Chapter 4

Kenya

James Thurlow, Jane Kiringai, and Madhur Gautam

Kenya's economy is diverse, with both agricultural and industrial potential. However, the economy has not performed especially well over the past two decades, and evidence suggests that poverty and inequality has not declined much. Therefore, it is imperative that Kenya's government foster stronger growth and a process of income generation that benefits the broader population. As discussed in the next section, numerous studies emphasize the importance of rural development in Kenya, largely because a majority of the population, especially poor households, lives in rural areas, where they rely heavily on agricultural incomes. Urban households also depend on rural areas as a source of food and as a market for nonagricultural goods. However, Kenya's ninth National Development Strategy has not taken a particularly optimistic view of agriculture's potential contribution to economic growth—it targets an annual growth rate of around 4 percent per year, with agriculture growing at a little more than 3 percent (Kenya 2002). The strategy instead places greater emphasis on the creation of a dynamic industrial sector that provides employment opportunities and improves incomes. These objectives are important if Kenya is to diversify its economy and encourage long-term structural transformation. However, past strategies have not generated rapid economic growth,

This chapter draws on an IFPRI Discussion Paper (Thurlow, Kiringai, and Gautam 2007) to which a number of people contributed. In particular, the authors thank Bernadette Wanjala, who helped build the social accounting matrix for Kenya; James Njeru and Nicholas Waiyaki, who provided information on Kenya's agricultural systems; and Sam Benin and Xinshen Diao, who provided technical advice during the research process. The Discussion Paper was a research output from a project funded by the World Bank.

which raises questions about potential sources of future growth and the appropriate allocations of public investments.

It appears that agriculture might play a more important role in Kenya's future strategies. The government has adopted the Comprehensive Africa Agriculture Development Programme (CAADP) promulgated under the New Partnership for Africa's Development (NEPAD). This program sets a continentwide agricultural growth target of 6 percent. To achieve this growth, Kenya's government has signed the Maputo Declaration, which calls on African governments to increase the share of agricultural spending to 10 percent of their total budgets.

In light of these developments, we evaluate alternative growth paths for Kenya in terms of their ability to reduce poverty. We also assess the impact and fiscal implications of investing in agriculture and rural infrastructure to accelerate agricultural growth. For this purpose, we develop a recursive dynamic computable general equilibrium (DCGE) model of Kenya based on the one described in Chapter 2 of this volume. Although most of the country case studies in this volume conduct top-down investment cost analysis, the Kenya case study fully integrates public investment functions and impact response elasticities into the DCGE model. This allows us to estimate the economywide returns to different investments, including irrigation, agricultural research, and rural roads.

The chapter is structured as follows. We first review Kenya's recent economic performance, its most recent development strategy, and the role of agriculture in the economy. We then describe the structure of the Kenyan DCGE model and its underlying data sources. The model results are then presented for the baseline growth scenario and the accelerated agricultural growth scenarios. This presentation is followed by the results from the integrated agricultural investment analysis. We conclude the chapter by summarizing our findings and providing recommendations for a more equitable growth strategy in Kenya.

Agriculture in Kenya

Growth and Poverty Trends

Kenya grew at an average rate of about 3 percent per year during the decade following the reforms that started in earnest in the early 1990s (see Table 4.1). Economic growth since 2004 has risen slightly, to 4 percent per year. This apparent continuity over the period hides the volatility of growth and its shifting structure. For instance, agricultural growth was initially slow during the mid-1990s but rose rapidly to almost 5 percent before declining again after 2000. In contrast, the industrial sectors have followed the opposite trend, falling into stagnation during the late 1990s and then rising to average about 2 percent growth overall.

Table 4.1—Past and projected growth performance, 1992–2009 (percent)

Category	GDP share, 1997	Observed annual real compound growth rate					ERS projection, 2003–07
		1992–97	1997–2000	2000–04	1997–2004	2004–09	
GDP market prices	100.0	2.9	2.1	3.0	2.6	4.1	6.0
Households	75.1	3.1	1.5	2.6	2.1	4.8	4.7
Investment	15.0	7.8	7.2	3.0	4.8	13.2	12.7
Government	17.3	3.4	–0.4	1.5	0.7	2.5	3.0
Exports	22.4	8.7	1.7	9.9	6.3	3.7	7.7
Imports	29.8	12.2	1.7	6.8	4.6	9.9	6.0
GDP factor cost	100.0	3.0	1.8	2.7	2.3	4.1	6.0
Agriculture	18.1	1.7	4.3	2.6	3.3	1.3	3.1
Manufacturing	22.4	2.6	–0.5	2.1	0.8	5.6	8.6
Other industry	9.1	2.3	0.9	2.0	1.5	4.5	11.3
Private services	39.7	4.8	2.2	3.2	3.2	5.7	3.0
Public services	10.7	1.6	1.4	2.6	1.9	2.5	3.0
Population		2.6	2.4	1.9	2.1	1.8	2.0

Source: Authors' calculations based on Kenya (2003b, 2006) and World Bank (2010).
Notes: GDP = gross domestic product in constant prices. ERS = Economic Recovery Strategy. Blank cells = not applicable.

Modest economic growth until the mid-2000s was offset by high population growth, so that average per capita incomes stagnated during the 1990s. Consistent with stagnant income growth and a worsening income distribution, the national poverty headcount rate does not appear to have changed much since the early 1990s. Table 4.2 reports poverty headcount rate estimated using four household surveys. Although differences in the design and implementation of these surveys prevent an accurate comparison of poverty over time, there is little evidence to suggest any significant reduction in poverty since reforms began two decades ago.

The survey results also suggest that any reductions in poverty have been concentrated in urban areas. This reflects rapid urbanization and slow industrial growth, which in turn explains the growth in private services typically associated with the informal economy (see Table 4.1). Conversely, the small change in rural poverty rates may be due to agriculture's relatively weak performance. Regardless of whether poverty rose or fell over the past two decades, the level of poverty in Kenya clearly remains high. Almost half the population's incomes are insufficient to meet their basic needs. It is in this context of sluggish growth and severe poverty that we review the government development strategy.

Kenya's Development Strategy

The Economic Recovery Strategy (ERS) (Kenya, 2003b) and Ninth National Development Plan (NDP) (Kenya 2002) outline Kenya's development objectives,

Table 4.2—Changes in the poverty rate, 1992–2005/06

	Poverty rate (percent)				
Category/feature	1992 WMSI	1994 WMSII	1994 WMSII	1997 WMSIII	2005/06 KIHBS
National	46.3	43.8	45.5	51.3	45.9
Rural	47.9	46.8	45.9	52.9	49.1
Urban	29.3	28.9	n.a.	49.2	33.7
Geographic coverage	Half of districts	All districts	Same as WMSI	No north–eastern	All districts
Survey period	November–December	June–August	June–August	April–June	May–April

Sources: Kenya (2000, 2003a); Kimalu et al. (2002); World Bank (2008).
Note: KIHBS = Kenya Integrated Household Budget Survey. n.a. = not available. WMSI, WMSII, WMSIII = Welfare Monitoring Surveys for 1992, 1994, and 1997, respectively.

which include restoring economic growth, generating employment, and reducing poverty (based on ERS). This plan has been supplemented by *Vision 2030* (Kenya 2007). The ERS is the most specific of the three documents, as it stipulates the expected contributions of each sector during 2003–07 and the policies required to realize growth (see the final column of Table 4.1).

Broadly speaking, based on ERS, Kenya was expected to follow an industry-led growth path, encouraged by a series of policy interventions and public investments. The ERS prioritized both formal and informal economies, although many policies identified in the strategy appear to be geared more toward the formal sector. These policies include reducing bureaucratic delays; computerizing immigration, customs, and the registration of companies; negotiating trade protocols; and encouraging research and development through tax incentives. Policies for the informal sector include establishing incubator zones for small enterprises and supplying them with supporting infrastructure. It is hoped that reducing production costs and providing an enabling environment for renewed investment will allow the trade sector to grow at 11 percent per year. High industrial growth requires enhanced levels of investment and imports. As such, although the economy was projected to grow at about 6.0 percent per year during the recovery period, household consumption expenditure was expected to grow more slowly at 4.7 percent. Because this projection is still substantially higher than both population growth and past economic performance, it was expected that the level of poverty would decline by at least 5 percent by 2007. If one ignores comparability problems with the surveys, then recent estimates suggest that this poverty target might have been achieved (see Table 4.2). Moreover, manufacturing gross domestic product (GDP) growth estimates for 2004–09 were higher than in the pre-ERS period (5.6 percent per year), although they fell short of the ERS target of 8.6 percent (see Table 4.1).

According to both the ERS and NDP, agriculture has been expected to grow at about 3 percent per year under a series of proposed policies and investments. For crop agriculture, these include expanding extension services, improving rural roads and irrigation, and strengthening farmer organizations. The livestock sector is also targeted through increased support for the dairy sector and improved animal health services. Emphasis is placed on diversifying into new crops, such as cashew nuts, oilseeds, sorghum, and cassava. Agricultural research is directed toward ensuring the potential of these new crops, while extension services facilitate the dissemination of new technologies to farmers. Although it was hoped that these investments and policies could reverse the long-term decline in agricultural productivity, the two strategies were not particularly optimistic, as evidenced by the modest growth projection of 3 percent. This projection represents a continuation of the agriculture's poor longer-term growth performance. Moreover, even though the targeted growth rate was modest, the actual agricultural growth rate during 2004–09 was even lower, at only 1.3 percent per year. Later in this chapter we quantitatively evaluate the relationship between agricultural growth and poverty reduction.

The Role of Agriculture

Agriculture is the largest sector in the Kenyan economy, generating a quarter of GDP and two-fifths of export earnings (Kiringai, Thurlow, and Wanjala 2006). Moreover, agricultural production in Kenya is relatively diverse, particularly in export crop production. Although Kenya is well known for its rapid development of nontraditional crops, such as cut flowers, it has continued to produce many important traditional export commodities, such as tea and coffee. In contrast, food-crop production is dominated by maize, whereas rice and wheat are heavily import dependent. Nonfarm activities, such as food processing, are as important as primary agriculture for the rural economy, generating two-thirds of rural GDP. Moreover, 85 percent of the population lives in rural areas, where agriculture and agriculture-related nonfarm activities are the primary sources of income for a majority of households.

Despite Kenya's diversity, the agricultural sector has experienced mediocre growth over the past two decades, thus mirroring the weak overall performance of the economy. Agricultural production grew at 1 percent annually during the 1990s, driven by marginal improvements in crop yields or productivity (FAO 2010). However, this growth was well below the population growth rate of more than 2 percent. Although agricultural growth has doubled since 2000, this more recent period has been characterized by rapid cropland expansion and stagnant yields (FAO 2010). There is also variation in the performance of individual sectors. On the one hand, horticulture and export crops have grown rapidly over the past decade, with the exception of coffee (caused by a collapse in international prices).

