
<td>Facilitate enterprise growth</td>
<td>Develop small towns</td>
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<tr>
<td></td>
<td>Support producer associations for marketing and sourcing</td>
</tr>
<tr>
<td></td>
<td>Remove regulatory or bureaucratic burden on small and medium-size enterprises</td>
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<tr>
<td></td>
<td>Reform rural extension into business advisory services</td>
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<tr>
<td>Adopt sector or sub-sector specific interventions</td>
<td>Support industrial clusters</td>
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<td></td>
<td>Provide incentives for industry relocation</td>
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<td></td>
<td>Use planning gain in concession allocation to foster local economic linkages</td>
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</tbody>
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Source: Ashley and Maxwell 2001.

Based on a successful pilot program in Ceará that rapidly settled 700 families on about 23,000 hectares, the federal government, in partnership with the Bank, developed the
expanded Cédula da Terra project in five Northeastern states (box 1). When the program closes, at the end of December 2002, another 17,000 families will have been settled on 442,00 hectares, at an average cost of R$4,900 per family and R$190 per hectare. The successor to this project is the 14-state Crédito Fundiário program. This program, which targets lands not subject to expropriation and the poorest potential beneficiaries of the national land reform program, is financed 50/50 by the federal government (land acquisitions) and the Bank (on-farm investments). Community associations identify suitable lands and negotiate their purchase with willing sellers, receiving an investment grant for on-farm improvements. Crédito Fundiário is notable for the important role of rural workers' unions (CONTAG and FETAG) in implementation, technical assistance, and project evaluation.
Box 1. Lessons learned from market-based land access projects in Brazil

The community-based, market-oriented method for settling landless rural families is agile and effective. Communities take ownership of their land within 90 days, in most cases.

- Self-selection for participation is effective; the vast majority of beneficiaries have household incomes and characteristics consistent with the intended profile.
- The modest size of community groups acquiring properties (about 15-30 families) appears to be an advantage. Groups with less than 15, or over 50 members, can face difficulties.
- Despite generally poor land quality in the Northeast, communities have consistently chosen good-quality land, at considerable savings compared with traditional methods and without increasing land prices.
- Land prices have been favorable, with costs per family significantly lower than the present value of initial expropriation prices in the Northeast.
- The success of community associations in mobilizing members, selecting land for purchase, designing a productive on-farm investment, and carrying it out has been impressive.
- The great majority of subprojects promise to be financially and economically viable. Financial returns are likely to exceed initial estimates in better agro-climatic areas; in the semi-arid Sertão water is the key determinant.
- Annual family incomes are expected to rise 200-400 percent from an initial R$1,400 (typical case) in three to six years, net of loan repayment amounts.
- Repayment of land loans is occurring in the original Ceará pilot properties, where families from 42 of 44 properties have paid without difficulty. Measures are needed to avert defaults.
- Strong management information systems and continuous evaluation are crucial to resolve problems promptly and monitor a project involving numerous community groups in multiple states.

financed by the Bank and state governments of the Northeast and several states of the South, a series of rural poverty reduction projects have successfully delivered funds directly to poor rural communities for cost-effective, sustainable investments in basic infrastructure, services, and productive activities. The core institutional feature of these projects is the project municipal council. In some cases, these institutions have evolved from purpose-specific commissions into project municipal councils with technical chambers to handle demands for specific projects, and finally into rural development municipal councils that coordinate demands for support from diverse programs and oversee the allocation of funding. In the case of the Northeast Rural Poverty Reduction projects, the councils (FUMAC) are representative bodies comprising 80 percent membership of beneficiary communities and civil society and 20 percent municipal authorities. Councils discuss and establish priorities working within an indicative annual budget, approve community proposals, and monitor and supervise subproject execution. An even more decentralized pilot variant of these councils (FUMAC-P) manages its own actual budget based on an annual operating plan, distributes funds to beneficiary associations for approved investments, and monitors execution. Beneficiaries contribute a minimum 10 percent in labor, materials, or cash under both models. Results of these projects are summarized in box 2.
Box 2. Impact of Northeast Rural Poverty Reduction projects

By 2000, about 50,000 subprojects in more than 1,400 municipalities were completed (77 percent infrastructure, 20 percent productive, and 3 percent social), benefiting about 1.7 million families with at least one investment (many received several), at a total cost of US$800 million.

Study of a sample of 8,123 subprojects funded in 1995 and 1997–98 revealed that at least 89 percent were fully operational, demonstrating the sustainability of investments chosen, executed, operated, and maintained by beneficiary communities.

Investments generated almost 100,000 additional permanent jobs, increased the area cultivated by more than 80,000 hectares, and generated sustainable annual income of US$200 million.

Implementation of productive subprojects and rural water supply works under these programs enabled families to take fuller advantage of available productive resources than families not participating.

Social capital rose markedly, with the impact depending on the levels of decentralization and participatory decision-making and communities’ ability to control the allocation and management of budget resources for their investments.

The social capital created by the projects has been used by communities and municipal councils to access other sources of financing and programs previously not available to them.


Four crucial findings can be generalized to projects with similar institutional features:

- How, with minimal bureaucracy and greater transparency, the projects support decentralized resource allocation, employment generation and income enhancement, and social capital formation in poor communities.
- Councils’ role as democratic vehicles for integrated, sustainable rural poverty reduction and development, with increasing capacity to influence broader local planning, and contribute to integrating policies and programs spanning the “rural space” while improving the targeting and impact of public resources.
- Superior outcomes when communities participate in selecting, financing, executing, operating, and maintaining investments themselves—real needs are met, costs are lower, and sustainability is better because of community ownership.
- Flexibility and adaptability of the mechanism for nationwide use under varying circumstances and across sectors.
Options
A suggested strategic framework for reducing rural poverty integrates policies supporting multiple paths to opportunity for a heterogeneous rural population with diverse needs. It could include the following strategies:

• **Intensify agriculture in the economically viable small-farm sector.** Policies to benefit small-scale, low-productivity farms are mainly poverty-reduction strategies, not agricultural growth programs. Successful “blueprints” for viable small-farm activities typically combine market and subsistence production and often irrigation, and include technical assistance-based intensification, community-based land access, and community-driven infrastructure investments (water supply, electricity and rural access roads). Credit, physical investments, and services for family farmers increase productivity and incomes, create jobs, and reduce out-migration. In areas where agriculture is declining, public programs might invest in adapted technologies for poor small-scale farmers with productive potential and improve transport infrastructure, technical assistance, access to credit, and farmer organizations to reduce agricultural transactions costs.

