



In Chapter 4

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WHAT THIS CHAPTER SHOWS

This chapter examines the principal domestic sources of food in Kenya, including crop production, livestock, fishing, and hunting-gathering. A detailed livelihood map gives an overview of how Kenyan households use natural resources, wage labor, and other urban employment to make a living. Maps of cropping intensities show that Kenya's rainfed agriculture reflects the country's rainfall patterns, with a significant proportion of farmers being exposed to the risks of unreliable rainfall or prolonged drought. A detailed view of central and western Kenya, where more than 90 percent of croplands are located shows that farmers dedicate large shares of their cropland to food crops in selected high-potential Districts such as Trans Nzoia, Uasin Gishu, Lugari, upper Nandi, and Nakuru (maize and other cereals), Narok (wheat), and lower Kirinyaga (rice). Food crop shares are also high in the more marginal cropping areas—but here agriculture is dominated by lower-yielding maize—for example, along Lake Victoria and large parts of Laikipia, Machakos, Mwingi, Kitui, Makueni, Taita Taveta, Kwale, Kilifi, and Malindi Districts. Livestock production in Kenya also displays distinct spatial patterns: high dairy output and surpluses primarily in central Kenya; milk deficits in large parts of Nyanza and Western Provinces; and pastoral and agropastoral livestock rearing in the arid and semi-arid lands. The chapter concludes with a set of maps on fishing and hunting-gathering of wild animals and plants.

Food

Obtaining food, the most basic human need, is an activity that is always closely linked to natural resources. This chapter covers four dominant sources of food and livelihoods in rural Kenya: crop production, livestock, fishing, and hunting-gathering. Using indicators such as the presence and level of an activity (cropping, livestock rearing, fishing, etc.), and its contribution to cash income, this chapter explores the distribution of different livelihood strategies throughout Kenya, and how these patterns are influenced by ecosystems and the resources they provide. In some cases, changes in the resources available—for instance declining fish catches and crop yields—have begun to influence livelihoods, or may in the near future. Changes in land-use patterns—the creation of permanent water points in Turkana, for example, and increasing reliance on wage labor—also have repercussions on the environment and the people within it.

FOOD AND LIVELIHOODS

Sources of Food

Kenyans obtain most of their food from a few prominent sources. Agriculture provides an important source of subsistence as well as cash income for food for rural households. Maize, the staple food for most Kenyans, is the most widely grown cereal crop. Other major food crops include beans and cassava, and cereal crops such as wheat, millet, and sorghum. Kale, tomatoes, onions, potatoes, carrots, and cabbage are important minor crops.

Kenyan livestock consist of chickens, cattle, camels, pigs, sheep, and goats. These animals provide meat, milk, and eggs, and are an important source of protein and micronutrients, especially for children. Livestock play a particularly vital role as a food source in the semi-arid and arid lands that cover more than 80 percent (SoK 2003) of Kenya, where it is difficult or impossible to grow most crops.

Fishing provides food and a way to earn cash income for many Kenyans living near major bodies of water, particularly Lake Victoria. However, fishing plays a fairly small role in much of the country.

Finally, hunting wildlife and gathering nuts, fruits, and tubers in Kenya's forests and savannas remain important to many, as has been true for thousands of years. These wild resources become particularly critical in times of drought, stress, and hunger—whenever other resources become unreliable.

Predominant Strategies for Food and Livelihoods

The spatial distribution of different ecosystem types greatly influences the choice of livelihood strategies that Kenyan families pursue. Livelihood strategies can range from focusing predominantly

