

Feeder Roads in Brazil

THE BANK-FUNDED IMPROVEMENT OF MORE THAN 1,500 kilometers of roads in the Brazilian state of Bahia helped expand agricultural production, increase the availability of hospital beds, and raise school attendance, according to an OED study.* An opinion survey among local residents also indicated that the road works, carried out under two Bank projects, helped increase the number of jobs and improve living conditions in some regions.

The roads were built in areas where coffee, cocoa, and dairy were the leading agricultural products. But the market prices of the key commodities whose production the roads were intended to benefit dropped dramatically a few years after the road improvements were completed. The improved roads, however, helped local farmers diversify their products or shift to other business activities.

The study stresses the importance of adequate monitoring in assessing rural road investments. It recommends that similar projects include measures to limit environmental degradation and to consider clusters or small networks of rural roads when preparing state or regional development strategies. Local beneficiaries, including the private sector, should be involved in the funding, maintenance management, and evaluation of the social benefits of road works.

In the mid-1970s the Bank made a shift in its rural development lending policy vis-à-vis Brazil to support less developed regions, especially in the northeast. In 1976 the Bank approved its first

rural roads project (the Secondary and Feeder Roads Projects), which closed in 1985. This was followed by the Second Feeder Roads Project in 1979 (closed in 1987). The projects, cofinanced by state and federal governments, marked the first attempt to establish collaboration at the central, state, and municipal levels.

One of the main beneficiaries of the two projects was the state of Bahia, where more than 1,500 kilometers of “feeder” roads—roads connecting agricultural production areas with villages and produce markets—covering 63 road sites were built. This state was chosen because it was better equipped to deal with the complex administrative, economic, and engineering prerequisites needed to obtain financing for subprojects.

Study Methodology

Assessing the impact of the road works was difficult (both in terms of physical and developmental objectives) since the projects lacked monitoring and evaluation systems. Neither project identified control





roads that could have been used to assess impacts. Assessing developmental objectives was especially difficult because Brazil's economic conditions changed considerably during the life of the investments. Thus, the study focused on quantitative and qualitative changes “before and after” rather than “with and without” road improvements.

A sample of 20 roads (38 percent of the total) completed before 1985 was selected for field research. The study labeled regions according to their main crops—coffee, cocoa, and dairy.

The coffee region covers a substantial part of the state; the cocoa region is located along the coast in southeastern Bahia; the dairy region is located in the southern part of the state, on the border with the state of Minas Gerais in Bahia's south. Half a million people, accounting for about 15 percent of the total population of the three regions, inhabited the area covered by the study.

Impacts

Surveys

Opinion surveys carried out by the study team indicated that the road improvements led to better standards of living and access to social services.

Eighty-three percent of all respondents said the roads yielded benefits. The initial beneficiaries of the projects were large producers, but the roads eventually benefited the entire local populations by expanding production and generating a greater flow of wealth, increasing the number of jobs, and attracting migrants to some areas. Social infrastructure, particularly in the cocoa and coffee regions, was also upgraded.

Economic Impact

The roads helped expand production of local crops, especially cocoa and coffee, in the years immediately after

Table 1: Diversification of Economic Activity in Project Areas, by Economic Region

Diversification by type of economic activity

Region	Agricultural	Non-agricultural
Coffee	Irrigated vegetable/fruit farming, cattle raising, pig/chicken farming, irrigated coffee, manioc, bean, corn, potatoes, tomatoes, avocados, acerola, maracuja, guarana, orchids, sugar cane, dairy	Lumber extraction, charcoal production, masonry rocks, diamond extraction
Cocoa	Cattle raising, vegetable farming, manioc, corn, beans, bananas, rubber trees, papaya, maracuja, watermelon, garlic	Lumber extraction, charcoal production
Dairy	Sugar cane	Graphite mining

the improved roads were opened to traffic. Producers were able to market their products more easily and to bring in machinery and other modern appliances at a time when traditional production techniques were being upgraded. In the early 1980s, international cocoa prices were favorable, producers had access to credit and subsidies, and commercial and service activities in urban areas were expanding.

In the late 1980s and early 1990s, world market prices of both coffee and cocoa dropped steadily and severely, wiping out the gains made in previous years. Prices plummeted to their lowest levels in 1993, discouraging production. Dairy was also affected by the slump, but to a much lesser degree than cocoa and coffee. However, the crisis of the region's traditional commodities encouraged producers to diversify their crops and develop nonagricultural economic activities (see Table 1).

Traffic Impact

During the study period, traffic increased substantially, in most cases more rapidly than that of the national economy. The roads in the cocoa and dairy regions appeared to have had the highest traffic levels, but there were also considerable fluctuations in traffic levels and growth over the years, partly because the continued drop in coffee and cocoa prices caused the economy to decline steadily. The roads showing large increases in traffic were mostly those that were integrated as long-distance links in the federal and state networks.

Social Impact

Objective and quantified data on social change were difficult to obtain. Nevertheless, some data on changes in land tenure, health, education, and urbanization in each of the three main regions were available. The data showed a significant improvement in land tenure. The proportion of small landholders increased in all three regions, despite the fact that at the national level very few changes were occurring at the time. Also, the number of

inhabitants per hospital bed dropped (even during economic decline), especially in the coffee and dairy regions. The proportion of children attending school continued to grow significantly in two of the three regions, even after the period of prosperity ended (see Table 2). Finally, the proportion of the population living in urban areas grew in all regions.

The extent to which these changes can be attributed to the road works is uncertain, but it can be said that the social changes coincided with the improvements to the feeder roads.

Environmental Impact

Because the road works generally followed existing tracks, the environmental impact of road construction was minor. The survey found that deforestation, mostly through traditional slash and burn techniques, occurred in all three regions, with subsequent erosion, alterations in the ecosystems, siltation of creeks, reduced water availability, and negative effects on local fauna. But the rate of change in land cover in the regions under study was generally comparable to that observed in the rest of the country. The only incidence of environmental degradation directly traceable to the feeder roads project was the erosion caused by poor construction and ineffective maintenance on some roads in the cocoa region. Deforestation, siltation, and the extended use of chemicals were otherwise related to increased economic activity in the early years after project completion.

Economic Analysis

It was virtually impossible to calculate the investments' economic rates of return by replicating the methodology used during project preparation because of data problems with two key variables: agricultural output and inflation. The projects had no yearly monitoring data to measure output, which varied greatly from year to year because of price fluctuations and weather conditions; agricultural production has diversified consider-

Table 2: Social Impacts in Areas Affected/or Serviced by Feeder Roads, by Economic Zone

Zone	Land Tenure		Health		Education		Urbanization	
	% holders with 50 hectares or less		No. of inhabitants per hospital Bed		% children attending		% urban population	
	1975	1985	1985	1989	1985	1991	1980	1991
Coffee	73.6	93.4	740.2	629.5	85.5	86.7	43.8	54.4
Cocoa	57.8	81.4	550.2	542.2	77.3	87.8	46.2	59.0
Dairy	48.8	69.4	636.6	573.3	82.6	90.9	47.5	61.3

ably since the projects closed; investments other than road construction may have influenced production; and, lastly, inflation has varied greatly since the late 1970s (reaching 2,000 percent in 1994). Thus, the study assessed the investments' economic performance by estimating the drop in transport costs (resulting from road improvements), although actual traffic data were available only for the year prior to road improvement for 1993 and for 1996.

Overall, the results show that 60 percent of roads in the sample had satisfactory benefit-cost ratios (based on 1996 traffic levels), but the ratios cannot be extrapolated to assess the likely economic rate of return because of lack of information on traffic levels in the years just after road completion. Usually, traffic volume grows steadily over time after a road is built. But in the case of Bahia, traffic congestion declined between 1993 and 1996 as a result of reduced economic activity during this period. It is likely that the benefit-cost ratios in the early years were higher than in 1996.

Sustainability

Brazil has decentralized most infrastructure planning, financing, and maintenance to the state authorities. However, because of lack of funds, municipalities have often been forced to carry out their own road maintenance. When commodity prices were high, producers' associations financed the upkeep of the roads serving their areas. But currently, maintenance often depends

on the ability of local populations and businesses to apply political pressure on state governments for funds.

The study surveyed the condition of the roads in 1993 and again in 1996, finding three-quarters of them to be in fair or good condition. Sustainability is in doubt for roads in poor condition and for those facing competition from newer and better parallel roads carrying long-distance traffic.

Measuring future sustainability of benefits will depend in large part on Bahia's capacity to maintain the roads in good condition and on the roads' ability to attract traffic. If the roads are kept in reasonably good condition, sustainability will depend on transport demand. Also, adequate funding for maintenance will depend on providing local government with the right to collect user charges and involving users and other stakeholders in the management of such funds.

Recommendations

Clusters or "mini-networks" of roads that are part of a state and regional development strategy have better chances of attracting and retaining traffic than isolated road investments. When designing feeder road programs, especially within network-wide investment schemes, it may be advisable to plan investments for clusters of roads.

The direct involvement of beneficiaries can help state and local planning agencies assess the social and economic benefits of roads.

Précis

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