• **Revitalize commercial agriculture to increase employment and reduce poverty directly by absorbing wage labor and indirectly by fostering growth of downstream processing.** Efficient, market-driven expansion of irrigation in the Northeast can create new opportunities. Agricultural growth will be driven by commercial farmers, not the small-scale farm sector, in areas such as the semi-arid Northeast. Growth and increased employment depend on improved factor markets (markets for labor, water, land, and capital). Better education and labor code reform will improve employment opportunities for the poor in commercial agriculture. Since that sector produces most of Brazil’s export crops, avoiding real exchange rate appreciations and sharp interest rate fluctuations and instituting trade policies that adopt relatively low tariffs on imported inputs and final products could markedly improve the sector’s international competitiveness. Doing so would raise real wages and increase job opportunities on farms and in the processing and transport sectors.

• **Stimulate the growth of rural nonfarm activities as a promising source of rural employment, especially in food processing and services.** Evidence from Brazil and elsewhere strongly suggests that rural nonfarm opportunities are greater in areas better served by roads, electricity, and communications, in which factor and product markets work better and transactions costs are lower. In most cases, these are areas located close to urban centers. Women are highly represented...
in the rural nonfarm sector, particularly in education and domestic services. The critical ingredients for developing a thriving rural, nonfarm, opportunities-based economy are thus better education levels and good basic infrastructure. This strategy will not work for people living in more remote, low-density, and poorer rural areas.

- Accept migration, especially of the young, into urban areas and rural towns as inevitable and rational. Migration cannot solve the problem of rural poverty. But given the high incidence of rural poverty, the large number of very small farms, the large average family size in rural areas, and the low agricultural potential in the semi-arid Northeast, migration may be rational and even desirable. Rural-urban migration was a major factor in rural poverty reduction in Latin America in the 1990s, but also contributed to urban poverty, due to migrants’ lack of education and skills for successful relocation. Data limitations hamper proper analysis of this complex subject, but findings in Brazil and experiences in other countries suggest directions for further research and policy.

- Raise educational levels in rural areas to prepare migrants for successful absorption in better-paid urban and rural non-farm employment. Training and educational opportunities for the rural poor are crucial for easing their absorption into the general economy. Migration will also benefit family members who remain in their communities, through remittances. Providing young people with non sector-specific skills gives them access to opportunity-driven migration by equipping them to respond to better economic opportunities elsewhere.

- Ensure a safety net for the rural poor who are unable to benefit from opportunities in commercial agriculture, small-scale intensification, or migration. Older rural people, widows, and farm workers in poorly endowed areas who are marooned in extreme poverty with no viable future in agriculture are unlikely to benefit from new opportunities. A social safety net (for example, pensions) is crucial to providing them with basic, decent living standards. Safety net programs must be administratively accessible for people in remote, low-density areas with high illiteracy. The intergenerational aspect of rural poverty must also be acknowledged through parallel efforts to reach young people in the poorest households, educating them to escape the trap restraining their parents.
Message 2. Making bold changes to arrest agro-ecological decline and boost economic, social, and environmental sustainability in the semi-arid area of the Northeast

Almost half the population of the Northeast lives in the semi-arid region, which is in economic, social, and environmental decline as a result of frequent drought, the limited natural resource base, and rising demographic pressures on fragile lands. Many cities and towns lack viable productive activities, and dependence on pensions, drought workfare programs, and municipal employment is high. Policies to deal with the problem could include agro-ecological zoning for regional land planning and broad reform of the land tenure structure; productive reorganization through adaptive research, reform of regional technical assistance facilities, and credit and marketing services; and initiatives to reduce population pressures on the resource base.

Context

About 45 percent of the population of the Northeast lives in the semi-arid region, which covers large portions of all Northeast states except Maranhão. The region is in economic, social, and environmental decline or stagnation, exacerbated by its susceptibility to drought, its limited natural resource base, and increasing demographic pressures on fragile lands. Drought is unpredictable in severity, duration, and timing. The effects of drought are reduced in certain areas by dams and irrigation—irrigated agriculture is the only sub-sector that shows significant potential and expansion. Despite strong out-migration, the region’s net population decline in the period from 1980 to 1996 was less than 1.0 million (10.1 million to 9.2 million). In many parts of the region, demographic pressure remains high and unsustainable, given the weak natural resource base.

Low-technology, dry-land agriculture is the economic mainstay of this region. Secondary and tertiary sectors are modest, given the fragile agricultural base on which they largely depend. Growth of the livestock and cotton sub-sectors underpinned significant agricultural expansion and diversification in recent decades, but that growth has faded and the sustainability of the region is declining.

Contraction of dry-land agriculture. Understanding the regressive processes affecting the region and the loss of capacity to support its populations requires a brief resumé of the evolution of dry-land agriculture.

The agriculture system of the Sertão includes all of Ceará, a large part of the states of Rio Grande do Norte and Paraíba, the center and west of Pernambuco, the central part
of Bahia, and a small portion of western Alagoas. Between 1970 and 1985 the crop area in the Sertão increased from 7.7 million to 9.9 million hectares, and the planted pasture area rose from 3.6 million to 6.8 million hectares, with the natural pasture area remaining at 17 million hectares. In 1985 the farm area in the Sertão totaled 63.1 million hectares.1

In 1970 the farming sector of the Sertão was diversified, with seven basic production systems in place. The decline and virtual disappearance of tree cotton, a traditional mainstay of these diversified agricultural systems, and the expansion of cattle raising changed the landscape markedly.