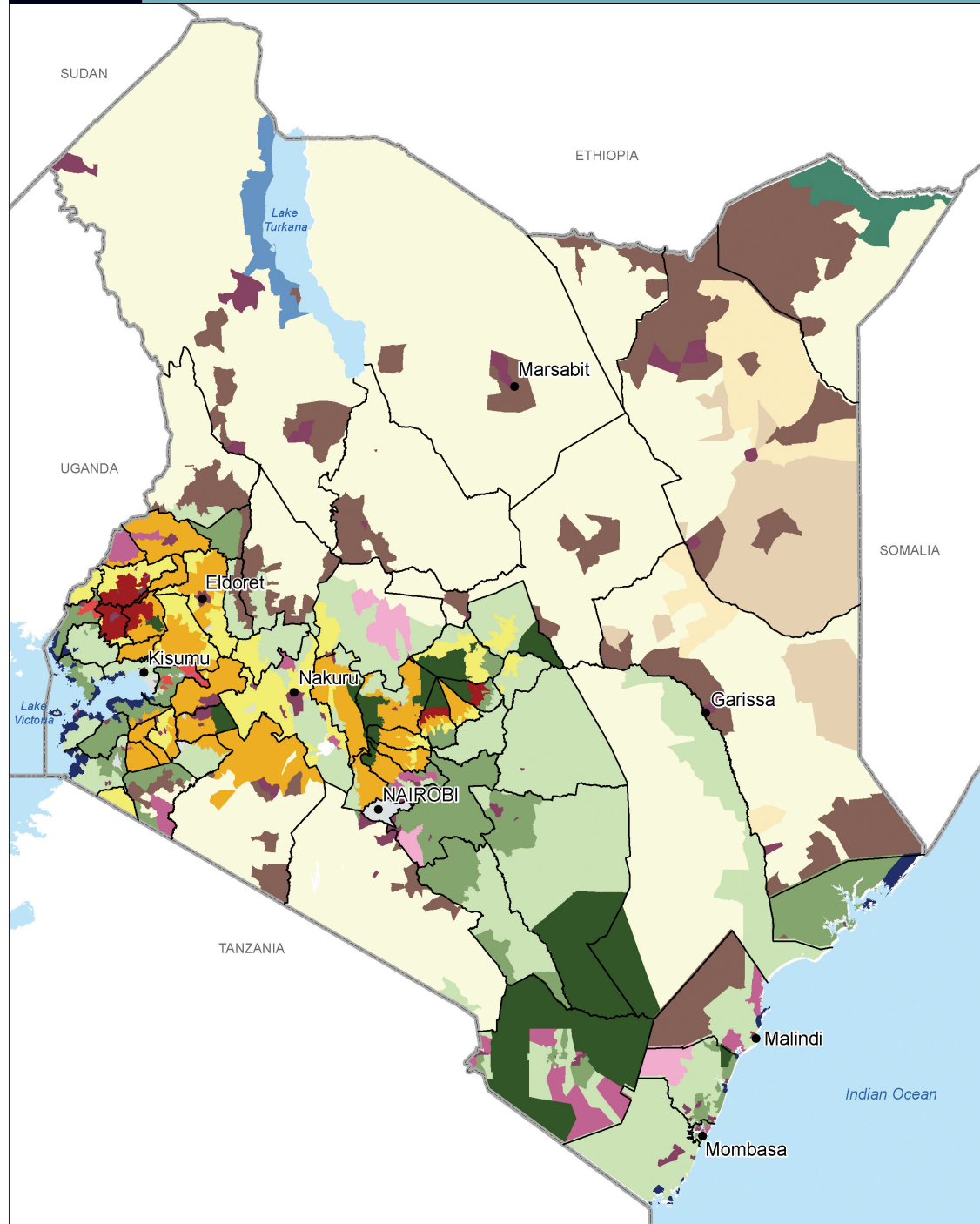
on livestock products such as meat and milk in rangeland ecosystems, to a mix of livestock, food, and cash crops in areas with adequate rainfall and soils. In some areas of the country, fishing, hunting, and gathering are all important sources of food and livelihoods—typically in forest, rangeland, and freshwater ecosystems. In urban ecosystems, a large percentage of households rely on wages and other income sources to purchase food, but agriculture still plays an important role in the daily activities of many urban families (see Box 4.1).

While subsistence food production is still widespread in Kenya, most households attempt to diversify their food and income sources. A recent survey covering each Sublocation across Kenya asked experts to describe the predominant strategies for obtaining food, clothes, and shelter for the majority of families in that Sublocation (ALRMP et al. 2006). Map 4.1 organizes these data into major livelihood zones, which are grouped into six broad classes reflecting various levels of ecosystem modification and net returns to land and labor:

- ▶ Forests or mixed fishing;
- ▶ Pastoral or agropastoral;
- ▶ Marginal mixed farming;
- ▶ High-potential mixed farming;
- ▶ Cash cropping or irrigated cropping;
- ▶ Wage labor or urban livelihoods.

Map 4.1

Predominant Livelihood Strategies Pursued by Households, 2003-05



Sources: Administrative boundaries (CBS 2003), cities (SoK and ILRI 2000), water bodies (FAO 2000), and livelihood zones (ALRMP et al. 2006).

In most of Kenya's arid and semi-arid areas, pastoral livelihood strategies dominate. This involves moving live-stock periodically to follow the seasonal supply of water and feed. Depending on the availability of water, feed, and capital, families may choose certain mixes of species, as in areas close to Somalia where mixed herds of goats and sheep are common. Cropping combined with pastoral livestock raising (agropastoral strategies) are clustered along the margins where rainfed agriculture is possible and around more permanent water sources such as the mountains close to Marsabit and along the Tana River near Garissa. They are often close to trading and market centers (shaded in dark purple), which provide some employment and wage opportunities.

In the majority of central and western Kenya, high-potential agricultural lands are dominated by a mix of dairy cattle, food, and cash crops (shaded yellow and orange). Mixed farming along the shores of Lake Victoria, in the croplands east and southeast of Nairobi, and in the coastal hinterlands is more marginal (shown in two shades of green). In many of these areas, rainfall is more erratic or soils are less fertile. Here, yields and incomes coming from a mix of livestock and food crops are generally lower.

Fishing, sometimes combined with pastoral livestock raising or food crop cultivation (shown in different shades of blue), is much more localized. It is the dominant livelihood strategy for communities along the shores of Lake Victoria, Lake Turkana, and the Indian Ocean.

In some areas, the link from ecosystems to livelihoods is more indirect. Families in the rangelands northwest of Mount Kenya (Laikipia District), for example, depend more on casual wage labor on large ranches (shown in pink); in parts of the coastal hinterlands, plantation labor, mining, and other wage labor are important (shown in dark pink).