On the other hand, cereals and root crops performed poorly during the 1990s, and although these sectors have subsequently expanded production, they have continued to experience pronounced declines in yields. Given Kenya's growing population and land constraints, the key challenge for accelerating agricultural growth is overcoming the long-standing and widespread deterioration of farm productivity.

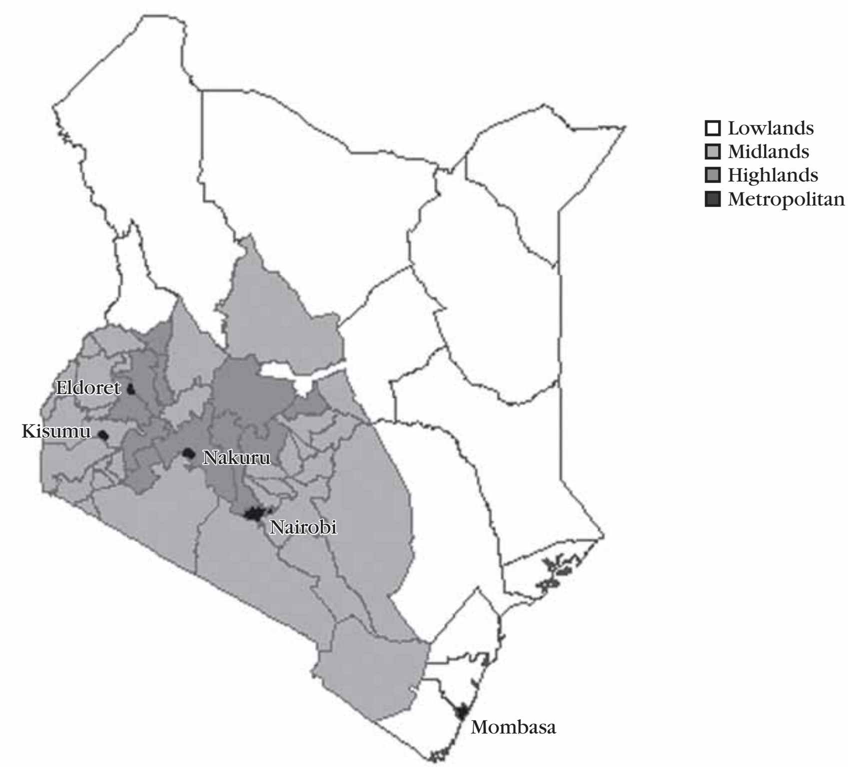
Several studies have examined the determinants of agricultural productivity in Kenya. Falling yields during the early 1990s are attributed to the poor sequencing of market reforms and subsequent declines in the use of fertilizer and hybrid seeds (Karanja, Jayne, and Strasberg 1999; Odhiambo, Nyangito, and Nzuma 2004). Recent evidence suggests that fertilizer use is rising rapidly, although this trend is concentrated in favored agroecological regions (Ariga, Jayne, and Nyoro 2006). Furthermore, increased population pressure in these favorable regions has caused migration to less-favored lands, where existing technologies are often inappropriate (Nyoro and Jayne 1999). Funding for agricultural research is insufficient for the development of more appropriate seed varieties (Odhiambo, Nyangito, and Nzuma 2004). Accordingly, increased spending on research and the provision of extension services is identified as a binding constraint to agricultural growth (Nyangito 1999). However, farmers' knowledge of improved inputs is already widespread, suggesting that market development may be as important as extension (Nyoro, Wanzala, and Awour 2001). This is because higher input prices and lower output prices reduce the incentive for small-scale farmers to purchase fertilizer and hybrid seeds (Owuor 1999).

Increasing market access by investing in roads is considered complementary to enhancing on-farm technology. Furthermore, improved market access and commercialization are found to increase input use and yields for both food and cash crops (Strasberg et al. 1999). Productivity growth also depends on other forms of rural infrastructure, such as irrigation. Investments to improve water management have slowed dramatically over the past two decades, yet they remain fundamental for growth in some areas of the country (Odhiambo, Nyangito, and Nzuma 2004). Similarly, agricultural services that improve livestock management and disease control are found to have a positive impact on growth (Kabubo-Mariara 2001; Karanja 2003). Finally, the literature identifies access to credit and working capital as a constraint for rural households (Nyoro, Wanzala, and Awour 2001; Kibaara 2006). Therefore, extensive empirical evidence exists to identify the types of investments needed to enhance agricultural productivity and accelerate rural growth in Kenya.

Regional Differences in the Agricultural System

A key finding in the literature on rural investment is that returns tend to vary across regions (see, for example, Fan and Rao 2003; Fan and Zhang 2008). To capture how initial economic and environmental conditions influence the impact of rural invest-

Figure 4.1—Kenya's agroecological zones and metropolitan centers



Notes: Metropolitan centers includes cities with more than 100,000 residents. Agroecological zones are defined at the district level and are based on the dominant agroecological zone by unweighted land area.

ments, we divide Kenya into its three main agroecological regions: lowlands, midlands, and highlands (Figure 4.1). These regions include both rural areas and small towns. Major metropolitan centers are identified separately as cities and towns with more than 100,000 inhabitants. Although the five metropolitan centers in Kenya comprise less than 10 percent of the total population, they generate three-quarters of nonagricultural production and more than half of national GDP (see Table 4A.1 in the appendix to this chapter). Linkages to agriculture are mainly through demand for intermediate inputs for food processing, because urban households consume processed food rather than agricultural products and metropolitan areas produce a surplus of processed food (Kiringai, Thurlow, and Wanjala 2006).

Kenya's agrological regions differ considerably (Table 4.3). The lowland region has the largest land area but is sparsely populated, although most of the population lives near the coast rather than in the interior. The lowland region generates less than

Table 4.3—Characteristics of subnational regions in Kenya, 2003

	Agroecological zone				
Characteristic	**Lowlands**	**Midlands**	**Highlands**	**Metro centers**	**All of Kenya**
Area (km^2)	384,759	161,942	43,824	8,391	598,916
Population (thousand)	4,622	15,934	4,899	2,324	27,779
Population density (per km^2)	12	98	112	277	46
GDP per capita (KES)	10,007	15,237	28,098	236,571	35,152
GDP per capita (US$)	132	201	370	3,117	463
Poverty rate (P0) (percent)	61.0	54.9	41.5	13.9	51.4
Share of maize farmers (percent)					
Using fertilizer	22.2	81.4	86.0		64.9
Using improved seed varieties	26.4	87.5	82.8		67.7
Engaged in commercial activity	19.6	47.7	44.1		38.2
Maize fertilizer use (kg per acre)	7.0	46.3	77.4		50.4
Maize yield (KES per acre)	5,760	11,637	9,928		9,364
Rainfall (mm per year)	563	1,061	815		839
Distance to piped water (km)	10.4	9.1	4.0		8.0
Road density (km per km^2)	0.12	0.50	0.88	1.85	0.30
Number of cattle (per household)	1.0	1.5	2.2	0.0	0.8

Source: Authors' calculations using 1999 population census (Kenya 2000), 1997 household survey (Kenya 2000), and the 2003 Kenyan social accounting matrix (Kiringai, Thurlow, and Wanjala 2006).
Notes: Population-weighted regional averages are calculated using information from Karanja, Jayne, and Strasberg (1999); Owuor (1999); Strasberg et al. (1999); and Ariga, Jayne, and Nyoro (2006). km^2 = square kilometer. GDP = gross domestic product. KES = Kenyan shillings. mm = millimeters. kg = kilograms. Blank cells = not applicable.

5 percent of national GDP, and average per capita incomes are low at US$132 per year. These numbers are reflected in the region's high poverty rate, with three-fifths of the population falling below the official poverty line. Despite better conditions along the coast, much of the lowland region is semiarid, with low average annual rainfalls. Access to assets and infrastructure is also poor, with low road densities, few cattle per capita, and long distances to piped water. Finally, only a quarter of farmers use fertilizer and improved seeds, and few households engage in commercial agriculture, relying more on subsistence food production. In spite of the region's low level of development, agriculture generates less regional GDP in the lowlands than in either the midlands or highlands. However, pastoralists are a significant portion of the population, thus making the livestock sector an important component of the lowland economy. Therefore, given the poor initial conditions, improving food security is likely to be the key objective for lowland development.

The midlands is the main region for foodcrops, producing three-quarters of all cereals and root and oilseeds in Kenya. Rainfall and maize yields are highest in this region, and a large share of farmers uses fertilizers and hybrid seeds. However, population density is eight times higher than in the lowlands, and land scarcity is increasingly a constraint to growth (Nyoro and Jayne 1999). Livestock also forms an important part of the midlands economy, although, unlike the lowlands, dairy rather than cattle farming dominates, because the midlands has better access to urban markets (Karanja 2003). Average incomes are higher and poverty is lower in the midlands than in the lowlands. However, the midlands' large share of the population implies that almost two-thirds of the poor live in this region. The region's dependence on agricultural incomes and its favorable initial conditions suggest that reversing falling maize yields and encouraging cash crop production are key development objectives (Mose 1999).

Finally, agrological conditions are also favorable in the highlands region, where maize yields and annual rainfall are relatively high. As in the midlands, there is widespread use of improved inputs, although only half of farmers engage in commercial agriculture. Unlike other regions, the highlands is heavily involved in higher value horticulture and export crops, and, despite its relatively small land area, is responsible for half of all production in these sectors. Accordingly, average incomes are higher, and poverty is substantially lower in the highlands than in the other regions. Infrastructure is also more developed, with higher road densities and better access to water. Therefore, although the nature of investments may differ, the objectives for the highlands are similar to those of the midlands: encourage commercialization and increase cash crop production.

In summary, although recent growth has been more promising, the performance of the Kenyan economy over the past decade has not been strong enough to generate significant reductions in poverty. Both agricultural and industrial growth has been erratic, with periods of expansion followed by slowing growth and even stagnation. In this context, the government devised a joint strategy for economic recovery and national development, focusing primarily on industry-led growth. The strategy is less optimistic for agriculture, which is projected to continue growing at its long-term growth rate of about 3 percent per year. However, despite regional differences, the agricultural sector plays an important role throughout the Kenyan economy, both as a source of growth and as a provider of employment and incomes for a majority of the population. In light of the diverging expectations placed on agriculture and industry in the country's development strategy, we now examine and contrast these alternative sources of growth and estimate their impacts on poverty.

The Kenyan DCGE Model

A DCGE model like the one described in Chapter 2 of this volume was developed for Kenya. The model was calibrated on a detailed 2003 social accounting matrix (SAM) developed by IFPRI and the Kenya Institute for Public Policy Research and

Analysis (KIPPRA). The SAM drew together information from a wide range of data sources, including national accounts, trade data, government budgets, indirect tax schedules, and household and labor-force surveys. Once compiled into a consistent economywide database, the SAM was balanced using cross-entropy estimation techniques. For detailed documentation of the data sources and balancing procedure, see Kiringai, Thurlow, and Wanjala (2006).

The SAM distinguishes between 53 agricultural and nonagricultural sectors (see Table 4A.2 in the appendix to this chapter). All sectors are further disaggregated across four subnational regions, including the three main agroecological zones (lowlands, midlands, and highlands) and the major metropolitan areas. Regional labor markets are segmented according to occupations, including skilled labor (professional workers), semiskilled (technicians, clerks, and sales workers), and unskilled workers (all other occupations and subsistence farmers). Workers are able to migrate between activities within but not between regions. Agricultural land and capital are also separated by region. Whereas agricultural land can be reallocated across crops depending on factor demands and relative factor prices, capital is fixed by sector and, after depreciation, is supplemented by new capital from investment depending on relative sectoral profit rates.

To capture the income and distributional impacts of alternative growth strategies, the DCGE model identifies 70 representative household groups based on individual households surveyed in the 1997 Welfare Monitoring Survey (WMSIII). Households were separated by rural and urban areas, four subnational regions, and by nationally defined per capita expenditure deciles. Each aggregate household in the model is linked top down to their corresponding households in the survey, so that changes in per capita consumption of specific commodities from the DCGE model can be translated into changes in Kenya's poverty headcount rate. The model is thus a spatially explicit representation of the Kenyan economy in 2003, and its detail allows us to conduct detailed sectoral growth simulations.

Baseline Growth Scenario

We use the DCGE model introduced in Chapter 2 to examine the impact of alternative sources of growth on poverty and inequality. We first calibrate the model to replicate the level and structure of growth that Kenya experienced over the past five years and assume such growth trends continue until 2015 (the baseline scenario) (see Table 4A.3 in the appendix to this chapter). We then design a set of scenarios to compare the poverty outcomes resulting from accelerating agricultural and industrial growth. In the second set of scenarios we assess the poverty impact of accelerating growth in different agricultural subsectors (foodcrops, livestock, and export crops).

In the baseline or business-as-usual scenario, Kenya is assumed to grow at an annual rate of 3 percent between 2006 and 2015 (Table 4.4). This rate is slightly higher than what was actually experienced during the seven years (1997–2004) leading up to the base year of the model, but it is consistent with the subsequent acceleration of growth after 2000. The agricultural sector grows more rapidly than overall GDP growth at 3.3 percent, driven by the strong performance of cash crops and livestock. In contrast, foodcrops grow slowly, and food processing in the manufacturing sector stagnates. The baseline scenario assumes a more balanced structure of growth. Manufacturing grows at 2.2 percent per year during 2006–25, which is in line with more recent trends and the observed investment growth. Services also follow past trends, with private and public services growing at 3.3 and 2.0 percent per year, respectively.

Although the economy grows at 3 percent per year, household consumption expenditure rises by only 0.9 percent in per capita terms. This rate is higher than the per capita consumption growth experienced during the 1990s. Given rising per capita consumption, income-based poverty declines slightly in the baseline. The national incidence of poverty falls from 51.3 percent in 2003 to 48.1 percent in 2015 (Table 4.5). However, this aggregate decline hides the continued rise in urban poverty, from 47.6 percent in 2003 to 49.5 percent by 2015. With declining rural poverty during the same period, the baseline scenario suggests that, if the 1997–2004 growth rates had been maintained, then urban poverty would be higher than rural poverty by 2015.

We also measure the effectiveness of baseline growth to reduce poverty using the poverty–growth elasticity (Ravallion and Chen 2003). The value of this elasticity is low at –0.38 (see Table 4.5). Thus, 1 percent growth in per capita GDP leads to a 0.38 percent decline in the poverty rate. With this elasticity it would require an annual GDP growth of 10.3 percent in 2006–15 to achieve the first Millennium Development Goal (MDG1) of halving 1992 poverty by 2015 (that is, to reach a poverty rate of 22.2 percent). Required growth for MDG1 is based on a balanced growth assumption, and poverty–growth elasticity is assumed to remain constant at –0.38. In the next section we assess whether there are alternative sources of growth that would be more pro-poor than the current baseline.

Accelerated Growth Scenarios

Comparing Agriculture and Industry-Led Growth

The impact of agricultural and industrial growth on poverty is examined by accelerating the overall GDP growth rate from its current 3 percent to 4 percent per year. Two scenarios are presented, in which the source of this additional growth differs.

Table 4.4—Growth outcomes under growth scenarios (percent)

		Average annual growth rate						
			Simulation results, 2006–15					
Outcome	GDP share, 2003	Actual, 1997–2004	Baseline scenario	Industry-led	Agriculture-led	Foodcrops	Livestock	Export crops
GDP factor cost	100.0	2.6	3.0	4.0	4.0	4.0	4.0	4.0
Agriculture	23.5	3.3	3.0	2.8	7.0	7.2	6.5	7.4
Cereals	2.9	2.1	2.5	3.3	4.3	5.7	2.6	1.9
Roots and tubers	3.1	0.9	0.9	1.4	3.0	7.9	0.9	–1.2
Horticulture	3.7	3.4	4.0	4.3	7.5	21.2	4.2	–0.1
Export crops	6.1	5.5	4.0	1.8	10.5	–11.0	5.5	16.3
Livestock	6.6	2.8	3.0	3.6	6.0	3.1	11.6	3.7
Industry	21.2	2.1	2.8	6.4	2.3	2.3	3.0	1.9
Manufacturing	12.4	0.8	2.2	6.5	1.2	1.2	2.4	0.1
Food processing	4.2	0.2	1.0	3.4	1.1	0.7	1.8	0.6
Light industry	2.0	1.7	1.5	6.4	–0.1	0.0	1.3	–1.1
Heavy industry	6.2	0.3	3.2	8.2	1.6	1.8	3.1	0.2
Private services	42.7	3.2	3.3	3.9	3.5	3.4	3.5	3.5
Public services	12.6	1.9	2.0	2.0	2.0	2.0	2.0	2.0
GDP factor cost			3.0	4.0	4.0	4.0	4.0	4.0
Labor employment			0.9	0.9	0.9	0.9	0.9	0.9
Capital and land			1.4	1.7	1.5	1.4	1.4	1.5
Total factor productivity			0.7	1.5	1.7	1.7	1.7	1.7

Source: Authors' calculations based on Kenya (2006) and Kenyan dynamic computable general equilibrium model results.

Notes: Foodcrops include all edible crops (such as cereals, roots, and pulses); cash crops include both export and industrial crops (such as cut flowers, tea, horticulture, tobacco); light industry includes textiles, clothing, and wood and paper products; and heavy industry includes chemicals, petroleum, and machinery. GDP = gross domestic product. Blank cells = not applicable.

Table 4.5—Poverty outcomes under growth scenarios

Outcome	Population share, 2003 (percent)	Poverty rate, 2003 (percent)	Baseline scenario	Industry-led	Agriculture-led	Foodcrops	Livestock	Export crops
Final year poverty rate in 2015 (percent)								
National poverty rate	100.0	51.3	48.1	46.0	38.7	39.3	41.6	39.9
Rural	84.3	51.9	47.8	45.8	36.7	37.4	40.1	37.9
Urban	15.7	47.6	49.5	46.8	48.6	47.9	48.8	49.8
Lowlands	6.3	61.0	60.0	57.6	55.0	53.6	58.7	54.3
Midlands	59.5	54.7	51.8	49.8	40.0	40.8	44.1	41.9
Highlands	22.2	41.4	34.3	31.4	24.9	26.1	25.9	25.2
Metropolitan	11.9	47.1	48.3	47.2	47.9	47.0	47.9	48.7
National poverty gap		17.9	18.0	16.6	12.8	13.4	15.0	13.1
National squared poverty gap		8.2	8.7	7.9	5.7	6.1	7.1	5.9
Poverty–growth elasticities, 2006–2015								
National poverty rate			–0.38	–0.51	–2.20	–2.13	–1.58	–1.90
Rural poverty rate			–0.50	–0.45	–2.66	–2.46	–1.90	–2.36
Rural poverty gap			–0.37	–0.57	–4.22	–3.72	–2.51	–4.32
Rural squared poverty gap			–0.25	–0.57	–5.32	–4.53	–2.84	–5.66
Urban poverty rate			0.23	–0.78	–0.23	–0.66	–0.18	0.15

Source: Kenyan dynamic computable general equilibrium model results.

Notes: The microsimulation module is based on the 1997 survey (Kenya 2000), and so the initial poverty rates in the model are really those for 1997. The official basic needs poverty line is set at KES1,239 (US$21; rural) and KES2,648 (US$45; urban) per adult per month (1997 prices). The poverty gap is the extent, measured as a proportion of the poverty line, to which a given group of poor people's consumption level falls below the poverty line. The squared poverty gap is the average of the squared values of the poverty gaps for different groups of poor people. KES = Kenyan shillings. Blank cells = not applicable.

In the agriculture-led scenario, growth in the agricultural and food processing sectors is increased, while additional growth in the industry-led scenario comes from mining, nonfood manufacturing, and construction. Although the two scenarios try to target the same overall GDP growth rate, the required sectoral growth rates differ in the two scenarios because of their sizes and growth linkages in the economy. For instance, to raise GDP growth rate from 3 to 4 percent per year, the growth rate of agriculture has to increase from the baseline 3.3 percent to 7.0 percent in the agriculture-led growth scenario (see Table 4.4). Conversely, in the industry-led scenario, manufacturing growth increases from 2.2 to 6.5 percent per year to have a similar overall GDP growth outcome as the agriculture-led growth scenario.

Although we assume that accelerated agricultural growth occurs in all agricultural subsectors in the agriculture-led scenario, export crops are assumed to grow faster than other agricultural subsectors. This might possibly be due to better foreign market opportunities, such that production of export crops is not necessarily constrained by domestic demand. In the agriculture-led scenario, rural households benefit directly from increased agricultural incomes. In contrast, the benefit for urban households is mainly through lower food prices, and hence an increase in their consumption levels at a given income (that is, real consumption). Therefore, in the agriculture-led scenario poverty in both rural and urban areas declines, although rural poverty rate falls more (see Table 4.5). Rising incomes and expenditures are particularly pronounced among the poorest populations, as seen by the larger decline in both the depth and severity of poverty.