The area and production of tree cotton (nearly all of it grown in the Sertão) peaked in 1977, with about 2.6 million hectares harvested and 438,000 tons—some 23 percent of total national cotton production—produced. Global price and marketing problems exacerbated by the entry and spread of the bicudo pest accelerated the decline in productivity. Harvested area declined to 656,600 hectares and production of only 47,100 tons (2.5 percent of national production) by 1989. Other commercial crops, such as the castor oil plant, sisal, tobacco, and corn, also declined.

The tree cotton crisis reduced rural activity and employment; changed production relations; caused an exodus of rural labor, with consequent growth in urbanization and slums in small cities; and intensified the concentration of landholdings. As a result, large-scale land ownership alongside small-scale subsistence became the prevailing pattern in the Sertão.

The tree cotton crisis contributed to a marked expansion of cattle raising and pasture area, filling the gap caused by the drop in cotton production and the decline of other commercial crops. The outcome was a predominantly extensive but relatively unproductive livestock system based mainly on natural pastures with limited support capacity, despite the increasing use of planted pastures. The surge in cattle raising significantly altered the pattern of diversified dry-land agriculture, leading to an agricultural economy based primarily on livestock multi-cropping, with localized variations based on climatic differences and soil suitability. Today two typical production "sectors" are evident: subsistence smallholdings with rudimentary farming activities, occasionally generating marketable surpluses, and large commercial farms with extensive livestock production and

1 The 1995/96 agricultural census was not used because that census underwent a considerable change in methodology, which affected the comparability of its results with those of previous census exercises (1970 and 1985). The consistency of this last census is also questioned by many researchers in Brazil.
food crops as a secondary activity. There are some exceptions in more fertile zones and in irrigation projects.

The intense exploitation of land associated with subsistence farming is degrading soils and steadily expanding the area needed to maintain a given level of production. As a result, dry-land agriculture is contracting. The population of the semi-arid region—and indeed of the entire Northeast—depends increasingly on the Center-South for its food supply, even in normal years; during drought this dependence is even greater. The demographic intensity of this agricultural system, its land tenure structure, and the region's declining ability to absorb permanent workers and sharecroppers as a result of declining commercial crops means that at least in the short to medium term, subsistence survival cropping will continue to press on fragile natural resources.

**CHANGES IN RURAL EMPLOYMENT.** The declining sustainability of Sertão agriculture becomes even more evident when the evolution of rural employment is examined. From 1970 to 1985 the number of people employed in rural areas expanded from 3.0 million to 4.2 million, an average annual rate of about 2.2 percent. This rate is higher than the rate of expansion of cropped areas (1.5 percent per year) but lower than that of the area under cultivated pasture (5.7 percent per year), indicating growth of the livestock sector. The fact that the number of people employed grew faster than the cultivated area does not signify increased land productivity, since production did not rise; productivity is, in fact, stagnating in many areas for principal crops.

Labor retention results from the large size of the smallholder segment, where most workers are concentrated. The quest for survival by family members, not profit maximization, is the primary goal. In prosperous times, some family members may still relocate, but in an economic downturn, the flow is back to rural areas. This in-migration increases pressure on smallholdings, reduces productivity, and increases the number of people employed. This represents an unsustainable pattern of land occupation and use.

Since livestock raising is not labor intensive, there has been little increase in new permanent jobs to soak up this surplus labor. From 1970 to 1985 the number of temporary workers grew from about 299,000 to about 527,000. Part of this increase was associated with the building up of planted pastures and seasonal maintenance activities. In the same period the number of sharecroppers and assimilated laborers decreased from 218,500 to 174,200, as a result of both the tree cotton crisis and changes favoring temporary labor rather than permanent, salaried labor or sharecropping arrangements. Permanent labor linked to large-scale agricultural production has thus declined, while subsistence family labor has swelled. These workers are employed on a temporary and seasonal basis by com-
mercial agriculture and in other intermittent activities, such as drought workfare programs. Again, comparability problems and methodological inconsistencies impede the use of the more recent data from the 1995/96 census.

**Prospects of Irrigation in the Semi-arid Region.** Since most of the region’s agriculture is rain-fed and therefore subject to the uncertainties imposed by droughts, irrigation could in principle reduce such uncertainties and allow the introduction of yield-increasing technologies. This would not only significantly expand agricultural output, but also absorb labor and generate income growth. While this makes wholesale expansion of irrigation a tempting solution for the social and environmental problems of the semi-arid region, it is important to note that the results of past investment in irrigation have not been consistently positive (see Policy Note on the water agenda).

Water is obviously a fundamental input, but the feasibility of irrigated agriculture also depends on topography, soil conditions, adequate infrastructure, institutional support, and market conditions for the products of irrigated activities. Considering all these restrictions, the availability of land with potential for irrigation declines markedly. Despite that, even the most conservative estimates confirm the possibility of doubling the current area under irrigation and the opportunity of increasing current productivity; this potential cannot be easily mobilized but should not be ignored.

**Lack of Education and Skills.** Social problems are an obstacle to any major attempt to rationalize, develop, and reorganize the region, economically or environmentally. The extremely low educational level of a large part of the population seriously limits the possibility of introducing conservation-oriented agricultural practices that would foster coexistence with droughts. Increased agricultural productivity will be difficult without such technologies, reinforcing the cycle of decline. Lack of the education and skills to either improve productivity or migrate successfully, combined with the mediocre performance in the past two decades of the Northeastern and Brazilian economies, virtually ensures continuation of this vicious cycle.

**The Need for Decisive Action.** Other sectors of the semi-arid regional economy offer no relief. Regional cities and towns are modest, with few industries, weak infrastructure, and poor social services, including healthcare and education. A poor person thus has little alternative but to survive in a rural area until retirement.

In recent years federal and state government interventions in the semi-arid region have increased. An impressive and often ambitious array of policies and programs to transform the region and improve its sustainability have been tried. With some striking
exceptions, the results have been limited and the broad outlook remains depressed. Decisive action is essential to avoid a crisis of sustainability in the region and potential social unrest.

**Options**

There is no magic bullet for the region's recovery and growth; improvement in living conditions is likely to take place only over the long term. The following policy recommendations are not a blueprint for success, but they may indicate the principal actions necessary to reorganize the rural space.