Note: Data on livelihood zones are based on questionnaires sent to key food security experts in all 71 Districts (generally about 6-10 persons). In some cases where further clarification was necessary, questionnaires were sent to experts below District level (Division). This group of experts classified each of Kenya's 6,632 Sublocations by their predominant livelihood strategy and other livelihood characteristics.

FORESTS OR MIXED FISHING

- Large protected area or forest
- Fishing and pastoral
- Fishing and food crops

PASTORAL OR AGROPASTORAL

- Pastoral (all species)
- Pastoral (sheep and goats)
- Pastoral (cattle, sheep, and goats)
- Agropastoral

MIXED FARMING - MARGINAL

- Food crops and livestock
- Food crops, cash crops, and livestock

MIXED FARMING - HIGH POTENTIAL

- Food crops and livestock
- Food crops, cash crops, and livestock

CASH CROPPING OR IRRIGATED CROPPING

- Cash cropping - low potential
- Cash cropping - high potential
- Irrigated cropping

WAGED LABOR OR URBAN LIVELIHOODS

- Casual waged labor (ranching)
- Casual waged labor (plantation, mining, and others)
- Trade business, and employment centers
- Urban centers

OTHER FEATURES

- District boundaries
- Water bodies

Box 4.1 Urban and Periurban Agriculture

Urban agriculture went unnoticed until the 1980s, when the first pieces of research revealed startling numbers. In Kenya, one third of urban dwellers were growing subsistence crops and raising livestock, and two thirds were farming in either urban or rural areas, or both. The numbers in the rest of East Africa were the same or higher (Urban Harvest 2004).

Agriculture is a major livelihood strategy of the urban poor in their struggle against hunger and poverty. Studies in Kenya have since confirmed that urban dwellers (particularly women) who grow crops or livestock, feed their children better than those who do not. Some of the major issues surrounding urban and periurban agriculture include the following:

Public health. Municipalities are very worried about the potential public health hazards of urban agriculture. One significant risk is associated with pathogens, toxic chemicals, or heavy metals that are often present in waste water or solid waste used in urban farming. Additional hazards include overuse of agrochemicals in densely populated areas, creation of vector breeding sites, and air pollution. For example, polluted air, largely from petrol fumes, deposits lead in the soil and on the leaves of plants. In addition to heavy metals such as lead, cadmium, and zinc, there are complex organic compounds produced by numerous indoor and outdoor sources in urban areas, including vehicles, industrial emissions, appliances, and woodfuel burning. The urban poor frequently burn plastic and other materials to get rid of waste or even to use as fuel.

Zoonotic diseases. Zoonotic diseases are those that are transmitted between animals and people. Keeping animals allows poor residents to feed their children milk and eggs, but people are not always aware of the health risks of living so close to animals. Households may also know the risks but feel they can't do anything about them. In poor and crowded urban areas—where sanitation systems are often inadequate or missing altogether—livestock diseases can jump to humans. Cysticercosis, an infection caused by the pig tapeworm, is a good example. A person does not have to eat pork or keep pigs to become infected with cysticercosis; poor hygiene, or consumption of contaminated food or water can cause infection if someone accidentally ingests eggs from human tapeworm carriers.

Nutrient cycling. It has been said that the biggest agricultural productivity problem in sub-Saharan Africa is

soil infertility, yet urban areas are vast sinks of nutrients which are being wasted. Nairobi produces 635,000 tons of solid waste in a year, 70 percent of it organic, containing thousands of tons of nitrogen, phosphorus, and potassium. Almost all of this material is wasted, lying in landfills—or worse—blocking up drains. Research shows that less than one half of one percent of urban waste is being composted for agricultural use (Urban Harvest 2004). And by whom? The urban poor.

As for manure, in 2003 Nairobi had 24,000 head of dairy cattle, but virtually none of the manure from these cows was sold. Nairobi does, however, export livestock fodder from urban to rural areas in the dry seasons, when the grass is depleted in the countryside.

Wastewater produced by urban agriculture is similarly nutrient-rich. It is a potentially valuable resource, but can also carry dangerous levels of heavy metals. The goal is to find water-management systems that can help farmers to safely use the nutrients in wastewater while preventing the heavy metals from making their way into food.



Pigs in Kibera, Nairobi. Raising pigs in the urban environment poses a serious risk of spreading the pig tapeworm to nearby human residents.



Cattle in Soweto-Kahawa, Nairobi. Some livestock in Nairobi slums are well looked after and stall-fed on urban-grown napier grass. This photo was taken in Soweto-Kahawa, where manure and compost from domestic waste are also cleaned up and recycled for crop growing.

Importance of the Agriculture and Food Sector

The agricultural sector, which includes livestock products and food and nonfood crops, is the dominant source of food and livelihoods in Kenya. In 2004, it contributed 26 percent of Kenya's gross domestic product (53 percent, if indirect links to other economic sectors are counted), 60 percent of total export earnings, 45 percent of government revenue, and 62 percent of jobs in the formal economy. Accounting for employment in the informal sector, the share of Kenyans depending on agricultural resources for their livelihoods rises to almost 80 percent (RoK 2006; CBS 2004, 2005). These official figures do not include the value of food that is hunted or gathered, nor do they value products such as animal blood that are part of pastoralists' diets.