In contrast, the benefits of faster nonfood manufacturing growth in both the formal and informal sectors in the industry-led scenario are concentrated among the less-poor households. Although faster growth in the labor-intensive light industry and construction sectors does benefit poorer urban households, urban poverty in the industry-led scenario declines only slightly faster than under agriculture-led growth. This modest difference is because poor urban households are less likely to be employed in the mining and heavy manufacturing sectors and hence only benefit indirectly through higher economywide growth in the informal service sectors. However, the overall effect of accelerating growth in light manufacturing and construction and the spillover into services is enough to ensure that the informal economy grows alongside the formal economy. This parallel growth drives the decline in urban poverty but limits any positive spillovers to rural households. Accordingly, if an additional 1 percent of overall GDP growth is led by faster growth in nonfood manufacturing sectors, then the national poverty rate declines by 2.1 percentage points more than that in the baseline by 2015. Conversely, national poverty declines by 9.4 percentage points if the same level of national growth is led by the agricultural sector. This difference is reflected in the poverty–growth elasticity, whose value is –2.2 and –0.51 in the agriculture-led and nonagriculture-led growth scenarios, respectively (see Table 4.5).

Not only does agriculture-led growth reduce poverty more than nonagriculture-led growth does, agricultural growth can also generate more economywide growth through its linkages to the nonagricultural sectors, particularly the informal nonagricultural sectors, such as rural nonfarm economic activities. In contrast, agricultural linkages with the formal urban manufacturing sector are relatively weak, because rural households consume fewer formal sector goods than do urban households. Thus, when an economy has a relatively large informal nonagricultural sector, as in Kenya, agriculture has stronger growth linkages than does industry. Table 4.6 shows that agricultural multipliers are larger than those of industry and are similar to those of services.

Different sources of growth favor different groups and regions in Kenya. Faster industrial growth is more effective at reducing poverty in urban areas and metropolitan centers, whereas agricultural growth is more effective at reducing poverty in regions where farm incomes are most important. Unlike industry, however, agricultural growth reduces poverty in all regions and among the country's poorest popula-

Table 4.6—Sectoral growth multipliers under growth scenarios

	Multiplier after increasing sectoral output by KES1		
Sector	**Output**	**Gross domestic product**	**Income**
Agriculture			
Cereals	4.85	2.39	2.18
Roots and tubers	5.21	2.67	2.33
Horticulture	5.15	2.68	2.35
Export crops	5.16	2.62	2.32
Livestock	4.79	2.54	2.15
Industry			
Food processing	4.05	1.76	1.55
Light industry	4.25	1.87	1.67
Heavy industry	3.98	1.87	1.76
Construction and energy	4.59	2.11	1.81
Services			
Trade	4.63	2.24	1.87
Transport	4.78	2.32	2.03
Other private services	4.44	2.40	1.99
Public services	4.78	2.50	2.13

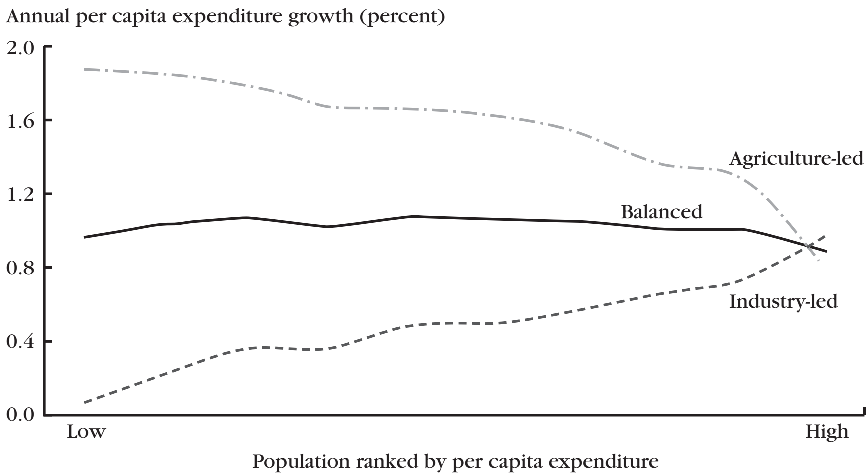
Source: Authors' calculations using the 2003 Kenyan social accounting matrix (Kiringai, Thurlow, and Wanjala 2006).

Notes: Multipliers are unconstrained, thus assuming perfectly elastic supply and fixed prices. KES = Kenyan shillings.

tion (that is, the gap between elasticities is even larger for the depth and severity of poverty). These distributional effects are more clearly seen using national growth incidence curves (Figure 4.2). These curves show the additional per capita expenditure growth for each percentile of the population ranked according to expenditure levels. In the balanced growth scenario the curve is always positive, implying that poverty is unambiguously declining. Furthermore, the curve is horizontal, indicating that per capita expenditure increases equally for both high- and low-income households. Thus, inequality remains unchanged. In contrast, the growth incidence curve under industry-led growth slopes upward, indicating that expenditure for low-income households rises less than that for higher-income households. Although industrial growth exacerbates inequality, the opposite is true for agricultural growth, whose curve slopes downward. Perhaps most important, however, the growth incidence curve for agriculture-led growth is always above that of industry-led growth, implying that all households are likely to benefit more from agricultural growth. This is because industrial growth is more capital intensive and investment driven, thus leading to lower growth rates in private consumption spending.

Our findings indicate that differences in the sectoral structure of growth can have significant implications for poverty reduction. Increasing the national rate of growth may be insufficient to significantly reduce poverty if growth generates distributional changes that isolate the poor from the growth process. The results for the industry-led scenario are similar to the projected structure of growth under the

Figure 4.2—Growth incidence curves under growth scenarios



Source: Kenyan dynamic computable general equilibrium model results.

Note: Per capita expenditure growth is in addition to the growth that occurs in the baseline.

government's national growth strategy ERS. Therefore, given its focus on industrial growth, the ERS is likely to produce poverty outcomes similar to the industry-led scenario presented here. Our results also indicate that industry-led growth could worsen income inequality, which is already high in Kenya. This increase in inequality was indeed observed in the few years after the ERS was implemented, with poverty falling only slightly in rural areas but more substantially in urban ones (see Table 4.2). However, caution should be exercised, because the 2005/06 survey may not have allowed sufficient time for ERS to be properly implemented, and so it may reflect the effects of policies and events prior to ERS.

Although agricultural growth may be more pro-poor than industrial growth, no single source of growth is equally effective at reducing poverty in all areas and regions of the country. Nor should the benefits of agricultural or industrial growth be seen to affect only rural and urban households, respectively. In the case of Kenya, industrial growth linkages generate positive spillovers to the rural nonfarm economy, and agriculture's growth linkages raise real urban incomes, especially in the informal economy. Agricultural and industrial growth are therefore not mutually exclusive. However, our results suggest that agricultural growth should receive greater emphasis in Kenya's future growth strategy if the country is to achieve more equitable outcomes. Accordingly, the rest of this chapter focuses on accelerating growth in the agricultural sector.

Decomposing the Contribution of Agriculture

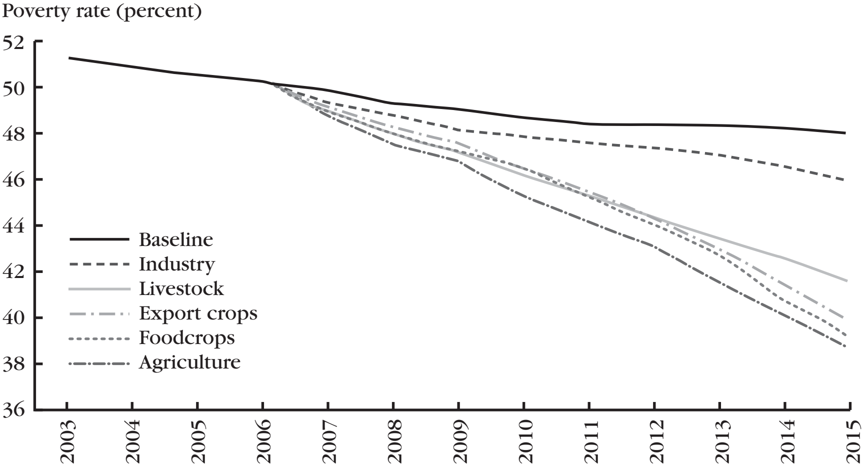
Now we look within Kenya's agricultural development and decompose the potential contribution of different agricultural subsectors to growth and poverty reduction. The effectiveness of the foodcrop, livestock, and export crop subsectors in reducing poverty is again examined by raising the overall GDP growth rate from 3 to 4 percent per year. This is done by increasing their sectoral growth rates via higher productivity. Three simulations are considered: (1) accelerated growth in foodcrops, (2) accelerated growth in the livestock and dairy sectors, and (3) accelerated growth in export crops. In these simulations, foodcrops include maize, sorghum, and millet; export crops include traditional and nontraditional crops, such as tea, cotton, coffee, and horticulture; and livestock includes beef, poultry, dairy, and other livestock-related activities. Understanding the relationship of these subsectors to pro-poor growth is especially important for Kenya, whose agricultural growth in recent years has been characterized by a relatively rapid expansion in export crops and livestock but modest growth in foodcrops and downstream processing.

Agriculture's overall growth rate in the foodcrop scenario increases from 3.0 to 7.2 percent to generate the additional 1 percent in overall GDP growth (see Table 4.4). The additional agricultural growth is higher in the export crop scenario, and the effect of rapidly rising agricultural exports is an appreciation of the real exchange rate, which undermines the competitiveness of other agricultural and manufacturing exports. Manufacturing growth therefore declines significantly in the export crop scenario. However, despite improved agricultural productivity, rapid growth in foodcrops creates greater competition for agricultural resources, especially land and rural labor, and this reduces the availability of these resources for other agricultural sectors. Accordingly, export crop growth reverses from 4 percent in the baseline scenario to –11 percent in the foodcrop scenario. Therefore, there is definite competition over resources between foodcrops and export crops. Shifts in the composition of agricultural growth also influence how households benefit from growth. These differences remain small at the national level, with foodcrop growth generating slightly better poverty outcomes than does growth in export crops (Figure 4.3). However, at the subnational level there are more significant differences, with the lowlands and midlands benefiting more from foodcrop expansion than the highlands do, which in turn benefit more from export crops.

Accelerating livestock production in the livestock scenario does not lead to pronounced resource competition with other agricultural sectors. Growth in the dairy sector favors the highland region. However, the impact on poverty resulting from accelerated livestock growth is smaller than under either foodcrop or export crop growth, especially for the depth and severity of poverty. This relationship is evident in the relative sizes of the poverty–growth elasticities (see Table 4.6). Although all three scenarios have large elasticities, it is foodcrop production that strengthens the growth–poverty relationship the most. However, even though this is true for the lowlands and midlands, it is not true for the highlands, where the growth–poverty relationship is weakened by an expansion of foodcrops (at the expense of cash crops). In contrast, households in the highlands benefit more in the cash crop and livestock scenarios, albeit at the expense of lowland growth and poverty. Therefore, although the previous section found that agricultural growth is more pro-poor than is industrial growth, there are still trade-offs in agriculture that can result in significant distributional changes.

In summary, a growth strategy that seeks to share the benefits of growth among households throughout the country cannot focus agricultural growth only in certain sectors. Such a narrow approach may successfully reduce poverty in the short term as incomes rise for households in those regions with appropriate conditions. However, national poverty reduction would taper off, because households in the less-favored regions are effectively isolated from the growth process. This differential effect is especially true in the lagging lowlands. Promoting only certain sectors without considering distributional change and regional differences can effectively exclude sections of the population from the benefits of growth. It should also be noted that the growth rates that would be required from export crops and horticulture if they were solely responsible for generating additional GDP growth are unrealistically

Figure 4.3—Changes in the national poverty rate under growth scenarios, 2003–15



Source: Kenyan dynamic computable general equilibrium model results.

high (about 10 percent per year). Therefore, over and above the need to generate broad-based agricultural growth to ensure regional equity, it is unlikely that a strategy based on a single sector will be able to generate the levels of growth necessary to significantly raise growth and reduce poverty.

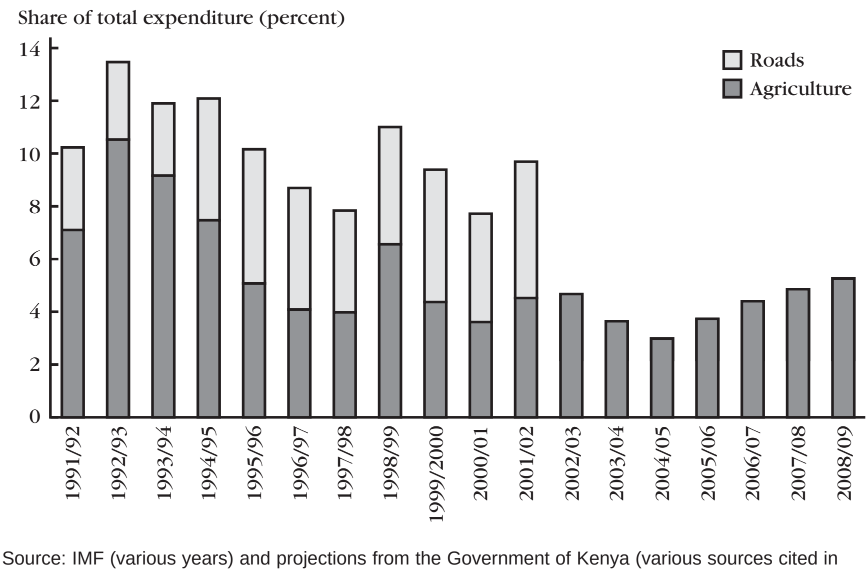
Agricultural Investment Analysis

Public Spending and Agricultural Productivity

So far we have identified agriculture as an effective source of poverty-reducing growth. Next we consider how public investments can be used to accelerate agricultural growth, taking into account fiscal implications. Although there are many necessary interventions, there is some consensus in the empirical evidence. Given the constraints to area expansion in Kenya, policies should focus on raising agricultural productivity (Nyoro and Jayne 1999). The empirical evidence suggests that several binding constraints have lowered agricultural productivity. These include poor access to credit and farm capital (Ekbom 1998); low use of farm inputs, especially fertilizer (Nyoro and Jayne 1999; Odhiambo, Nyangito, and Nzuma 2004); and a lack of technical knowledge among smallholders that has limited the use of pesticides and other farm inputs (Evenson and Mwabu 1998; Nyangito 1999). These constraints emphasize the need for extension services over and above rural education, whose relationship to agricultural productivity is found to be relatively weak (Odhiambo, Nyangito, and Nzuma 2004). Most important, increased investment in agricultural research has a strong and positive relationship to agricultural productivity. Supporting agricultural research is therefore especially important in Kenya, where increased rural population density has forced smallholder farmers to transfer inappropriate technologies into new environments (Nyoro and Jayne 1999). Taken together, improved inputs and technologies can reverse the long-run decline in the country's agricultural productivity. Finally, lowering Kenya's high transport costs through improvements in rural infrastructure, especially roads, is not only important for improving access to input and output markets, but it is also found to indirectly enhance the productivity of nontraded crops.

Empirical studies have found that government spending on agriculture has a positive impact on agricultural productivity (Odhiambo, Nyangito, and Nzuma 2004). However, agricultural spending has fallen dramatically, having peaked at about 10 percent in the early 1990s and dropping below 5 percent in more recent years (Figure 4.4). Government projections indicate that agricultural spending will gradually increase its share of budget allocations over the next five years, but its share will remain around 5 percent. This allocation mirrors the emphasis of the country's current development strategy but contrasts with the 10 percent expenditure target

Figure 4.4—Public spending on agriculture and roads, 1991–2009



Source: IMF (various years) and projections from the Government of Kenya (various sources cited in Akroyd and Smith 2007).

Note: Figures for 2002–09 are projections.

that the government committed to under the Maputo Declaration. Expenditure on roads has increased slightly, but even though it is impossible to isolate data for rural roads in the figure, it is reasonable to conclude that total expenditure on agriculture and rural infrastructure has declined over the past decade.

In this section we consider the impact and fiscal implications of increasing agricultural spending to 10 percent of the budget. Drawing on recommendations from the Kenyan literature, we explore two potential areas of investment in the agricultural sector. These include raising expenditure on research and extension (R&E) and on irrigation and water management. Although the Maputo Declaration refers specifically to agricultural spending, we also examine the impact of increasing investment in rural road infrastructure and strengthening market development. To estimate these impacts, we extend the DCGE model to endogenously capture the relationship between spending and agricultural productivity.

Modeling the Impact of Rural Investments

Modeling the impact of investments takes place in two stages (see Thurlow, Kiringai, and Gautam 2007). First, a set of equations is specified that captures the channels through which specific investments affect agricultural productivity. The initial estimates of key parameters are drawn from the literature. Second, the productivity equations are integrated in the DCGE model to capture the impact of increasing agricultural productivity on regional production and incomes, relative prices, resource allocations, and market constraints.

The impact of investments on productivity is modeled using a set of nested linear equations. The DCGE model contains production functions for representative producers who can represent a subsector nationally or a subsector within a region. Although producers in the model attempt to maximize their profits by substituting among factor inputs (for example, labor, land, and capital), the productivity of these factors will affect their returns (profitability). These total factor productivity (TFP) levels, and hence sector-level growth, are affected by public investments. Obviously, different types of public investment affect agricultural productivity differently, and such effects have to be econometrically estimated using historical data. However, we are constrained by a lack of data in Kenya and so draw on the literature. Specifically, the TFP–public-investment-growth elasticities are drawn from Fan and Zhang (2008; Table 4.7), who used data from neighboring Uganda. We assume the elasticities are the same across subnational regions in Kenya. Of course, elasticities are not strictly transferable across countries. In light of Kenya's own circumstances, we use a slightly lower elasticity for R&E than was found for Uganda, because there is evidence that extension services in Kenya are not as effective as elsewhere (Gautam and Anderson 1998). We use a slightly higher initial elasticity for rural roads, because Kenya has a more extensive road network than

Table 4.7—Elasticities in the productivity–investment function

	Productivity–investment elasticity				
Investment type	Uganda	Lower	Initial	Upper	Sectors affected
Roads	0.139	0.113	0.150	0.188	Crops, livestock, food processing, and trade
Irrigation	n.a.	0.150	0.200	0.250	Crops (excluding highlands)
Extension	0.189	0.113	0.150	0.188	Crops (excluding export crops), and livestock

Source: Estimates for Uganda from Fan and Zhang (2008).
Notes: Upper and lower bound estimates are used for sensitivity analysis and are based on a 25 percent confidence interval around the initial (or midpoint) estimate. n.a. = not available.

Uganda has, and hence percentage stock changes are substantially larger in absolute terms. Because the returns to irrigation were not estimated in Uganda, we assume an initial elasticity for irrigation stocks. However, given the uncertainty associated with each of these elasticities, we conduct sensitivity analysis assuming a 25 percent confidence interval around initial estimates. These intervals are shown in the table as upper and lower bounds.

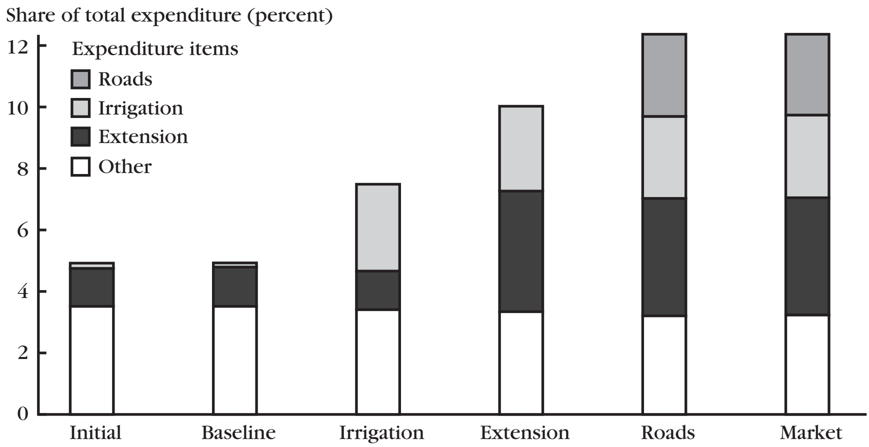
Government expenditures are already captured in the DCGE model, which tracks how revenues are raised through various taxes and then allocated across regions and government functions (health, education, agriculture, and roads, for example). District-level expenditure information is drawn from government sources, and labor income data from the WMSIII was used to disaggregate the government sector by function and region. The growth rate of public expenditures in the DCGE model is determined exogenously for each government function. In the baseline scenario, all expenditures grew at the same 2 percent annual growth rates. However, in the investment scenarios that follow we increase the growth rate of each expenditure item to achieve expenditure share targets by 2015. In other words, additional agricultural spending is not at the expense of other expenditure items but is brought about by higher overall spending by the government. The revenues needed to finance this additional spending are generated by increasing direct taxes on household incomes, so that the government budget deficit remains unchanged.

Increasing Spending on Irrigation and Extension

The literature identifies irrigation and water management and R&E as areas where additional investments are needed to raise agricultural productivity. The first two investment scenarios assess these investment options. In determining the financial resource envelope for each scenario, we start with the initial share of total agricultural spending, which was equal to 4.8 percent of government spending in 2002 (Figure 4.5). This share comprised 0.2 percent for irrigation and 1.3 percent for R&E; the remaining 3.3 percent was for other areas of agriculture. Because all expenditure areas grew at 2 percent per year in the baseline scenario, there was no change in the final composition of total expenditure. However, in the irrigation scenario we gradually increase the share of government expenditure on irrigation from 0.2 to 2.7 percent during 2006–15. In the extension scenario we also increase the share of R&E spending by 2.7 percent, so that agricultural spending as a whole is 10 percent of total spending. This scenario is equivalent to meeting the expenditure target identified in the Maputo Declaration. It is important to note that the scenarios are cumulative, meaning that the extension scenario includes the effects of the irrigation scenario. Therefore, the counterfactual for the extension scenario is the irrigation scenario rather than the baseline scenario.

Increasing irrigation's share of total spending from 0.2 to 2.9 percent is equivalent to increasing the share of irrigable land under irrigation from 5.3 percent to 19.3 percent by 2015. In the baseline scenario, the share of land under irrigation would have risen to 6.9 percent by 2015. So in the irrigation scenario we are more than doubling the amount of irrigated land over a period of 10 years. The impact of increasing irrigation investment is an acceleration of agricultural growth from 3 percent per year in the baseline scenario to 3.8 percent in the irrigation scenario

Figure 4.5—Final agricultural expenditure shares under investment scenarios, 2015



Source: Kenyan dynamic computable general equilibrium model results.

Note: Outcomes are cumulative (for example, "Roads" includes the expenditures from "Irrigation" and "Extension").

Table 4.8—Growth outcomes under investment scenarios (percent)

Outcome	GDP share, 2003	Average annual growth rate: Baseline	Irrigation	Extension	Roads	Market
GDP factor cost	100.0	3.0	3.2	3.5	3.8	3.9
Agriculture	23.5	3.0	3.8	5.3	6.0	6.1
Cereals	2.9	2.5	3.1	4.2	4.6	4.6
Roots and tubers	3.1	0.9	1.7	4.4	4.8	4.6
Horticulture	3.7	4.0	4.6	10.6	11.4	11.2
Export crops	6.1	4.0	5.7	3.6	4.9	5.4
Livestock	6.6	3.0	3.0	4.4	5.0	5.1
Industry	21.2	2.8	2.6	2.5	2.4	2.7
Food processing	4.2	1.0	0.9	1.0	1.1	1.5
Private services	42.7	3.3	3.3	3.3	3.3	3.5
Public services	12.6	2.0	2.2	2.5	2.8	2.8

Source: Kenyan dynamic computable general equilibrium model results.

Notes: Foodcrops include all edible crops (such as cereals, roots, and pulses); cash crops include both export and industrial crops (such as cut flowers, tea, horticulture, and tobacco); light industry includes textiles, clothing, and wood and paper products; and heavy industry includes chemicals, petroleum, and machinery. GDP = gross domestic product.

(Table 4.8). Additional spending on R&E in the extension scenario accelerates agricultural growth by a further 1.5 percent per year. This growth comes from increasing the share of R&E expenditure from 1.2 to 4.0 percent of total spending. These two scenarios suggest that increasing the share of government spending on agriculture to 10 percent would allow agriculture to reach an average growth rate of 5.3 percent during 2006–15.

This acceleration of agricultural growth in the irrigation scenario is driven by strong growth in export crops, especially tea and sugarcane, which have better access to foreign markets and are less constrained by domestic market opportunities. However, despite market constraints, foodcrops and horticultural crops, especially rice, pulses, and fruits and vegetables, grow more strongly as a result of irrigation and improved water management. In contrast, the livestock sector remains unaffected, because productivity in this sector is not directly linked to irrigation, and falling feed prices offset any resource competition with other sectors. However, extension services do affect livestock productivity, and so the livestock sector grows more rapidly than the crop sectors in the extension scenario.

Public extension services do not directly increase productivity among export crops, because these crops typically rely on private sector schemes. Therefore, public extension services cause resource competition between export and other sectors, and the improved profitability of nonexport crops and livestock causes farmers to reallocate resources away from export crops. Accordingly, growth in export crops slows from 5.7 to 3.6 percent in the extension scenario. The impact on traditional export crops is more pronounced, with production in tea and coffee slowing dramatically. This dynamic emphasizes the need to partner public service provision with private sector initiatives and—as will be seen in subsequent scenarios—to increase rural infrastructure and market access for traditional export crops.

Faster agricultural growth resulting from additional rural investments increases household incomes, especially in rural areas, where most households engage in agricultural activities and therefore incomes are directly affected. Increasing irrigation and R&E spending causes the national poverty headcount to fall more than it does in the baseline scenario (Table 4.9). Not surprisingly, rural poverty declines more than urban poverty does in both scenarios, and this decline is concentrated in the lowlands and midlands, because the highland region has better rainfall patterns and hence benefits less from irrigation investments. The lowlands and midlands also experience larger declines in poverty after improved R&E services, because these regions are already more heavily engaged in crops that benefit greatly from extension services, such as vegetables, wheat, and maize. Finally, although irrigation improves rural incomes, it does little to reduce poverty in urban areas. However, extension services reduce foodcrop prices, thereby indirectly raising real incomes and lowering urban poverty by 0.7 percentage points by 2015. In total, the model results suggest that increasing agricultural spending to 10 percent of total spending could lift an additional 1.6 million people above the poverty line by 2015, compared with the current growth path.

Table 4.9—Poverty outcomes under investment scenarios (percent)

Poverty measure	Incidence, 2003	Final year incidence, 2015				
		Baseline	Irrigation	Extension	Roads	Market
National incidence	51.3	48.1	46.3	42.9	40.9	39.5
Rural	51.9	47.8	45.7	41.6	39.3	37.6
Urban	47.6	49.5	49.3	48.8	48.7	48.4
Lowlands	61	60.0	57.1	54.7	53.8	52.3
Midlands	54.7	51.8	49.1	44.9	42.5	40.7
Highlands	41.4	34.3	34.2	30.8	28.7	27.3
Metropolitan	47.1	48.3	48.3	47.9	47.9	47.9
National depth	17.9	18.0	16.6	14.9	13.8	13.2
National severity	8.2	8.7	7.8	6.9	6.3	5.9

Source: Kenyan dynamic computable general equilibrium model results.

Notes: The incidence is the proportion of the population with per capita consumption below the poverty line. The microsimulation module is based on the 1997 survey (Kenya 2000), and so the initial incidence values in the model are those for 1997. The official basic needs poverty line is set at KES1,239 (US$21; rural) and KES2,648 (US$45; urban) per adult per month (1997 prices). KES = Kenyan shillings. The depth of poverty is the extent, measured as a proportion of the poverty line, to which a given group of poor people's consumption level falls below the poverty line. The severity of poverty is the average of the squared values of the depth of poverty for different groups of poor people.

Supporting Investments in Rural Roads and Market Development

Apart from insufficient direct agricultural investments, such as in irrigation and R&E, the literature also identifies poor market access and inadequate rural infrastructure as binding constraints to agricultural growth and rural development. Accordingly, we increase government spending on rural feeder roads in this scenario. Roads increase agricultural productivity in the same manner as irrigation does in the previous subsection. Building new roads improves on-farm productivity, and it also enables broader market development by reducing transaction costs for rural nonagricultural sectors. Government policies to improve rural distribution and marketing systems will also improve productivity for rural traders. Therefore, apart from a road investment scenario, we also consider a second scenario that simulates the development of rural markets. This is done by increasing productivity in the trade sector and reducing transaction costs for domestic and export agricultural sectors. Unlike the previous scenarios, we assume that there is no cost associated with this aspect of market development (in other words, the cost of building roads greatly overshadows the cost of implementing market-enabling policies). Therefore, although government spending increases in the roads scenario, it remains unchanged in the market scenario (see Figure 4.5). In the roads scenario, we increase the share of road expenditures in government spending by 2.7 percent, so that agricultural and new road expenditures reach 12.8 percent of total spending by 2015. We assume that all additional spending is directed toward building rural feeder roads. This amount is equivalent to building an additional 67,500 kilometers of feeder roads by 2015, or alternatively, increasing Kenya's road stock by about one-third of its 2006 level. In the market scenario, we halve agricultural transaction costs and increase productivity in the rural trade sector by 3 percent per year during 2006–15.

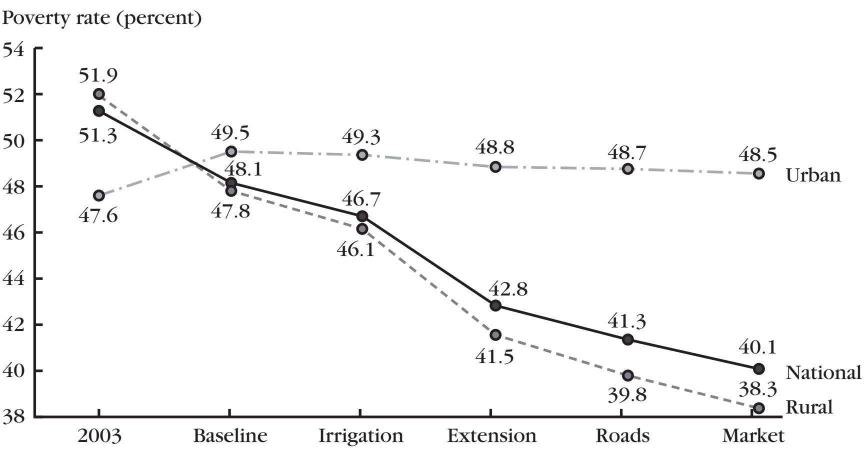
All crop and livestock sectors benefit from feeder roads. However, export and horticultural crops benefit more than the others, because they are more heavily marketed and thus better positioned to take advantage of expanding market opportunities. Such crops include tea, cut flowers, and fruits and vegetables. In contrast (and with the exception of wheat), cereal and root crops experience a slower acceleration of growth, because they are more constrained by domestic demand and by limited potential to displace imports. However, when road development is coupled with market development, as in the market scenario, then declining domestic transaction costs foster stronger growth in cereals. This synergy occurs because improvements in domestic marketing favor the food processing sectors, which in turn provide an expanding market for cereal farmers. Traditional exports also benefit from lower transport costs in the market scenario.

Although it is not surprising that rural roads favors rural development, once road investments are coupled with policies to improve market access, then the benefits of investing in rural infrastructure are more broadly distributed. For example, national poverty declines by 2 percent in the roads scenario, but by a further 1.4 percent in the market scenario. Road and market development also reduces urban poverty, albeit only slightly (Figure 4.6). Road investments and market development favor poverty reduction in the midland and highland regions, which already have strong links to urban markets. However, the lowland region also benefits, since rural infrastructure is greatly lacking and transactions costs are initially high.

Comparing the Impacts of Different Investments

The poverty–growth and spending–growth elasticities estimated from the model indicate that the impact of different investments on growth and poverty is variable (Table 4.10). Increasing government spending on irrigation by 1 percent causes a 0.06 percent increase in agricultural GDP, whereas spending an additional 1 percent on R&E and roads causes agricultural GDP to increase by 0.13 and 0.08 percent, respectively. However, although irrigation spending is less effective at raising growth than the other interventions, its resulting growth is more effective at reducing poverty. A 1 percent increase in irrigation-induced growth causes national poverty to decline by 3.9 percent, compared to 2.1 percent for R&E and 2.4 percent for roads. Irrigation investments are also considerably more effective at reducing poverty among Kenya's poorest populations, as evidenced by their larger elasticity for the rural poverty gap and rural squared poverty gap (that is, poverty measures that attach

Figure 4.6—Poverty rates under investment scenarios, 2015



Source: Kenyan dynamic computable general equilibrium model results.

Note: Outcomes are cumulative (for example, "Roads" includes the expenditures from "Irrigation" and "Extension").

Table 4.10—Poverty–growth elasticities and benefit–cost ratios under investment scenarios

Elasticity/cost ratio	Baseline	Irrigation	Extension	Roads	Market
	Percent change in poverty from 1 percent change in GDP				
Poverty–growth					
National poverty rate	–0.38	–3.88	–2.09	–2.44	–1.73
Rural poverty rate	–0.50	–4.60	–2.34	–2.91	–2.00
Rural poverty gap	–0.37	–5.59	–3.38	–3.83	–2.65
Rural squared poverty gap	–0.25	–7.57	–3.79	–4.17	–3.28
Urban poverty rate	0.23	–0.22	–1.02	–0.10	–0.49
	Percent change in GDP from 1 percent change in agricultural spending				
Spending–growth					
Agriculture		0.06	0.13	0.08	
All sectors		0.01	0.03	0.02	
	Kenyan shilling (KES) increase in GDP per KES1 spent				
GDP benefit–cost ratios					
Initial elasticity		2.6	6.3	3.0	
Lower bound		0.7	4.1	1.6	
Upper bound		4.5	8.6	4.4	
	Poor people lifted out of poverty per KES1 million spent				
Poverty benefit–cost ratios					
Initial elasticity		29	103	21	
Lower bound		19	64	12	
Upper bound		42	139	32	

Source: Kenyan dynamic computable general equilibrium model results.

Notes: Upper and lower bounds on the benefit–cost ratios assume a 25 percent confidence interval around the relevant investment-function elasticity. One million Kenyan shillings are equivalent to US$12,658 in 2003 prices. The poverty gap is the extent, measured as a proportion of the poverty line, to which a given group of poor people's consumption level falls below the poverty line. The squared poverty gap is the average of the squared values of the poverty gaps for different groups of poor people. GDP = gross domestic product. Blank cells = not applicable.

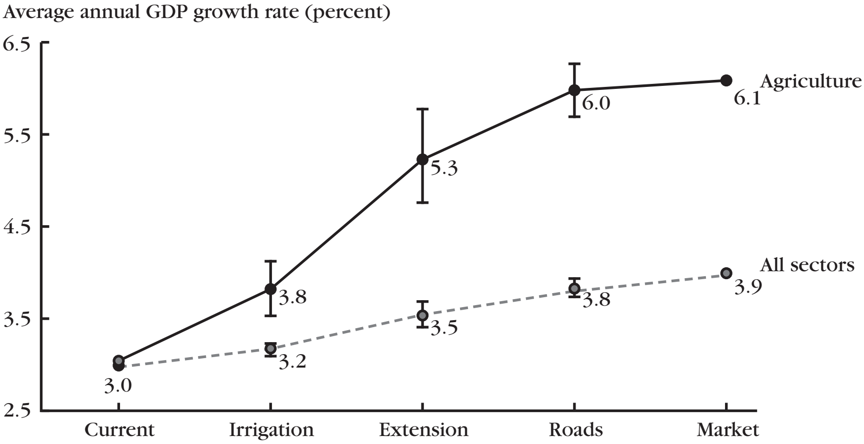
greater weight to households the farther they are from the poverty line). This differential occurs because irrigation benefits the lowlands, where poverty is more widespread and is most severe.

We estimate benefit–cost ratios for each of the investment scenarios. They suggest that the highest returns are from direct spending on R&E. For instance, every Kenyan shilling (KES1.0) spent on R&E during 2006–15 causes GDP to increase by KES6.3. In contrast, the return on irrigation and roads is KES2.6 and KES3.0, respectively. Despite differing magnitudes, all investments have positive returns (that is, all benefit–cost ratios are greater than one).

The estimated returns are sensitive to the TFP-spending elasticities that we draw from the literature. We thus conduct a sensitivity analysis by assuming a 25 percent confidence interval around our initial estimates (see Table 4.7). The impact of changing the elasticities can be seen in Figure 4.7, which shows the average annual GDP growth in each of the investment scenarios. The horizontal bars show the agricultural and economywide GDP growth rates that are achieved under the upper and lower bounds on the estimates of elasticity for the relevant investment. The model results shown in Figure 4.7 suggest that the agricultural growth rate in the irrigation scenario varies between 3.5 and 4.1 percent (averaging 3.8 percent), assuming a 25 percent lower or higher elasticity, respectively. This sensitivity is also evident for R&E and road investments, although it is most pronounced for the former. It affects the estimated returns to investments. For instance, although there is a positive return to irrigation investment based on the initial elasticity estimate, there is a net loss under the lower-bound estimate (the benefit–cost ratio is less than one). Furthermore, the return on R&E varies from KES4.1 to KES8.6 per shilling spent. However, even under a lower-bound estimate, the returns are higher than for the initial estimates for irrigation and roads. Therefore, the model results suggest that, assuming a similar return to investments in Kenya as in Uganda and given a relatively wide margin of error, the returns to R&E are higher than the returns to other investments considered.

The ranking of investments changes when their impact on poverty is considered rather than on growth. Although irrigation offers lower returns to growth, it has higher returns to poverty reduction than does road development. This result can

Figure 4.7—Average annual GDP growth under investment scenarios, 2006–15



Source: Kenyan dynamic computable general equilibrium model results.

Notes: Outcomes are cumulative (for example, “Roads” includes the expenditures from “Irrigation” and “Extension”). Horizontal bars show a 25 percent confidence interval around the relevant investment function elasticity. GDP = gross domestic product.

be explained by considering the differences in spending–growth and poverty–growth elasticities. The larger poverty–growth elasticity for irrigation offsets its smaller spending–growth elasticity. However, this result holds only when it is compared with road investments. Although R&E-induced growth is less effective in reducing poverty than irrigation-induced growth, R&E spending is considerably more effective at raising growth. It is this combination of pro-poor and pro-growth features that makes R&E better at reducing poverty. However, despite the strong results for extension services, it should be remembered that irrigation spending is more effective at reducing poverty in the lowlands, where poverty is most severe, and that roads and market development generate broad-based agricultural growth and benefit urban consumers along with rural households.

Conclusions

Our findings indicate that Kenya should focus its development strategy on accelerating economic growth, because in its current growth scenario, poverty will change little over the coming decade. However, under its current structure of growth, Kenya's economy would have to grow by more than 10 percent per year if it is to meet the MDG1 by 2015. Although it is clear that no single sector can lead development on its own, Kenya has to search for a growth option that is more pro-poor. Our findings indicate that without agricultural growth, it is unlikely that significant declines in poverty can be achieved.

The need for broad-based growth also applies to subsectors in agriculture. Despite differences across agricultural sectors, agriculture typically generates growth that is more beneficial to a majority of Kenyans. Agricultural growth is especially beneficial for poorer households in less-favored regions. Therefore, it is unlikely that the current strategy, which is not optimistic about agriculture's growth potential, can have a profound effect on poverty. Furthermore, an industry-led growth strategy that does not also increase investments in agriculture will exacerbate Kenya's already high levels of income inequality. Even in urban areas, the gap between formal and informal sectors means that industrial policies geared toward the formal sector are unlikely to benefit the urban poor in large numbers. Therefore, we conclude that, as Kenya prepares future national strategies, the country should direct greater emphasis and resources toward accelerating agricultural growth.

We have explored how agricultural growth can be accelerated through increasing public spending on agriculture and the rural sector. We find that increasing agricultural spending to meet the 10 percent target set by the Maputo Declaration can lift an additional 1.5 million people above the poverty line by 2015. Irrigation and R&E greatly accelerate growth for both food and export crops and benefit households throughout the country. Specific investments have higher returns in different parts of the country. Irrigation investments favor the lowlands and Kenya's poorest populations, whereas R&E favors the midlands and highlands. R&E is found to have the highest returns in terms of both growth and poverty reduction. However, the reduction in poverty resulting from meeting the 10 percent agricultural spending target is only one-third of the reduction required to meet the MDG1. Furthermore, increasing agricultural spending to 10 percent of total spending is insufficient to meet the CAADP agricultural growth target of 6 percent. Achieving this target will require additional nonagricultural investments, such as improved rural infrastructure and rural market development. Even though building rural roads and reducing transaction costs is an expensive option, we find that these investments significantly reduce rural poverty and encourage growth that extends beyond rural areas.

The total cost of increasing agricultural and rural investments to achieve the 6 percent CAADP growth target is about US$127 million per year during 2006–15 in 2003 prices. The additional spending above the 10 percent committed to under the Maputo Declaration is US$54.9 million. However, improving the efficiency of government investments could reduce these cost estimates. We have shown that even slight improvements in the relationship between investment and productivity can greatly improve growth and poverty outcomes. Therefore, although it is necessary to increase spending on agriculture, the fiscal burden of an agricultural growth strategy can be reduced through better fiscal management and implementation. Finally, we find that even though the 10 percent agricultural growth target set under the CAADP initiative will cause a significant decline in poverty, it still falls far short of halving poverty by 2015. Therefore, agricultural growth should be afforded a more central role in Kenya's development strategy, but it will also be necessary to continue to encourage urban and nonagricultural growth. However, Kenya's development strategy will have to move beyond its current overemphasis on industrialization if the benefits of future growth are to be shared throughout the population.

Appendix

Table 4A.1—Structure of the Kenyan economy, 2003

Category/sector	National economy	Urban economy: Informal	Urban economy: Formal	Rural economy	Agroecological region: Lowlands	Agroecological region: Midlands	Agroecological region: Highlands	Metropolitan centers
	Contribution to national gross domestic product (percent)							
GDP factor cost	100.0	12.0	54.7	33.2	4.7	24.9	14.1	56.3
Agriculture	100.0	5.7	6.9	87.4	5.6	60.2	32.6	1.7
Industry	100.0	12.1	68.5	19.4	2.9	11.3	9.6	76.2
Services	100.0	14.7	69.8	15.5	5.1	15.1	8.0	71.8
	Contribution to region and economy's gross domestic product (percent)							
GDP factor cost	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Agriculture	23.5	11.1	3.0	61.8	27.6	56.9	54.3	0.7
Cereals	3.1	0.1	0.0	9.3	5.1	9.0	4.5	0.0
Roots and oilseeds	3.0	0.1	0.1	8.8	3.7	9.1	3.7	0.0
Horticulture	3.6	0.2	0.0	10.8	1.8	7.4	12.1	0.0
Export crops	6.4	0.2	0.3	18.8	2.4	13.9	20.3	0.0
Livestock	6.3	10.5	1.0	13.3	12.9	15.2	12.7	0.1
Forestry and fishing	1.1	0.0	1.6	0.7	1.8	2.2	1.1	0.6
Industry	21.8	21.9	27.3	12.7	13.1	9.9	14.8	29.5
Food processing	4.1	2.1	4.6	4.1	2.6	1.9	2.3	5.7
Services	54.7	66.9	69.8	25.5	59.3	33.2	30.9	69.8
Retail trade	6.5	23.4	1.8	8.2	9.5	5.6	4.0	7.3
Public services	14.9	0.4	20.8	10.3	25.0	19.9	13.4	12.2

Source: Authors' calculations using the 2003 Kenyan social accounting matrix (Kiringai, Thurlow, and Wanjala 2006).

Notes: Informal economy comprises private businesses or activities in urban areas that are not registered to pay taxes. Lowlands, midlands, and highlands refer to agroecological regions. Metropolitan areas include centers with more than 100,000 residents. GDP = gross domestic product.

Table 4A.2—Structure of the Kenyan social accounting matrix

Agricultural sectors	Maize; wheat; rice; barley; other cereals; roots and tubers; pulses and oilseeds; fruits; vegetables; cotton; sugarcane; coffee; tea; cut flowers; other cash crops; beef; poultry; dairy; sheep and goats; other livestock; fishing; forestry
Industrial sectors	Meat and dairy; grain milling; sugar and bakery; beverages and tobacco; other manufactured food; textiles and clothing; leather and footwear; wood and paper; printing and publishing; mining; petroleum; chemicals; metals and machines; nonmetallic products; other manufactures; water; electricity; construction
Service sectors	Trade; hotels; transport; communication; finance; real estate; other services; public sector (health); public sector (education); public sector (roads); public sector (irrigation); public sector (agricultural research and extension); public sector (other agriculture); public sector (administration and other)
Factors[a]	Capital; agricultural land; skilled labor; semiskilled labor; unskilled labor
Households	Disaggregated by rural/urban, four regions, and per capita expenditure deciles
Regions	Lowlands; midlands; highlands; metropolitan areas

Source: Authors.
[a]All factors are disaggregated across regions.

Table 4A.3—Some assumptions in calibrating the baseline scenario in the dynamic computable general equilibrium model

Category	Annual growth rate (percent)	Sources and notes
Population	1.9	Kenya (2000) and World Bank (2010). Baseline assumes a slowdown in urbanization and overall population growth (as per observed trends).
Rural	1.5	
Urban	2.4	
Labor supply	2.2	Skilled and semi-skilled growth rates are based on weighted rural/urban population growth rates. Unskilled labor supply is endogenous, based on labor demand (shown here only for comparison).
Skilled labor	2.2	
Semi-skilled labor	1.9	
Unskilled labor	3.0	
Land supply	1.0	FAO (2010). Calibration is based on average area growth, 1990–2004.
Capital depreciation rate	7.0	Onjala (2002). Value is higher than Odhiambo, Nyangito, and Nzuma (2004) but produces a consistent capital stock growth rate.
Capital–output ratio	2.0	
Foreign capital inflows	1.0	World Bank (2010). Measured as the change in terms of trade and current account.
World commodity prices	–0.5	
Public recurrent spending	1.5	The value is the average growth rate for 2000–04.

References

Akroyd, S., and L. Smith. 2007. *Review of Public Spending to Agriculture.* Report prepared by Oxford Policy Management. London: Department for International Development.

Ariga, J., T. S. Jayne, and J. Nyoro. 2006. *Factors Driving the Growth in Fertilizer Consumption in Kenya, 1990–2005: Sustaining the Momentum in Kenya and Lessons for Broader Replicability in Sub-Saharan Africa.* Nairobi, Kenya: Tegemeo Institute of Agricultural Policy and Development, Kenya Agricultural Research Institute.

Ekbom, A. 1998. "Some Determinants to Agricultural Productivity—An Application to Kenyan Highlands." Paper presented at the World Conference on Environmental Economics, Venice, Italy, June 25–27.

Evenson, R. E., and G. Mwabu. 1998. *The Effects of Agricultural Extension on Farm Yields in Kenya.* Discussion Paper 708. New Haven, CN, US: Economic Growth Center, Yale University.

Fan, S., and N. Rao. 2003. *Public Spending in Developing Countries: Trend, Determination, and Impact.* Environment and Production Technology Division Discussion Paper 99. Washington, DC: International Food Policy Research Institute.

Fan, S., and X. Zhang. 2008. "Public Expenditure, Growth, and Poverty Reduction in Rural Uganda. Development." *African Development Review* 20 (3): 466–496.

FAO (Food and Agriculture Organization of the United Nations). 2010. FAOSTAT statistical database. Accessed September 16, 2011. http://faostat.fao.org/.

Gautam, M., and J. Anderson. 1998. *Returns to T&V Extension in Kenya: Some Alternative Findings.* Africa Technical Department Series Technical Paper 208. Washington, DC: World Bank.

IMF (International Monetary Fund). Various years. *Government Finance Statistics.* Washington, DC.

Kabubo-Mariara, J. 2001. "Herders Response to Acute Land Pressure and Determinants of Poverty under Changing Property Rights: Some Insights from Kenya." Unpublished working paper, Department of Economics, University of Nairobi, Nairobi, Kenya.

Karanja, A. M. 2003. *The Dairy Industry in Kenya: The Post-Liberalization Agenda.* Nairobi, Kenya: Tegemeo Institute of Agricultural Policy and Development, Kenya Agricultural Research Institute.

Karanja, D. D., T. S. Jayne, and P. Strasberg. 1999. *Maize Productivity and the Impact of Market Liberalization in Kenya.* Nairobi, Kenya: Tegemeo Institute of Agricultural Policy and Development, Kenya Agricultural Research Institute.

Kenya. 2000. *Poverty in Kenya: Vol. 1. Incidence and Depth of Poverty.* Nairobi, Kenya: Central Bureau of Statistics, Ministry of Planning and National Development.

———. 2002. *Ninth National Development Plan.* Nairobi, Kenya: Central Bureau of Statistics, Ministry of Planning and National Development.

———. 2003a. *Geographic Dimensions of Wellbeing in Kenya: Who and Where Are the Poor?* Nairobi, Kenya: Central Bureau of Statistics, Ministry of Planning and National Development.

———. 2003b. *Economic Recovery Strategy for Wealth and Employment Creation, 2003–2007.* Nairobi, Kenya: Ministry of Planning and National Development.

———. 2006. *Economic Survey: National Accounts.* Nairobi, Kenya: Central Bureau of Statistics, Ministry of Planning and National Development.

———. 2007. *Kenya Vision 2030.* Nairobi, Kenya: National Economic and Social Council of Kenya, Office of the President.

Kibaara, B. 2006. *Rural Financial Services in Kenya: What's Working and Why.* Nairobi, Kenya: Tegemeo Institute of Agricultural Policy and Development, Kenya Agricultural Research Institute.

Kimalu, P., N. Nafula, D. K. Manda, G. Mwabu, and M. S. Kimenyi. 2002. *A Situational Analysis of Poverty in Kenya.* Working Paper 6. Nairobi, Kenya: Kenya Institute for Public Policy Research and Analysis.

Kiringai, J., J. Thurlow, and B. Wanjala. 2006. *A 2003 Social Accounting Matrix for Kenya.* Nairobi, Kenya: Kenya Institute for Public Policy Research and Analysis.

Mose, L. O. 1999. *Maize Productivity and the Impact of Market Liberalization in Kenya.* Nairobi, Kenya: Tegemeo Institute of Agricultural Policy and Development, Kenya Agricultural Research Institute.

Nyangito, H. O. 1999. "Agricultural Sector Performance in a Changing Policy Environment." In *Kenya's Strategic Policies for the 21st Century,* edited by P. Kimuyu, M. Wagacha, and O. Agabi. Nairobi, Kenya: Institute for Policy Analysis and Research.

Nyoro, J. K., and T. S. Jayne. 1999. *Trends in Regional Agricultural Productivity in Kenya. Kenya Agricultural Marketing and Policy Analysis Project.* Nairobi, Kenya: Tegemeo Institute of Agricultural Policy and Development, Kenya Agricultural Research Institute.

Nyoro, J. K., M. Wanzala, and T. Awour. 2001. *Increasing Kenya's Agricultural Competitiveness: Farm Level Issues.* Nairobi, Kenya: Tegemeo Institute of Agricultural Policy and Development, Kenya Agricultural Research Institute.

Odhiambo, W., H. O. Nyangito, and J. Nzuma. 2004. *Sources and Determinants of Agricultural Growth and Productivity in Kenya.* Discussion Paper 34. Nairobi, Kenya: Kenya Institute for Public Policy Research and Analysis.

Onjala, J. O. 2002. *Total Factor Productivity in Kenya: The Links with Trade Policy.* Research Paper 118. Nairobi, Kenya: African Economic Research Consortium.

Owuor, J. 1999. *Determinants of Agricultural Productivity in Kenya.* Nairobi, Kenya: Tegemeo Institute of Agricultural Policy and Development, Kenya Agricultural Research Institute.

Ravallion, M., and S. Chen. 2003. "Measuring Pro-Poor Growth." *Economic Letters* 78: 93–99.

Strasberg, P. J., T. S. Jayne, T. Yamano, J. Nyoro, D. Karanja, and J. Strauss.1999. *Effects of Agricultural Commercialization on Food Crop Input Use and Productivity in Kenya.* International Development Working Paper 11463. East Lansing, MI, US: Michigan State University.

Thurlow, J., J. Kiringai, and M. Gautam. 2007. *Rural Investment to Accelerate Growth and Poverty Reduction in Kenya.* IFPRI Discussion Paper 723. Washington, DC: International Food Policy Research Institute.

World Bank. 2008. *Kenya Poverty and Inequality Assessment: Volume I. Synthesis Report.* Washington, DC.

———. 2010. *World Development Indicators.* Washington, DC.