The following actions are targeted mostly at the extensive hinterland, which is strongly dependent on agricultural activities:

- **Conduct an agro-ecological zoning study for the entire region, which could serve as the basis for regional land planning.** Actual zoning actions would take drought-induced uncertainties into account. Ecological-economic maps of the region could serve as the basis for preparing sustainable development master plans as well as defining the potential and limitations of the subregions of the semi-arid region. This in turn would allow for more efficient use of scarce financial resources.

- **Reform the land tenure structure.** Several million people are trying to survive on minute areas of land in a fragile, drought-prone ecosystem, while millions of hectares remain underutilized. Conventional restructuring—breaking up large land holdings to expand the number of smallholdings—is not adequate. Land tenure restructuring in the region requires the establishment of viable agricultural units that can survive even under drought and the adoption of innovative mechanisms and approaches (such as Crédito Fundiário). Another priority is strengthening property rights to land by formalizing informal titles so that the market can facilitate the formation of land holdings of more optimal size.

- **Adapt agricultural activities to regional environmental conditions, taking into account the vulnerability imposed by drought.** Agricultural activities need to be made minimally viable in drought years, which does not mean that these activities should be implemented only in areas where irrigation is feasible; because irrigated areas are limited, adopting such a policy would exclude most of the rural population. Instead, ways need to be found to accumulate and manage sufficient water to permit basic agricultural activities in drought years. Crops adapted to dry climates, such as castor bean and other oilseeds, as well as fibers...
such as sisal, drought-resistant grains, and adapted forage plants should also be developed or promoted. Reviving cotton in selected appropriate areas of the region could also be considered.

- **Reform the region’s technical assistance facilities and services, and provide adequate support for credit and marketing.** While emphasizing the dynamic competitiveness of enterprises, policymakers need to involve government in the initial stages of new activities, avoiding the paternalism and political interference that has marked such involvement in the past.

- **Resettle some of the population currently living in the semi-arid region.** Even if reforms were successful, agriculture would not be capable of supporting the entire rural population at a minimum standard of living. Out-migration has been occurring for many decades, but it has taken place in a manner that does not guarantee an improved existence elsewhere. Recently, the nation's economic difficulties have made demographic resettlement even more difficult. Better economic performance is needed, along with actions to make the voluntary resettlement process less traumatic. Urban restructuring and measures to encourage diversification are needed, keeping in mind the productive vocations of the region’s small and medium-size urban centers. Development of tourism and service sectors supporting diversified agriculture could also contribute in some areas. Investments in infrastructure and basic urban services are essential to create the minimum conditions required to raise regional urban centers to a position in which more dynamic economic activity is feasible.

- **Reconsider irrigation policy.** The past problems and failures of “social” irrigation, in contrast with the successes of entrepreneurial irrigation, should not deter efforts to formulate a new policy for irrigation that would continue to support commercial irrigation, but would stress the development of a new model for small settlers. This would contribute to the absorption of the region’s demographic surpluses, allowing the productive settlement of small farmers. This is a simple idea, but there are enormous difficulties in developing a real-world model that avoids the errors of the past and meets the pre-conditions for success, many of which—such as education and technical change—are addressed elsewhere in this section. In addition, priority should be given to rehabilitating and optimizing the returns of viable existing irrigation systems.
• Improve Education. Education is key to reducing the region’s human resource deficiencies and ultimately other major deficiencies. Without efforts to improve the quality of the educational system, the caliber of the work force, and human capital more generally, other development efforts, including the reorganization of agriculture’s productive structure and the development of activities adapted to the region’s characteristics, are unlikely to succeed. Specific actions needed include expanding and improving conventional educational networks in semi-arid areas and supporting programs to reduce adult illiteracy.

Message 3. Eliminating inefficiency, duplication, and waste in social expenditure programs, reallocating resources to proven, cost-effective, and well-targeted mechanisms

Public social expenditures in Brazil over the past 20 years have been more than sufficient to erase the poverty gap, yet extreme poverty persists. Both the skewed distribution and the inefficiency of social expenditures have contributed to the problem, particularly in rural areas. Emphasis should be shifted to programs generating the highest level of benefits for the poor per unit of public expenditure. Programs that demonstrate weak coverage and poor targeting should be retooled to improve their capacity to reach the poor.

Context
Poverty in Brazil is tied to an extremely unequal income distribution and the weak effectiveness of public expenditures. Social expenditures in Brazil represent about 20 percent of GDP, while per capita annual income is about R$5,000. Many countries with equal or lower levels of per capita income have lower levels of both poverty and inequality. Income inequality persists in Brazil not because of insufficient social expenditures but because of continued ineffective targeting of those expenditures.

The Government of Brazil has committed itself to reducing the incidence of extreme poverty (per capita income of less than US$1 per day) by 50 percent by 2015. Economic growth, social spending, and a quantum leap in the cost-effectiveness, efficiency, and coverage of a broad range of publicly funded programs will be needed to achieve this goal.

Between 1981 and 1999 the eradication of poverty in Brazil would have required estimated social expenditures of about R$35–R$40 billion year. Social expenditures by fed-
eral, state, and local authorities actually averaged about R$100 billion annually, well in excess of those levels, but only 13 percent reached the neediest; most investments in education, health, and social security went—and continue to go—to the middle class and wealthy. Ineffective or non-existent targeting of resources is the major obstacle to serious poverty reduction, especially in rural areas.

Initial international comparisons indicate that Brazil’s performance on such basic social indicators as infant mortality and youth literacy is not commensurate with its level of economic development. The problem is not caused by insufficient social expenditures: Brazil devotes some US$1,300 per capita to social expenditures, slightly more than other Latin American countries. Only Costa Rica, Panama, and Uruguay devote a greater share of GDP to public social expenditures. When both population and level of development are considered, Brazil’s per capita public social expenditures are markedly higher—by as much as 50 percent—than would be expected for countries with similar characteristics. These figures suggest that poor performance on social indicators may reflect the manner in which public sector expenditures are allocated and targeted.