Recent surveys of smallholder farming households throughout Kenya highlighted the following trends in the food sector (Jayne et al. 2000):

- ▶ **Diversification.** Incomes and livelihood strategies of rural farm households are highly diversified. Maize accounts for only 14 percent of total household income, on average, and does not exceed one quarter of total income, even in the highly productive maize areas of the northern Rift Valley. Other crops such as tea, vegetables, fruits, sugarcane, coffee, and root crops generally account for more than 20 percent of household income. Households that have traditionally relied solely on livestock for their livelihoods are also diversifying into cropping and other income-earning activities (Kristjanson et al. 2002).
- ▶ **Importance of non-farm and non-land income.** Smallholders currently derive between 25 and 70 percent of their income from non-farm sources, such as wage labor. Small rural farms in Kenya no longer rely mostly on cereal crops for their livelihoods. Similar trends are being seen in more remote areas that were traditionally pastoral and would now be considered agropastoral.

- ▶ **Small farm sizes.** Farm sizes have been declining with increased population pressure, from 0.53 hectares per farmer in 1960, to 0.20 hectares—less than half as much—in 2000 (FAO 2006, as cited in Jayne et al. 2000). This has made it much less viable to earn a living from crops with a low value per hectare.
- ▶ **Importance of cash crops.** Crops with the highest net returns to land and labor vary widely across Kenya, but generally tend to be those grown solely for cash income—horticultural crops, sugar, tea, and coffee. The exceptions are a few high-potential maize areas that include Trans Nzoia and Uasin Gishu in the North Rift Valley, where maize—not typically grown for export—is an important cash crop.
- ▶ **Most households must rely on the market for food security.** Most rural smallholders outside the “grain basket” of Rift Valley and Western Provinces, even in the high-potential agricultural zones, are net buyers of maize throughout the year. While almost all rural households grow maize to help feed their families, it is typically insufficient to meet their requirements, and households must use income earned from livestock, cash crops, or off-farm sources to purchase most of the maize they consume.

Croplands

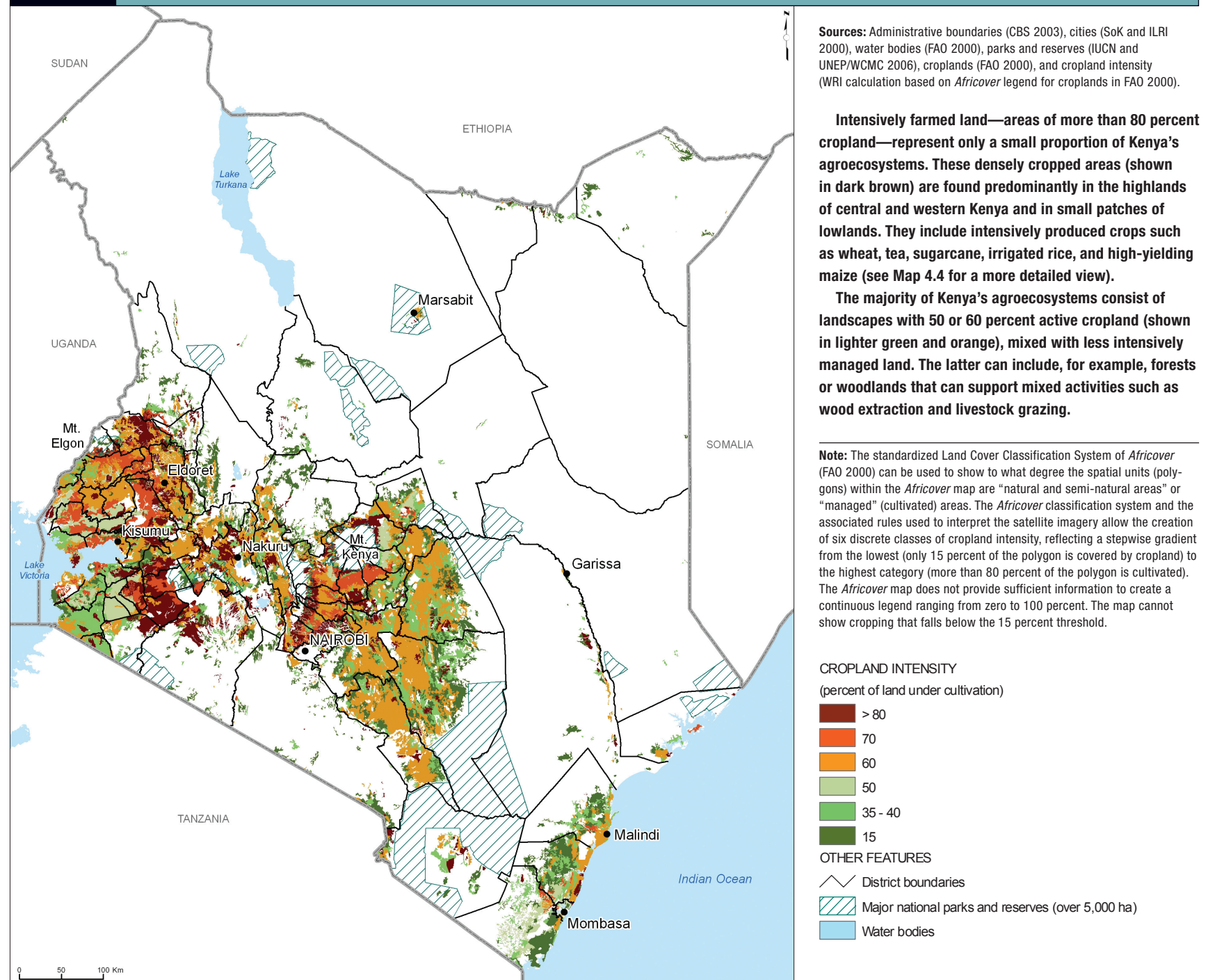
Croplands are the primary source of food and livelihoods for the majority of Kenyans. Kenyan landscapes where cropping is present can be roughly divided into agropastoral areas, cropland-dominated areas, and urban and periurban areas. Agricultural activities are carried out in parts of all of these areas, but the intensity, type, and location of crops varies within and between them. Since most Kenyan farming relies exclusively on rainfall, the spatial extent of croplands is closely linked to the country's annual and seasonal rainfall patterns (see Maps 3.1 to 3.5 in Chapter 3). Kenya's croplands are concentrated in the higher and more reliable rainfall zones (the highlands, Lake Victoria basin, and a narrow coastal strip) and in areas adjacent to year-round freshwater sources such as the lower Tana River. Farming intensity, or the percentage of land under cultivation,

varies significantly across Kenya, with the areas of highest rainfall and soil quality being able to support the highest percentages of cropland (Map 4.2).

At a national level, the total area under cultivation continues to increase, although at slower rates (FAO 2006). At a more local scale, this expansion includes new cropping in degazetted forest lands (Matiru 1999), conversion of “wetter” rangelands in Narok and Trans Mara Districts (Serneels and Lambin 2001; Lamprey and Reid 2004; Norton-Griffiths et al. in press), and fast growth of horticultural crops, such as fruits and vegetables. In the last 20 years, the greatest sustained growth in farm area expansion has been in crops with relatively high value per unit of land. This includes horticultural crops, sugarcane, and until recently, tea (Jayne et al. 2000).

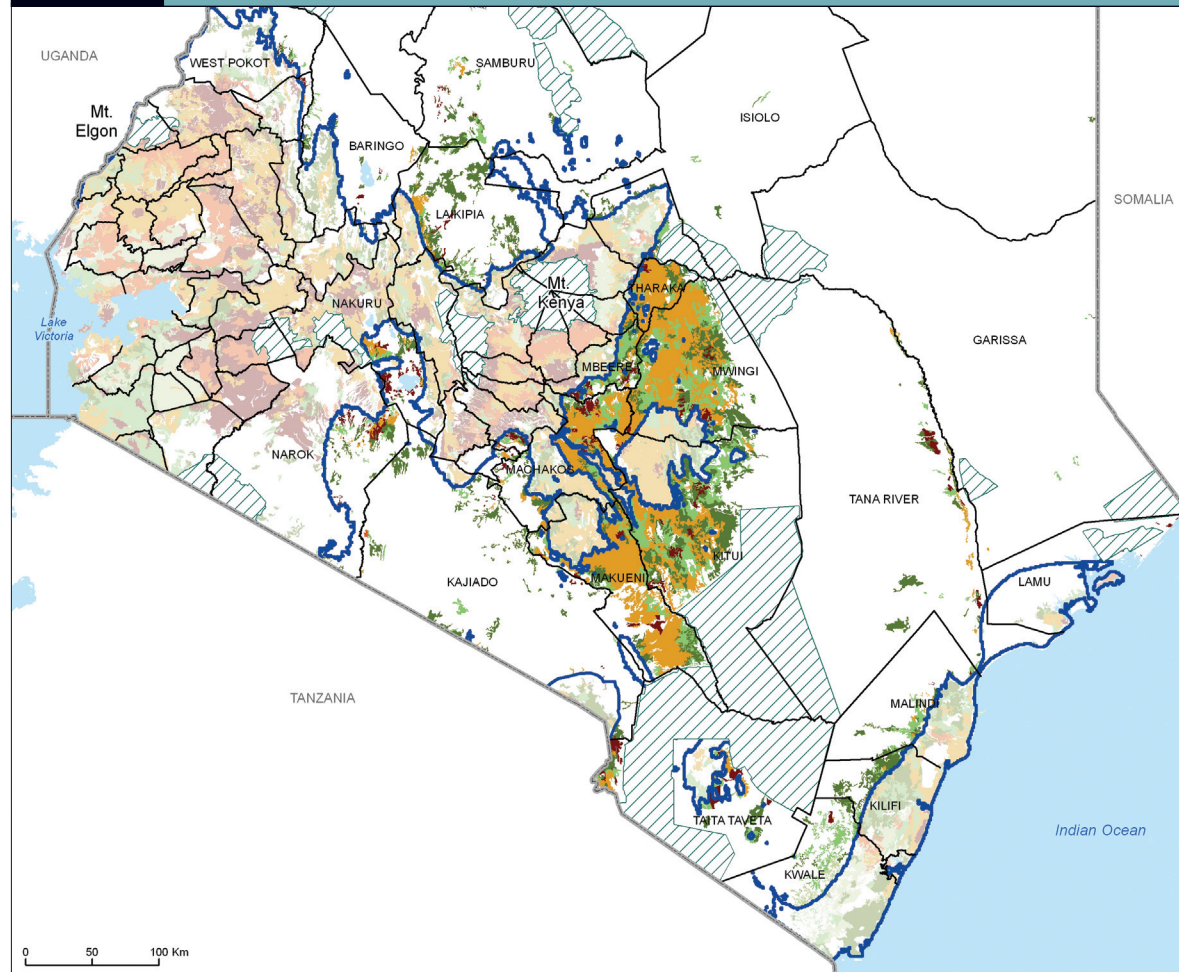
Anecdotal evidence suggests that some of the crop expansion is into marginal lands where there is a high risk of crop failure because of low and variable rainfall levels. A significant proportion of Kenya's cropland is already planted each year in areas with a high likelihood of insufficient rains. Map 4.3 approximates these areas by delineating croplands that receive less than 800 millimeters of rainfall a year. In most low-rainfall areas, households rely upon a combination of mixed crops, livestock rearing, and other activities for their livelihoods. However, they still remain highly reliant upon the weather. Farmers in Kitui, Makueni, and Mwingi Districts, for example, are greatly dependent upon the second rainy season (the “short rains”) to ensure they harvest at least one crop per year.

Map 4.2 Intensity of Cultivation, 2000



Map 4.3

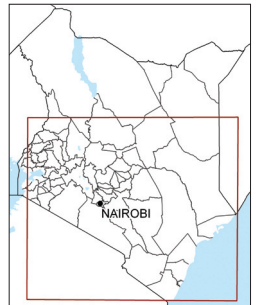
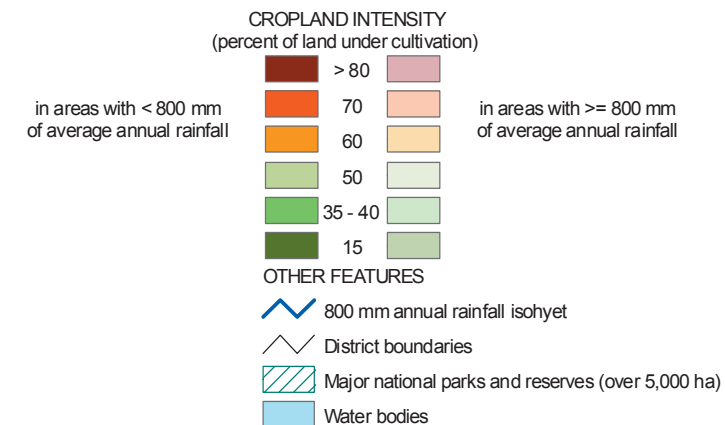
Intensity of Cultivation in Low-Rainfall Areas, 2000



Sources: Administrative boundaries (CBS 2003), cities (SoK and ILRI 2000), water bodies (FAO 2000), parks and reserves (IUCN and UNEP/WCMC 2006), 800 millimeter average annual isohyet (Hijmans et al. 2005), croplands (FAO 2000), and cropland intensity (WRI calculation based on *Africover* legend for croplands in FAO 2000).

Kenya's croplands can be delineated into areas that receive, on average, less than 800 millimeters of rain per year (shown in brightly colored zones) and those with higher annual rainfall (shown in faded colors). Annual rainfall of 800 millimeters, evenly distributed across the year, is sufficient to grow maize. The risk of crop failure increases, however, when this amount is split over two rainy seasons separated by a longer period with very little rainfall (bimodal rainfall patterns). With the exception of Rift Valley and the western highlands, maize is grown in two distinct seasons—the “short” and the “long” rain seasons. Most of the areas with less than 800 millimeters of rainfall are in Kitui, Makueni, Mwingi, and the lower Machakos Districts. They also include the cropland-rangeland boundaries in Samburu and Laikipia Districts and the coastal hinterlands of Malindi, Kilifi, and Kwale Districts.

Note: See note for Map 4.2.



FOOD CROPS: MAJOR SUPPLY AREAS

The following section looks at major patterns and trends in agriculture as a food source in Kenya. While the majority of agricultural land is dedicated to food production—maize, in particular, is grown on a wide scale—food crops do not occupy all cropland in Kenya. In conjunction with some of the earlier maps, planners can look at where food crops are being grown, under what rainfall conditions, and the percentage of cropland they cover. While Kenyans generally grow both food and cash crops on all croplands with sufficient rainfall, there are a few locations where cash crops are dominant, occupying more than 75 percent of the cropland in that area. In the hills below the Aberdare Range and Mount Kenya, for example, tea and coffee dominate. Tea is the predominant crop in agroecosystems in selected areas further west as well, such as Bomet, Buret, Kericho, and Nyamira Districts.

This section also looks at what types of food Kenyans are growing, and what the trends in production have been—in terms of both crop area and yield—for the major food crops over the past 15–20 years. Maize is a staple crop in Kenya, primarily as a food source and to a lesser extent for household income. The graphs present trends in maize production and the locations of high output. Despite increases in crop area and demand that has risen with population growth, yields have been declining in recent years, leading to an increasing reliance on imported maize. Finally, Box 4.1 briefly examines some of the major issues surrounding the important and often underestimated role played by urban and periurban agriculture.

Food Cropping in Central and Western Kenya

Kenyan government agencies collect detailed data on areas regularly planted with maize and other crops; this chapter highlights the degree to which farmers' crops are oriented toward food and nonfood production in central and western Kenya.

Nonfood crops, sometimes referred to as cash crops, mainly include tea, coffee, sugarcane, tobacco, and sisal. Map 4.4 depicts the spatial pattern of food and nonfood cropping. The map covers both high-potential production systems (mixed farming systems and cereal-dairy systems in the eastern and western highlands) and more marginal cropping areas, for example, areas in the Districts directly bordering Lake Victoria, and most land in Makueni, Mwingi, Kitui, and southern Machakos Districts.

In the majority of the croplands of central and western Kenya, farmers plant more food than other crops. Areas with little food cropping include the important coffee- and tea-growing areas. Here, special zones were established in 1986 and are now managed by the Kenya Tea Zone and Conservation Corporation. The purpose of these zones is to grow tea, establish intensively managed fire wood plantations (for drying tea), and improve livelihoods, thus creating an area where local communities put less resource pressure on the bordering gazetted forests. Every year the Corporation employs 2,000–10,000 people to harvest tea leaves (SoK 2003).

National Trends of Selected Food Crops

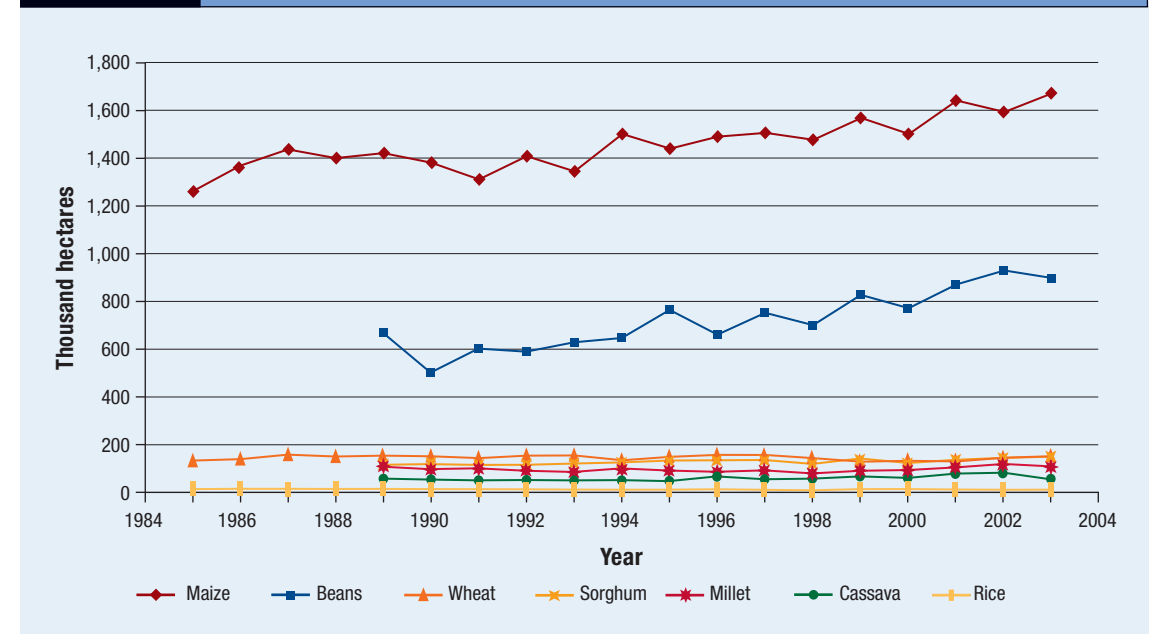
Trends in maize production. In terms of cropped area, maize is Kenya's most important food crop. For a large proportion of the population—both urban and rural—it is also the primary source of calories. Maize consumption is estimated at 98 kilograms per person per year, or around 2.7 to 3.1 million metric tons per year. The crop accounts for roughly 25 percent of gross farm output from the small-scale farming sector (Nyoro et al. 2004).

While most smallholder farms produce some maize for home consumption, maize that reaches the commercial market comes mostly from large-scale farms (the top 10 percent of farms in terms of size). These large commercial farms produce over 80 percent of the domestically marketed maize in Kenya (Jayne et al. 2000). Although the remaining 20 percent comes from smallholder farms, only a small proportion of these farms actually send much maize to the marketplace. Thus, Kenya's marketed maize output comes from a relatively small portion of the total farm population.

Figures 4.1 and 4.2 look at trends over the past two decades in areas planted and production levels of maize and other major crops in Kenya. In terms of quantity, Kenya's maize production peaked during the mid- to late-1980s, and has since stagnated due to declining yields. From 1985–2003, maize output fluctuated between 1.7 and 3.0 million tons per year, with an average of 2.5 million tons over the period. Maize is planted throughout the country, from high-yielding areas to riskier, semi-arid zones. Yields vary dramatically, from around 500 kilograms per hectare in semi-arid areas to greater than 2,500 kilograms per hectare in the high-potential maize zone (De Groote et al. 2005). Low-potential areas include Ka-

jiado, Makueni, and Mwingi Districts; parts of Meru; and parts of Machakos. The high-potential maize zone includes the Districts of Trans-Nzoia, Uasin Gishu, Bomet, Nakuru, Bungoma, Lugari, Nandi, Kericho, and highland areas of Kakamega. Even in high-potential areas, yields are typically very low, with little or no chemical fertilizers applied. Indeed, there may be more appropriate crops to plant that could increase both food security and profitability. However, the decision to grow maize for food reflects national consumption and dietary patterns that have been established over decades. If a shift in the choice of crops does occur, it will likely be a gradual change.

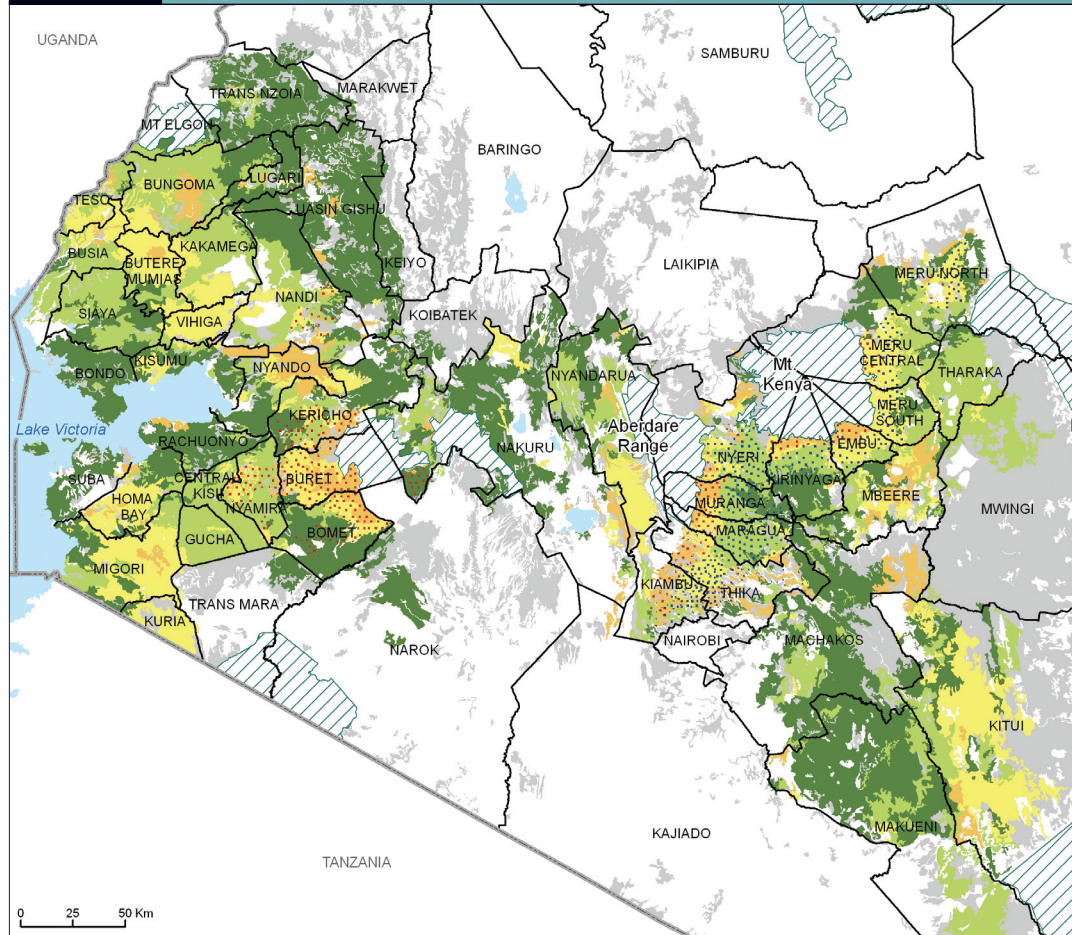
Figure 4.1 Area under Selected Food Crops, 1985 – 2003



Sources: CBS (1986, 1995, 2001, and 2005) and FAO (2006).

In 2003, maize covered the largest share of Kenya's croplands, with a harvested area of 1.67 million hectares. This was an increase from around 1.25 million hectares in 1985. