6-9

Rural Road Investments, Agricultural Development, and Poverty Alleviation in China

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CASE STUDY #6-9 OF THE PROGRAM:
"FOOD POLICY FOR DEVELOPING COUNTRIES: THE ROLE OF GOVERNMENT IN THE GLOBAL FOOD SYSTEM"
2007

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Executive Summary

Beginning in late 1978, China adopted a series of policy and institutional reforms and achieved rapid economic growth and poverty reduction. National gross domestic product (GDP) grew at more than 9 percent a year from 1978 to 2005, and per capita income increased by 8 percent a year. The level and speed of economic growth and poverty reduction are diverse across regions, however, and income inequality has worsened between the coastal and inland regions, as well as between urban and rural areas. Although a number of factors have contributed to this widening regional disparity in China, differences in the stock and quality of transportation infrastructure have been among the key factors.

When the reforms began in 1978, China's transportation infrastructure was relatively poor compared with that in other countries with a similar level of per capita GDP, like India. Following rapid economic growth during the reform period, the demand for road transport skyrocketed, and transportation shortages and urban congestion became serious problems. The government started increasing its road investments in 1985 and further prioritized road investments in the 1990s. In particular, the government focused on the construction of high-grade roads connecting major cities in the coastal region (such as highways and expressways). With these investments, road density in China increased from 93.1 kilometers per thousand square kilometers in 1979 to 189.2 kilometers per thousand square kilometers in 2002 (National Bureau of Statistics of China 2003).

Although the government initially allocated more resources to the coastal region, it has recently started allocating more resources to the inland region, making road projects an important part of the development strategy for that region. The government still emphasizes projects for high-grade roads, however, rather than low-grade and rural roads.

In the wake of the rapid economic growth and poverty reduction stimulated by policy and institutional reforms, China now faces a new phase of economic development. The government must adapt its policies and institutions to new socioeconomic circumstances, such as increased regional inequality, decentralization of governance, and past investments in high-grade roads.

Your assignment is to advise the Chinese government on a long-term plan that will address rural road development for facilitating agricultural and rural development and poverty alleviation.

Background

Rural Infrastructure, Agricultural Development, and Poverty Alleviation

The importance of good rural infrastructure for agricultural development is widely recognized.[1] Several studies have examined the effects of infrastructure on agricultural development and demonstrated that investment in infrastructure is essential to increase farmers' access to input and output markets, to stimulate the rural nonfarm economy and revitalize rural towns, to increase consumer demand in rural areas, and to facilitate the integration of less-favored rural areas into national and international economies (see, for example, Antle 1984; Binswanger et al. 1993; Fan et al. 2000; Mundlak et al. 2002; Fan et al. 2002; and Fan and Zhang 2004).

These effects are important drivers of economic growth and poverty reduction both within and outside agricultural sectors. For example, in a recent comprehensive analysis of the impact of rural roads in Bangladesh, Khandker et al. (2006) found significant poverty reduction (5–6 percent) brought about through increased agricultural production, higher wages, lower transportation costs, and higher output prices. Investments in rural roads also led to increased schooling, and the authors conclude that poor people gained proportionally more than the nonpoor. Fan et al. (2002)

[1] Pinstrup-Andersen and Shimokawa (2007) provide further discussion and more detailed empirical evidence for the relationships among rural infrastructure, agricultural development, economic development, and poverty alleviation.

document the critical role of infrastructure development—particularly roads and telecommunications—in reducing rural poverty in China between 1978 and 1997. The authors also show that poverty fell because of the growth in rural nonfarm employment that followed the expansion of infrastructure. Infrastructure investments along with appropriate institutions can reduce rural poverty in a variety of ways.

In addition, the quality of infrastructure is an important determinant of the effects of infrastructure on agricultural growth and poverty reduction. Fan and Chan-Kang (2005) show that, when measured by kilometer of new road, investments in high-grade roads in China produce returns to total GDP that are nearly 50 percent higher than returns from investments in low-grade roads. Investments in low-grade roads, however, have the largest returns in total GDP (41.5 percent higher) in rural areas, whereas the effects of high-grade roads were almost twice as high as those of low-grade roads in urban areas. Examining the economic rate of return per yuan taking the cost of construction into account reveals that high-grade roads have a lower rate of return per yuan than low-grade roads in all areas and regions. Similarly, Fan et al. (2004) demonstrate that investments in low-grade roads in Uganda (that is, feeder roads) reduced the number of poor Ugandans by more than three times as much as investments in more costly high-grade roads (that is, murram or tarmac roads).