Indeed, public sector expenditures are strongly skewed toward social security and welfare. Social security expenditures in Brazil account for about 68 percent of public sector spending, a level exceeded only by Uruguay among the Mercosul countries. Among Latin American countries outside Mercosul, the share of social security and welfare expenditure is closer to 30 percent. In the newly industrializing countries of the Far East, social security and welfare make up as little as 20 percent of total public social expenditures. Brazil spends 116 percent more on social security than do other countries with similar GDPs. Health and education expenditures in Brazil are being crowded out by social security spending. Health expenditure, at 11 percent of total social spending, is only slightly lower than the overall average of 15 percent for both Latin American and Far Eastern countries. Education expenditures, however, accounted for just 18 percent of total public social expenditures—markedly less than the average of 38 percent for Latin American countries outside Mercosul and the average of 52 percent for the newly industrializing countries of the Far East. Brazil spends 14 percent less on health and 21 percent less on education than countries with similar levels of GDP. World Bank (2002a) indicates that 43 percent of education expenditures in Brazil are allocated to tertiary education, a much higher proportion than the 19.5 percent for all Latin American and Caribbean countries. Given the tendency for tertiary education to disproportionately benefit higher-income classes, these findings suggest that Brazil’s education expenditures may also be inequitably distributed.
The high level of resources devoted to social security is increasingly constraining more spending on education and health, and the situation is likely to worsen. World Bank (2002a) finds that the accounting deficit associated with the state pension system is set to double in the next five years and triple in the next decade, leading to substantial expenditures to finance the associated public debt. As a result, other already under-funded areas of public sector expenditure, such as health and education, could come under increasing budgetary pressure over time.

Despite the low overall effectiveness of public social expenditures, some rural social spending has been satisfactory in both coverage and targeting (table 3). The main elements of rural social expenditures include rural credit (R$10.3 billion lending, including debt rollover); rural pensions (R$10.8 billion); spending of the Ministry of Agriculture (R$3.7 billion), mostly related to programs to stimulate overall agricultural development; land reform (R$1.9 billion); education and health spending in rural areas (estimated at R$4.5 billion); infrastructure investments (including water resource investments accounting for R$0.7 billion); and drought relief programs (accounting for approximately R$1 billion in drought years). Total selected rural spending analyzed here (excluding credit programs that cannot be easily assigned to rural or urban areas and many subnational spending programs) amounts to approximately R$24 billion.

Table 3. Selected rural social spending in Brazil, 1998 (R$ billion)

<table>
<thead>
<tr>
<th>Program</th>
<th>Expenditure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rural pensions</td>
<td>10.800</td>
</tr>
<tr>
<td>Ministry of Agriculture</td>
<td>3.689</td>
</tr>
<tr>
<td>Ministry of Health</td>
<td>2.390</td>
</tr>
<tr>
<td>Education</td>
<td>2.170</td>
</tr>
<tr>
<td>Ministry of Agrarian Development</td>
<td></td>
</tr>
<tr>
<td>(land reform)</td>
<td>1.950</td>
</tr>
<tr>
<td>Ministry of Environment</td>
<td>1.690</td>
</tr>
<tr>
<td>Drought relief</td>
<td>1.238</td>
</tr>
<tr>
<td>Subnational Rural Poverty</td>
<td></td>
</tr>
<tr>
<td>Alleviation Projects (RPAP)</td>
<td>0.090</td>
</tr>
<tr>
<td>Total rural spending</td>
<td>24.017</td>
</tr>
</tbody>
</table>

COMMUNITY-BASED LAND REFORM. Evaluation studies reveal that the Cédula da Terra project is expediting land access for the rural poor. Self-selection into this demand-driven model has worked well, with about 85 percent of beneficiaries having an initial annual income below the poverty line. (Since no detailed assessment of overall land reform beneficiary income is available, the targeting rate of 85 percent is assumed to be applicable to the overall land reform program.) Based on the current rate of 100,000 land reform beneficiary families per year and a targeting rate of 85 percent, 85,000 poor rural families, or 3.8 percent of all poor rural families in Brazil, would benefit each year. The 372,000 land reform beneficiary families from 1995 to 1999 include 316,000 poor families, accounting for about 12 percent of Brazil’s rural poor.

NORTHEAST RURAL POVERTY ALLEVIATION PROJECTS. Evaluations of the Northeast Rural Poverty Alleviation projects show that, depending on the state, 70–90 percent of beneficiary families have family income of less than two minimum salaries (about R$400 a month in 2002). Beneficiary income is probably under-estimated compared with the more detailed income calculation derived from the Living Standards Survey (Pesquisa sobre Padrões de Vida). Based on an average of five household members in the poor rural Northeast, about 70 percent of the benefits may be assumed to accrue to those considered poor for the purposes of this report (people with per capita income of less than R$72 per month). By 2000, about 50,000 subprojects were completed under the Northeast rural poverty projects at a cost of US$800 million (about 7,100 subprojects per year, costing about US$115 million), reaching 1.5 million rural families at a cost of about US$500 per family. With a targeting ratio of 70 percent, the projects would have reached 150,000 poor rural families in the Northeast each year, which, for the seven-year period, is about 40 percent of the 2.5 million poor rural families in this region.

DROUGHT RELIEF. The 1998–99 drought in Northeast Brazil affected more than 10 million people in eight states. The drought relief program focused on targeted food distribution, workfare, and a subsidized credit scheme to alleviate drought conditions. About 30 percent of all families affected received basic necessities and unprocessed or prepared meals under this scheme. The workfare component is estimated to have covered 1.2 million workers, or 60–70 percent of those in drought-affected areas who wanted to work at the offered wage rate. Three-fourths of program costs flowed out as wages to participants. In terms of overall efficiency, there is a strong case for relaxing current restrictions on eligibility and geographic targeting, to ensure wider coverage of the needy. About 100,000 families—about 1 percent of families affected by the drought—received sub-
dized credit totaling R$450 million. Both targeting and coverage of the credit were minimal, a critical issue.

Preparedness for and speed of response to drought need boosting. The federal funding response in 1998 was slow. In Pernambuco, for example, civic meetings to mobilize community members were held in August 1997 and the signals were clear beginning in early 1998, yet relief was not activated until May. Only in Ceará did relief programs begin in late 1997. Overall coverage of the 1998 drought relief effort was also inadequate. Higher aggregate funding and improved efficiency in reaching the worst-affected are needed, and the coordination of drought relief with anti-poverty policy in non-drought years must be tightened. Some attempts have been made to coordinate drought relief with other programs (for example, acceleration of Bank-supported rural poverty projects in drought-affected Northeast states), but such efforts have been mostly ad hoc and partial. Systematic coordination efforts must acknowledge that droughts are intimately connected to the general problems of rural development: high risk, credit and insurance market failures, under-investment in local public goods, and often weak local institutions.

PENSIONS. The government spends about R$11 billion a year on the rural pension scheme, but only 6 percent of the rural poor receive pensions, a much lower proportion than the 10–20 percent of higher-income groups who do so. About 13 percent of rural pension receipts accru to the rural poor (10.5 percent in the rural Southeast, 14 percent in the rural Northeast). The rural poor receive about R$1.4 billion a year in pension receipts, representing one-quarter of their total aggregate income. In the rural Northeast about 4 percent of the rural population (occupying the top income quintile) receive 43 percent of the pension receipts; 25 percent of the rural population (occupying the bottom income quintile) receive about 14 percent of pension benefits.

WATER AND SANITATION. For the rural poor, coverage by water distribution systems remains minimal, as does access to trucked water (carro pipa). In the rural Northeast water trucking services largely serve the 25 percent of the local population who fall within the second income quintile nationally; the 50 percent of the rural population that is poor receive only 16 percent of these services. Less than 25 percent of the rural poor in the Northeast have access to any type of sanitation system; in the rural Southeast about a third of the population has at least some access to sanitation.

EDUCATION. Nationwide 32 percent of Brazil's rural population 15 and older is illiterate; in the Northeast, the rate of illiteracy is 46 percent. Targeting ratios in the Northeast are
relatively high for day care (72 percent) and kindergarten (68 percent), but they decline steadily as education level increases. Primary school enrollment exceeds 85 percent in rural areas, but the Living Standards Survey suggests that 45 percent of rural children in the Northeast do not attend primary school. Less than 5 percent of the poor in the rural Northeast and Southeast attend secondary school.

**Health.** The rural poor depend mainly on public health care, making very limited use of private health care services. Some 35 percent of public health care users in the rural Northeast are poor, compared with 22 percent in the rural Southeast.

**Agricultural credit.** Like many other developing countries, Brazil provides directed loans and concessional credit to its agricultural sector. Only a small share of farm households have access to rural credit overall; the majority of the agricultural sector is thus not benefiting from subsidized directed credit. Forty percent of those receiving subsidized financing for agriculture are the rural poor, but only 2 percent of the rural poor have any access to subsidized agricultural credit.

**Comparison of rural spending programs.** (Figure 1) depicts selected rural social programs in three dimensions. The size of each sphere is proportional to annual spending per household (annualized in the case of investment programs), showing the relative importance of the program to beneficiaries. The horizontal position of the sphere shows the level of targeting of the program to the bottom income quintile. The vertical position of the sphere shows the reach (coverage) of the program among the bottom income quintile. For reference, the impact of distributionally neutral annual growth of 4 percent is shown in the top left-hand corner.

Programs shown in the lower left-hand corner are poorly targeted, with limited coverage of the poor. These programs include pensions, urban services, secondary education, and credit. Programs in the bottom right-hand corner are well-targeted but reach only a small share of the poor. They include market-based land reform, a relatively new program that is still expanding. Programs near the top left are universal. They include basic health care, education, and school lunches. The “ideal” social program, located in the top right-hand corner, is well-targeted and reaches a large share of the poor. Programs such as drought relief, workfare, and the Northeast rural poverty projects come close to these criteria for the Northeast.

The more complete the reach to the poor among these rural social spending activities, the more difficult is the control of leakage to the non-poor. In scaling-up small and well-
targeted social development programs, policymakers need to reallocate funds from programs with inadequate coverage and targeting or redesign existing programs to improve their targeting and extend their reach. If the budget constraint is binding, there may be tradeoffs between benefit size and coverage.

Figure 1. Coverage and targeting ratios of selected social spending programs in Brazil, 2001

Options
Many programs designed to target the rural sector in Brazil need to be reassessed in order to increase coverage and improve targeting. Given the binding resource constraint and the levels of rural need and demand, local, state, and federal governments need to invest in social programs with demonstrated ability to reach the maximum number of rural poor for a given level of funding. The following recommendations are intended to foster and facilitate a fresh analysis:

- RE-ANALYZE THE DISTRIBUTION OF PUBLIC SOCIAL EXPENDITURES TO MORE CLOSERLY ALIGN IT WITH BRAZIL’S STATED RURAL DEVELOPMENT PRIORITIES. While absolute per capita public social expenditures are high in Brazil compared with countries at similar levels of development, the structure and in some cases the low
effectiveness of these expenditures, remain an obstacle for sustained rural development. Massive resources devoted to social security, for example, appear to constrain much-needed investments in health and particularly rural primary and secondary education. Increasing support to health and education would support the Government's stated resolve to reduce extreme poverty by 50 percent by 2015.

- **Scale up programs that target the rural poor.** Examples of such programs are market-based land reform, drought workfare, and the Rural Poverty Reduction Projects, in all of which at least 70 percent of beneficiaries are the rural poor. These three programs are demand-driven instruments for rural poverty reduction. Despite similar targeting capacity, benefit size varies across these projects: while an additional R$1 million would reach about 1,000 poor beneficiaries under drought workfare or the rural poverty projects, it would support about 34 poor families under land reform.

- **Restructure rural social programs with limited coverage and poor targeting to increase their poverty reach and focus.** Subsidized directed agricultural credit currently reaches only a small fraction of the rural poor. Secondary education in rural areas is extremely limited, as is access to safe water and sanitation. Making greater use of the lessons learned from programs with better targeting and coverage—such as the importance of localized, participatory decision-making, decentralized administration of funds, and demand responsiveness—would increase the reach of rural social programs and reduce leakage to the non-poor.

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**Message 4. Adopting integrated natural resource management to reverse and prevent degradation, encourage preservation, and promote sustainable rural development**

Every year Brazil loses more than a million hectares of topsoil to erosion, costing the country about R$3.2 billion annually. Expansion and consolidation of the watershed-based approach to integrated natural resource management can help reverse land and water degradation processes and promote a socially, economically, and environmentally stronger rural space. Farmers' use of sustainable modern methods of land management and soil and water conservation is a win-win situation in which adopters improve their profitability while reducing pressure on natural resources. Upstream land management activities benefit downstream ecosystems and populations, and they contribute to community and institutional development. The contribution of these activities thus extends well beyond their direct impact on soil and water conservation by leveraging the benefits of other integrated community-based poverty reduction activities.
Context
Brazil is a major exporter of coffee, soybeans, maize, sugar, banana, manioc, orange juice, and meat. Agriculture represents 15 percent of total GDP (27 percent if agro-industries are included) and employs about 18 million people, on about 3.7 million farms. Total cropped area is estimated at about 40 million hectares, pastures cover about 180 million hectares, and about 20 million hectares are cleared fallow land.

Most land currently producing was cleared in the last 30 years. Significant areas of unsuitable land were deforested and put under cultivation, with negative results for the environment; most of these areas have now been abandoned. Exposed to erosive rains, these vulnerable areas continue to degrade and to adversely affect downstream lands and rivers through silting of hydraulic infrastructure and natural waterways.

As a consequence of deficient land management, Brazil loses the equivalent of more than 1 million hectares of topsoil to erosion every year, representing annual losses of about R$3.2 billion. Biodiversity has also been seriously affected by expansion of the agricultural frontier; losses caused by the use of mistaken natural resource management practices are incalculable.

Public intervention and a growing environmental awareness have helped reduce the incorporation of unsuitable land to production, while agricultural research has contributed to integrated management of resources and increased yields, thus reducing the need for area expansion. Progressive farmers have been adopting sustainable land management practices in recent years, diminishing negative environmental impacts. Most crop and grassland areas continue to be managed using conventional or traditional technologies, however, causing soil erosion and degrading natural resources.

Soil degradation by runoff erosion is a universal, pervasive phenomenon in Brazil. Even the semi-arid regions of the Northeast suffer heavy, erosive summer rains that cause irrecoverable losses to farmers’ production base. Soil degradation is most destructive in the small-farm sector. In a perverse vicious cycle, soil degradation is both a cause and a consequence of rural impoverishment that leads to declining yields and revenues, promotes land clearing, harms the water cycle, and reduces biodiversity. This destructive cycle is perpetuated by market developments and government policies that have reinforced the bias toward technologically advanced producers and against low-technology, small, and semi-subsistence farmers, who find it difficult to find and adopt suitable, sustainable resource management practices that might reverse it.

The link between natural resources management and the poor is two-fold. First, many natural resources are commonly shared assets, and since the poor have fewer of their own assets, natural assets make up a larger share of the total wealth of the poor than of the non-
poor. Second, limited financial capacity means that whatever access poor people have to ownership of natural assets will be mostly to fragile, lower value resources with lower intrinsic productivity and more prone to degradation due to improper management. That is, natural resources are an important part of the livelihood of many poor people.

**Integrated Natural Resource Management.** Integrated natural resource management refers to responsible and broad-based management of the land, water, forest, and biological resource base needed to sustain agricultural productivity and avert degradation of potential productivity. It involves the assessment of tradeoffs between productivity and environmental services, profitability, and cultural concerns, focusing on the impact of resource management on social, economic, and cultural concerns.

Integrated natural resources management is an efficient approach to achieving the highly interdependent goals of conserving the environment, eradicating poverty, and attaining food security. It is often characterized by its support of flexible, diverse, careful, and intensified management rather than of intensification of production in the simple sense.

Among the strategic tools used in integrated natural resources management are programs of integrated catchment management and integrated water resource management. Both programs are used in national planning for integrated management of land, water, and forest resources at river catchment scales of 5,000–500,000 square kilometers. The boundary ascribed is always the physical watershed. Integrated natural resources management is also being promoted with community groups and in some cases even with individual farmers, through community-based natural resource management of common property, open access, and privately owned resources in micro-catchments of 5–50 square kilometers. Integrated natural resource management is also central in current thinking on poverty alleviation.

Governments and development agencies have turned to integrated natural resources management to safeguard the natural resource base and improve agricultural productivity. While the experience in Brazil and elsewhere highlights the merits of this approach and the flexible use of the catchment as the planning unit for natural resource management, its scope is limited and the concept still faces challenges of scaling up and out. The scaling-out of successful experiences in some areas to others with similar characteristics will involve some adaptation and require supporting research and flexible implementation. Scaling-up the approach to reach more beneficiaries across larger areas within a reasonable time period will depend on creating the conditions for community participation. As demonstrated by
the series of Bank-supported projects in southern Brazil, success in scaling up and out will depend on the effective adaptation and integration of lessons into new operations.

Contrary to the common view, the catchment may not always be the optimal unit for all activities, because neither catchments nor the groups who live among them, are homogeneous; their problems and the possible solutions are varied. Complex and prescriptive external solutions have little chance of fitting and may be inappropriate or unacceptable to the majority of farmers.

Integrated natural resources management activities need to fit into the increasingly decentralized context of targeted programs in Brazil. Greater participation of state and local governments and beneficiary communities in targeted expenditures is being promoted to achieve efficiency gains, greater commitment, and long-term sustainability. The experiences in Paraná, Santa Catarina, and Rio Grande do Sul show that success depends critically on adequate localized technical assistance and training. Special measures are needed to foster the involvement or evolution of technical assistance service providers in areas in which official extension is weak or non-existent. Sound operational strategies should include robust monitoring and evaluation systems. Bank experience proves that even highly decentralized projects can be operated efficiently and transparently when appropriate monitoring systems are used.

Beyond the institutional and operational complexities faced, expansion of the integrated natural resources management concept will require focused research to build knowledge to help people manage the natural resources on which they depend. Better understanding of the circumstances underlying patterns of natural resource use, and the needs for and implications of introducing natural resource management methods in different ecological, socioeconomic, and policy environments, is needed. Increasing the capacity of the rural environment to reduce poverty and foster food security and environmental sustainability also implies developing systems to address emerging issues that could further marginalize poor farmers. These include market-driven bio-technological developments, globalization of trade, climatic change, and changing patterns of land use.

**Improving Land Management and Stopping Soil Degradation: Outcomes in Southern Brazil.** The agricultural “modernization” campaign promoted by the government in the 1970s to foster production and generate export surpluses produced some perverse effects in the southern states. Widespread deforestation, incorporation of unsuitable land to production, intensified tilling, and increased use of agro-chemicals caused severe erosion and increased water pollution. The states of Paraná and Santa Catarina invested heavily in developing a strategy to revert natural resources degradation back to environ-
mentally superior, sustainable farming systems. With the help of external experts, researchers and technicians in both states established an effective technical strategy, initially tested in pilot areas and subsequently implemented statewide, through several successful World Bank–supported land management projects.

The technical strategy adopted to improve land management and stop soil degradation had three core objectives: maximizing soil cover to avoid the rain-splash effect, improving soil structure to maximize infiltration, and handling excess surface runoff. The strategy also included an important pollution control objective. The operational strategy sought adoption of the micro-catchment as the core geographical planning and implementation unit.

Municipal micro-catchment commissions were created in each participating municipality to select the micro-catchments and set annual investment priorities for their jurisdiction. A formal commission was set up in each micro-catchment. Local extension workers helped prepare a participatory survey, and a micro-catchment management plan was prepared and approved by each commission. Micro-catchments and municipal micro-catchment commissions received intensive leadership and management training. Technical training was provided to assisted farmers, addressing the main land management and agro-environmental problems and introducing relevant technologies.

The outcome was impressive: about 2,100 micro-catchments were assisted in Paraná and 530 in Santa Catarina, benefiting 300,000 small-farmer families (200,000 in Paraná and 100,000 in Santa Catarina), at an average cost of about US$700 per assisted family or US$80 per hectare. At completion, soil losses in assisted areas were down 50 percent. Runoff water in streams contained lower levels of suspended solids, coliform bacteria, and pesticide residues, reducing silting and water treatment costs in downstream areas and the incidence of waterborne diseases and pesticide poisoning. Maintenance costs for rural roads fell by as much as 80 percent, while better all-weather access stimulated both commercial and social activities. The new land management practices proved more profitable to farmers than the practices they replaced.

These Bank projects incorporated features common to successful community-based natural resource management experiences, including a reasonable initial degree of social organization to facilitate collective action, flexibility and focus on adaptation rather than adoption, provision of tangible benefits to participants in a short space of time, and subsidized investments with mandatory beneficiary contribution (in cash or kind) to increase commitment. The lessons are summarized in box 3.
Box 3. Lessons of micro-catchment programs in Southern Brazil

Catchments of 80–120 families enabled extension technicians to work efficiently and facilitated association and participatory planning.

A quality soil and water management implementation scheme, jointly executed by the farmers of a micro-catchment, had greater environmental impact than traditional, individually implemented soil conservation schemes.

The participatory experience developed by the micro-catchment strategy enabled small farmers to successfully shift from strictly agro-environmental activities to more comprehensive integrated rural development schemes. Use of micro-catchments—a proven, versatile strategy for multi-purpose, sustainable rural development—is already being replicated with local adaptations in Mato Grosso, Mato Grosso do Sul (improved land management in buffer areas of the Pantanal to protect against silting and pollution), and São Paulo (water resources management program). New projects are underway in Parana and Santa Catarina.

Rural extension was the pivotal component of micro-catchment projects. Extension technicians were responsible for key activities, motivating and mobilizing farmers, and helping them correctly define their problems and understand and adopt the technical strategy recommended.

The roads component and the incentive fund were important factors motivating farmers to meet and discuss their individual and collective technical and other problems.

Source: adapted from Marzall, 2002.

Options

Policymakers face a variety of options for dealing with the degradation of natural resources:

- Replicate the land management experience using the micro-catchment approach, with appropriate adaptations, in all small-farm areas.

Combining micro-catchment-based integration of natural resources management with poverty alleviation is the preferred strategy for sustainable rural development. While its adaptation for the semi-arid Northeast would focus on water saving, in the humid Amazon regions the focus would be on the sustainable management of native forest and the intensified use of already deforested areas. Land use would be adjusted according to soil type, topography, climate, and technological level adopted.
In the large-scale, entrepreneurial farming sector, where the micro-catchment approach may not be applicable, adopt different land management strategies based mainly on enforcing environmental legislation and instituting specific incentives. The government could provide grants to co-finance the protection or recomposition of gallery vegetation as well as of severely eroded areas that are generating downstream damage. It could also sponsor annual land management competitions in which integrated natural resources management practices adopted by competing farms are analyzed, with appealing prizes awarded to the winning farms.

Adapt technical and operational strategies to tackle weak institutions, farmers’ capacity constraints, and financing constraints of beneficiaries and state and federal governments. Whatever policy options are undertaken, planning flexibility will be needed to adapt the strategy to different local conditions across and within states.

Rethink the old extension model, and develop and set up new paradigms based on partnership schemes. Lack of reliable, coordinated institutional structures, especially the lack of qualified state extension services, represents a big hurdle in most states. Small farmers in many states have traditional backgrounds, and extensive training of beneficiaries and technical assistance agents is required. Good farmer capacity was the basis for successful implementation of the Paraná and Santa Catarina projects. Beneficiary farmers generally had long experience with market-oriented production, associated forms of development, and extension-assisted technological development and were therefore responsive to the projects’ proposals.

Set up co-financing schemes to leverage the limited financial resources of beneficiaries and state governments.

References

World Bank projects

World Bank reports

This chapter summarizes the content of the following World Bank reports. Those, in turn, draw heavily from a wide range of literature on the subject from experts in Brazil and beyond, which are referenced in the mentioned Bank reports.


———. 2002a. “Inequality and Economic Development in Brazil.” Brazil Country Management Unit, Poverty Reduction and Economic Management Sector Unit, Latin America and the Caribbean Region, in collaboration with Instituto de Pesquisa Econômica Aplicada, Washington, D.C.


Other references