China's Policy Reforms, 1949–Present

The People's Republic of China was established in 1949. During 1949–1978 the Communist Party employed the Soviet economic model of communism and centrally controlled all political and economic activities in China. In particular, the party emphasized a heavy industrial base, state ownership of the means of production in urban areas, collectively owned large units in agriculture, and centralized economic planning (Fan and Chan-Kang 2005).

In late 1978 the Chinese government began reforming the country's economic system. The reform has been implemented gradually and can be divided into three phases. During 1978–1984 the government initially focused on reforming the rural sector. Its main goal was to improve the standard of living in rural areas by increasing agricultural production and productivity and diversifying the rural economy. In the agricultural sector, the government broke up collective farming units and introduced individual farming under the household responsibility system. In the industrial sector, the government established township and village enterprises (TVEs)[2] and allowed individual enterprise. It also started relaxing the restrictions on international trade and foreign direct investment (Fan and Chan-Kang 2005).

During 1984–1991 the government extended reforms to the urban sector (that is, industrial enterprises). It began emphasizing market systems rather than central planning. During this period the government introduced the dual-track pricing system for industrial goods[3] and the enterprise contract responsibility system.[4] It also aimed to increase competition in markets by allowing private and foreign enterprises to compete with state-owned enterprises (SOEs). Other important reforms were the dissolution of the People's Bank of China, the introduction of an enterprise tax system, and an expansion of special economic zones. At the same time, the government introduced the first important poverty reduction programs, such as funds for public works in poor counties, which aimed at increasing the incomes of the poor and stimulating local economic growth (Fan and Chan-Kang 2005).

In 1992 Deng Xiaopeng asserted that China's reform toward the market economy would have to continue, and it was the first time that China officially supported the market economy instead of the socialist economic system. Since 1992 the government has further liberalized domestic markets to achieve more efficient resource allocation, although it continues to wield significant power in the economy. In late 2001 China joined the World Trade Organization (WTO), giving an important signal that it will continue its reforms toward a market-driven economy. At the same time, according to

[2] TVEs are industries owned by townships and villages.

[3] Under dual-track pricing, some goods and services were allocated at state-controlled prices and others were allocated at market prices. Prices were gradually deregulated as markets were allowed to play an increasing role in setting them (Fan and Chan-Kang 2005).

[4] The enterprise contract responsibility system granted greater autonomy to enterprises to make production and employment decisions.

Fan and Chan-Kang (2005, 10), the government launched "an ambitious poverty alleviation plan aimed at eradicating poverty by the end of the 20th century in the mid-1990s. Some key features of the program included subsidized loans, food-for-work infrastructure schemes, and various grants, which were targeted to 592 nationally designated poor counties." The government also supported agriculture directly by providing low-interest loans.

Overall, China experienced rapid economic growth of more than 9 percent a year during 1978–2005. During the same period per capita GDP in China increased from $673 to $5,878 in constant 2000 international dollars[5] (World Bank 2006). China has also successfully reduced poverty during the reform period. Based on China's official poverty line of US$0.66 per day (in constant 1985 purchasing power parity [PPP] dollars[6]), the number of rural poor decreased dramatically from 250 million in 1978 to 29.3 million in 2001 (Fan and Chan-Kang 2005). In addition, according to the World Bank, the poverty headcount ratio at $1 a day (in 1985 purchasing power parity dollars) fell from 28 percent in 1987 to 17 percent in 2001.

Lastly, it is worth noting that the agricultural sector remains an important component of China's economy, although its GDP share decreased from 31 percent in 1979 to 13 percent in 2004. Nonetheless, the agricultural sector provided 44 percent of total employment in 2002 (World Bank 2006). If other agriculture-related sectors are included (such as delivering and processing), the contribution of the agricultural sector to employment is much larger.

China's Road Development Policies

Before the reform period, China's national development strategy put little emphasis on road development (World Bank 1999).[7] Although the Chinese government started increasing investments in road development in the early years of the reform period, the investments had low priority compared with those in the industrial sector (Démurger 1999). Consequently, when the reforms began in 1978, road infrastructure in China was relatively poor compared with other countries like India. Road density was only 97 kilometers per thousand square kilometers in China in 1980, compared with 230 kilometers per thousand square kilometers in India (Fan and Chan-Kang 2005).[8]

In the early 1980s transportation shortages and urban congestion became increasingly serious problems owing to growing interregional trade combined with the insufficient investments in transportation infrastructure (Démurger 2001). Consequently, the government has increased its investment in roads since 1985, emphasizing in particular investments in high-grade roads connecting major cities in the coastal areas.

In the 1990s the government made investments in transportation infrastructure a higher priority. In particular, the government focused on constructing road networks connecting counties and towns and improving road quality. More emphasis has been placed at the national level on the construction of high-grade roads (expressways and class 1 and class 2 roads). Although the government initially allocated more resources to the coastal regions, it has recently started allocating more resources to the western region, making road projects an important part of the development strategy for that region. According to Fan and Chan-Kang (2005, 21), "the growing disparity in road provision across regions led the central government to launch major road construction projects in the central and western regions. As a result, the share of highway investment in eastern China declined from 54.8 percent in 1998 to 45.2 percent in 2001, whereas the corresponding shares in central and western China increased from 45.1 percent to 54.9 percent."

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[5] The constant 2000 international dollar is the U.S. dollar converted at purchasing power parity exchange rates in 2000 that equalize the purchasing power of the U.S. dollar in the United States with that of local currencies in their home countries.

[6] The constant 1985 purchasing power parity dollar is a hypothetical unit of currency that has the same purchasing power that the U.S. dollar had in the United States in 1985. It shows a unit value of a local currency within its home country.

[7] This subsection describes government policies for road development in China based on the information in Fan and Chan-Kang (2005). For more details, please refer to that paper.

[8] Please note that official Chinese statistics may have understated the length of rural roads in China because most rural roads are not included in China's road statistics. Benziger (1993) adjusted the official statistics of road density based on information from Hebei Province and found that China's road density in the 1980s was only 20–30 percent below India's.

Following these policy reforms, road density in China increased from 93.1 kilometers per thousand square kilometers in 1979 to 189.2 kilometers per thousand square kilometers in 2002. Also during 1980–2002, the share of high-grade roads in total road length increased from 1.4 percent to 14.1 percent, whereas the share of low-grade roads (class 3, class 4, and substandard roads) decreased from 98.6 percent to 85.9 percent. In particular, the decrease in the share of class 4 and substandard roads was significant, from 85 percent to 68 percent (National Bureau of Statistics of China 2003).

Policy Issues

Regional Inequality in Economic Development and Road Infrastructure

Although the whole economy of China has grown rapidly during the past few decades, economic development has been uneven across regions. China's coastal regions tended to develop faster than the inland regions, even before the policy reforms. The introduction of economic reforms (such as special economic zones along the coast) further intensified the economic gap between the coastal and inland regions. In 2002 average GDP per capita was 40,646 yuan in Shanghai and only 3,153 yuan in Guizhou—less than one-tenth of that in Shanghai. In addition, the shares of agriculture in total GDP tend to be much higher in inland provinces than in coastal provinces, showing that farming is still a major source of rural income in inland China. Moreover, per capita annual income was 2,476 yuan and 7,702 yuan in rural and urban areas in 2002, respectively. Because price levels and lifestyles differ significantly between urban and rural areas, the gap between these figures does not directly represent a gap in living standards between rural and urban areas. Yet these figures still imply a significant gap between these areas (National Bureau of Statistics of China 2003).

Naturally, the incidence of poverty is also unevenly distributed in China and most prevalent in inland rural areas with poor agricultural land and weak infrastructure. Based on the estimates in Chen and Wang (2001), the 1996 headcount poverty rate at $1 PPP was 24.8 percent in rural areas and 0.4 percent in urban areas. With respect to rural poverty, in 1996 the headcount poverty rate at $1 PPP among the rural population was 50.9 percent in Gansu and 0.8 percent in Shanghai. Moreover, because the incidence of rural poverty decreased much more slowly in the inland regions than in the other regions, the incidence of rural poverty has become increasingly concentrated in the inland regions.

The density and quality of road infrastructure also vary widely across regions in China. The western region is poorly served by roads compared with the central and coastal regions. According to Fan and Chan-Kang (2005, 19), "in 2002, there were only 166 and 66 kilometers of roads for every thousand square kilometers of land in southwest and northwest China, respectively, compared to more than 460 kilometers per thousand square kilometers of land in the eastern and central regions. Road quality is also the worst in the western region. In southwest China, for example, high-quality roads (expressways and class 1 and class 2 roads) account for less than 6 percent of the road network compared to 20 percent in the northern and the eastern regions." Road infrastructure is also unevenly allocated between rural and urban areas. In rural China about 184 towns and 54,000 villages, most of which are located in the western region, had no access to roads in 2003 (Xinhua News Agency 2003).

The growing socioeconomic inequality and the increasing concentration of poverty in the inland regions may cause social instability. Thus, since the late 1990s the Chinese government has initiated several projects aimed at reducing poverty and regional inequality in China. For example, the government has proposed improving infrastructure; intensifying environmental protection; and developing science, technology, and education in inland rural areas.

Social and Economic Returns to Investment in Rural Roads

Because available resources are limited, the government should select the projects that contribute most to social welfare. That is, the selected project should yield the largest gains in social welfare among available policy options. In the context of this case, there are two key questions: (1) How profitable are investments in rural roads in China? (2) Are there more cost-effective ways to promote agricultural development and poverty reduction?

The answers to these questions depend on whether profitability is measured in terms of private or public benefits and whether externalities are considered. Returns to investments in transportation infrastructure are much broader than just the decrease in transport costs. Investments in transportation infrastructure also benefit society by widening markets, increasing competition in markets, and enabling dissemination of knowledge and technology. Because of these characteristics of infrastructure investments, relying on the private sector is likely to result in underinvestment. Even the public sector may not adequately invest in infrastructure if it fails to consider the external effects of infrastructure.

For the first question, although there is some evidence of high rates of return to infrastructure investments in general (see, for example, World Bank 1994, 2003),[9] few estimates have been made of the rate of return to investments in rural infrastructure. Table 1 presents the estimated marginal returns from investments in rural infrastructure in selected developing countries. In these studies, the contributions of rural infrastructure are measured by the impact on aggregate output of an economy. All estimates are significantly higher than one, which implies that one currency unit of investment induces more than one currency unit of return, and thus investments are profitable. Investments in roads and telephone lines in particular have high returns.

For the second question, to the best of our knowledge, no existing studies provide a direct answer. The findings in Canning and Bennathan (2000), however, provide some indications of the relative profitability of investments in rural infrastructure. They estimate the rate of return to electricity-generating capacity and to paved roads at the national level for 51 and 41 countries over the past four decades, respectively. They find that investments in electricity-generating capacity and paved roads are more profitable than other public investments in 20 out of 51 countries and in 22 out of 41 countries, respectively. Although the rate of return to electricity-generating capacity tends to be high in low-income countries, that to paved roads tends to be high in middle-income countries. Unfortunately, these findings are not specifically for investments in rural infrastructure.

Types of Roads for Agricultural Development and Poverty Alleviation

Another important question concerns what types of roads are most effective for agricultural development and poverty reduction. The Chinese government historically emphasized the construction of high-grade roads during the reform period. Fan and Chan-Kang (2005), however, argue that investments in high-grade roads are not always economically superior to those in low-grade roads, largely because constructing high-grade roads costs much more than constructing low-grade roads. On average, about 8.5 kilometers of low-grade roads can be constructed using the same amount of money it costs to build 1 kilometer of high-grade roads.

Fan and Chan-Kang (2005) demonstrate that low-grade roads may have much greater benefit-cost ratios for national GDP than high-grade roads. Also, high-grade roads do not have a statistically significant impact on agricultural GDP whereas low-grade roads are not only significant, but also generate 1.57 yuan of agricultural GDP for every yuan invested. Moreover, investment in low-grade roads generates high returns in rural nonfarm GDP.

Taking these findings into consideration, the government must determine the allocation of investments between high-grade and low-grade roads depending on its policy priority. If the government prioritizes rural development and poverty reduction, investments in low-grade roads may be more cost-effective than those in high-grade roads.

Financing Rural Road Projects

Following the economic reforms, the sources of funds for road projects have become increasingly diverse. There are not only funds from the central and local governments, but also loans from international organizations, the domestic private

[9] The Operations Evaluation Department of the World Bank (2003) reported a higher economic rate of return for road projects (for example, 40 percent in Bangladesh during 1996–2003 and 460 percent in Togo during 1997–2003) than for energy projects (for example, 17 percent in Uganda during 1991–2002 and 21 percent in Lithuania during 1994–2003). The World Bank (1994) also reports that the average economic rate of return for World Bank projects evaluated over the period 1983–1992 was 11 percent for electricity projects and 29 percent for road building.

Table 1: Marginal Returns on Investment in Rural Infrastructure in Developing Countries

Country	Year	Source	Measure of Returns	Infrastructure Indicator	Effect
China	1997	Fan, Zhang, and Zhang (2002)	Rural GDP	Investment in irrigation (yuan)	1.88
				Investment in roads (yuan)	8.83
				Investment in electricity (yuan)	1.26
				Investment in telephone (yuan)	6.98
Uganda	1992–1999	Fan, Zhang, and Rao (2004)	Total GDP	Investments in feeder roads (shilling)	7.16
Tanzania	2000–2001	Fan, Nyange, and Rao (2005)	Total Output	Investments in roads (shilling)	9.13
China	1982–1999	Fan and Chan-Kang (2005)	Total GDP	Investment in high-quality roads (yuan)	1.45
				Investment in low-quality roads (yuan)	6.37

Source: Data sources are listed in the third column.

sector, and foreign capital. Another important financial source for infrastructure projects is long-term public bonds introduced in the late 1990s.

It is also worth noting that the decentralization over the reform period in China contributed to widening regional inequality in infrastructure. Although decentralization has given greater autonomy to local governments, local government revenue (based on local economic activity) and the quality of human capital are diverse across local governments. Thus, the capacity to finance infrastructure projects is also diverse across local governments (Démurger 1999).

The Capacity for Good Governance

Although the responsibilities of local governments have increased under recent decentralization, the capacity for good governance is still much lower among local governments compared with the central government. Thus, it is necessary to increase their capacity for good governance to effectively implement policies, reform institutions, and prevent corruption.

Stakeholders

There are six main groups of stakeholders related to rural road development in China: the central government, local governments, the domestic private sector, farmers and nonagricultural sectors in rural areas, urban communities, and foreign capital.

The Central Government

In the long run, investments in rural road development would contribute to improving the economic capacity of rural areas, and thus that of the whole Chinese economy. The investments would intensify rural economic development and poverty reduction. Investments in rural roads also improve human capital by increasing the access to school and health care. These improvements would contribute to increasing tax revenue over time and social welfare at the national level.

At the same time, the government must take short-run benefits into account to sustain current economic growth and finance long-run projects. For

example, investments in high-grade roads in the coastal region may yield higher profits in a shorter period compared with investments in rural roads in the inland region, although the investments in rural roads have larger effects on agricultural development and poverty reduction.

Another important interest for the central government is to reduce inequality in socioeconomic status across regions. Although greater autonomy has been given to local governments through recent decentralization, the central government is still responsible for harmonizing local policies and reducing regional inequality at the national level.

Local Governments

The interests of local governments are similar to those of the central government. A key difference is that local governments are principally interested only in their local areas—for example, local tax revenue and the development of the local economy. Thus, local governments may have little interest in, for example, reducing socioeconomic inequality at the national level.

In addition, the relationship with the central government is crucial for local governments to obtain enough support from the central government. This aspect tends to be more important for poorer local governments, which are mostly in the inland region.

The Domestic Private Sector

Rural road development is mainly related to two subsectors of the private sector: the construction industry and financial institutions. The size of road projects (that is, the budget size) may be a primary interest for construction firms. In many cases, construction firms will be more interested in larger projects (like expressways) that will provide larger returns and longer contract terms.

For financial institutions, the profitability of road investments is a key interest. The private financial has considered investments in infrastructure less profitable than investments in industries and thus avoided them. In addition, during the 1980s the government controlled the money supply and implemented a tight credit policy to slow down overheated infrastructure investments (Démurger 1999). Although the private financial sector has recently increased investments in expressways in the coastal region, it accounts for a small part of investments in rural road projects.

Rural Communities: Farmers and Nonagricultural Sectors in Rural Areas

High transportation costs to reach markets and education and health facilities are one of the key obstacles preventing the poor in rural areas from escaping from poverty. Improving access to economic centers, schools, and health services are main interests for farmers and nonagricultural sectors in rural areas. In addition, better access to new technology and technical support is crucial for farmers. On the other hand, rural people are also concerned about additional tax burdens stemming from infrastructure projects.

Urban Communities

Because the government has limited resources, emphasizing rural road development is likely to induce resource reallocation from urban to rural areas and may slow down urban road development. On the other hand, lowering transportation costs between urban and rural areas may provide cheaper rural products to urban communities and increase demand for urban products in rural areas.

Foreign Capital

International organizations like the World Bank are a main source of foreign capital for rural road development in China. During 1990–2005 the World Bank launched 108 toll road projects (9 projects were canceled) in China in collaboration with domestic and foreign private sectors. The total investments in road projects during this period reached US$15.4 billion. Although recent projects have focused on improving road infrastructure in the inland region, most projects are for the construction, rehabilitation, and operation of highways and bridges rather than for low-grade roads (World Bank 2007).

Policy Options

The Chinese government has implemented a series of policy and institutional reforms and invested a significant amount of money in the development of roads and other key infrastructure. As a result, China realized rapid economic growth and poverty reduction in recent decades. At the same time,

entering a new phase of economic development, the government must adapt its policies and institutions to new socioeconomic circumstances. This section presents potential policy options for facilitating further agricultural and rural development and poverty reduction in China.

Invest in Low-Grade and Rural Roads

In the past, road investments in China have been heavily focused on high-grade road projects such as expressways and intercity highways. These investments have significantly improved transportation infrastructure in China. On the other hand, low-grade and rural roads have received little attention. As more and more high-grade roads are constructed, the marginal returns of the investments in high-grade roads decline. As a result, the marginal returns to low-grade roads are much larger today than those to high-grade roads (Fan and Chan-Kang 2005). In addition, low-grade roads in rural areas will contribute more directly to improving the living standards of the poor in rural areas than do high-grade roads. That is, investments in low-grade and rural roads contribute to economic growth as well as poverty alleviation. Thus, the government should consider giving more priority to low-grade and rural roads in its future investment strategy.

Facilitate Private Sector Participation in Rural Road Projects

To sustain investments in rural roads and other key infrastructure and manage infrastructure services, the participation of the private sector in rural infrastructure projects is crucial. The Chinese government should make further efforts to create an enabling environment for a well-functioning capital market in rural areas. It is also important to recognize the role of government in facilitating private transactions. A number of public interventions such as standardization, grading, enforcement of contracts, and regulations to stimulate effective competition are needed to make private markets work.

Subsidize Road Development in Inland Rural Areas

As a result of decentralization, the share of local government in infrastructure investments has increased. On average, local government accounted for about 80 percent of public investments in road projects in 2002 (Fan and Chan-Kang 2005). Because budgets for these projects depend critically on local government revenue, which depends on local economic activities, decentralization increased a regional gap in the capacity to finance road projects. Although inadequate road infrastructure is more serious in the inland region than in the coastal region, local governments in the inland region tend to have much smaller capacity to finance road projects than those in the coastal region. To remedy this unbalanced situation, the central government may need to provide subsidies for rural road projects in the inland regions.

Invest in Market Institutions

To maximize the economic effects of rural road development, China needs to build and maintain proper market institutions that connect rural economies to major economic centers in the coastal region. Thus, in addition to rural road development, the Chinese government should consider investing in rural market institutions.

Pursue Other Policy Options for Facilitating Rural Development and Poverty Reduction

Rural road development is not the only way to facilitate rural development and poverty reduction. Other choices such as investments in agricultural research and technology, irrigation, electricity, educational facilities, and health care facilities are also important. Thus, the government should compare the costs and benefits of rural road development with those of other options.

Increase the Capacity for Good Governance

To implement the options described and use available resources more effectively, improving local governance is essential. In particular, China needs to improve supervision, monitoring, and evaluation methods through the transparent disclosure of project information and cross-functional teamwork. To reduce the risk of corruption, improvements in procurement and financial management will be important. For example, external firms could conduct specialized procurement audits to review procurement contracts for compliance with donors' guidelines.

Assignment

Your assignment is to advise the Chinese government on a long-term plan that will address rural road development for facilitating agricultural and rural development and poverty alleviation.

Additional Readings

Fan, S., and C. Chan-Kang. 2005. Road development, economic growth, and poverty reduction in China. Research Report 138. Washington, DC: International Food Policy Research Institute Research.

Pinstrup-Andersen, P., and S. Shimokawa. 2007. Rural infrastructure and agricultural development. Paper presented at "Rethinking Infrastructure for Development," the Annual Bank Conference on Development Economics, sponsored by the World Bank in Tokyo, May 29–30, 2006.

References

Antle, J. M. 1984. Human capital, infrastructure, and the productivity of Indian rice farmers. Journal of Development Economics 14 (1): 163–181.

Benziger, V. 1993. China's rural road system during the reform period. China Economic Review 4 (1): 1–17.

Binswanger, H. P., S. R. Khandker, and M. R. Rosenzweig. 1993. How infrastructure and financial institutions affect agricultural output and investment in India. Journal of Development Economics 41 (2): 337–366.

Canning, D., and E. Bennathan. 2000. The social rate of return on infrastructure investment. World Bank Policy Research Discussion Paper 2390. Washington, DC: World Bank.

Chen, S., and Y. Wang. 2001. China's growth and poverty reduction: Recent trends between 1990 and 1999. Working Paper. Washington, DC: World Bank.

Démurger, S. 1999. Differences in infrastructure investments: An explanation for regional disparities in China? Paper presented at session of the Chinese Economic Association in North America (CEANA) at the annual meeting of the Allied Social Sciences Association (ASSA), Boston, January 7–9, 2000.

———. 2001. Infrastructure development and economic growth: An explanation for regional disparities in China? Journal of Comparative Economics 29 (1): 95–117.

Fan, S., and C. Chan-Kang. 2005. Road development, economic growth, and poverty reduction in China. Research Report 138. Washington, DC: International Food Policy Research Institute.

Fan, S., and X. Zhang. 2004. Infrastructure and regional economic development in rural China. China Economic Review 15 (2): 203–214.

Fan, S., P. Hazell, and S. Thorat. 2000. Government spending, growth, and poverty in rural India. American Journal of Agricultural Economics 82 (4): 1038–1051.

Fan, S., L. Zhang, and X. Zhang. 2002. Growth, inequality, and poverty in rural China: The role of public investments. Research Report 125. Washington, DC: International Food Policy Research Institute.

Fan, S., X. Zhang, and N. Rao. 2004. Public expenditure, growth, and poverty reduction in rural Uganda. DSGD Discussion Paper 4. Washington, DC: International Food Policy Research Institute.

Fan, S., D. Nyange, and N. Rao. 2005. Public investment and poverty reduction in Tanzania: Evidence from household survey data. Development Strategy and Governance Division Discussion Paper 18. Washington, DC: International Food Policy Research Institute.

Khandker, S., Z. Bakht, and G. B. Koolwal. 2006. The poverty impact of rural roads: Evidence from Bangladesh. Policy Research Working Paper 3875. Washington, DC: World Bank.

Mundlak, Y., D. Larson, and R. Butzer. 2002. Determinants of agricultural growth in Indonesia, the Philippines, and Thailand. Policy Research Working Paper 2803. Washington, DC: World Bank.

National Bureau of Statistics of China. 2003. China statistical yearbook 2003. Beijing: China Statistics Press.

Pinstrup-Andersen, P., and S. Shimokawa. 2007. Rural infrastructure and agricultural development. Paper presented at in "Rethinking Infrastructure for Development," the Annual Bank Conference on Development Economics,

sponsored by the World Bank in Tokyo, May 29–30, 2006.

World Bank. 1994. World development report 1994: Infrastructure for development: World development indicators. Washington, DC.

———. 1999. Transport in China: An evaluation of World Bank assistance. Report No. 18865. Washington, DC.

———. 2003. Annual report of development evaluation. Washington, DC: World Bank, Operations Evaluation Department.

———. 2006. World development indicators online. Washington, DC.

———. 2007. Infrastructure. http://www.worldbank.org/infrastructure.

Xinhua News Agency. 2003. Rural road construction speeded up. May 16. http://www.china.org.cn/english/2003/May/64719.htm.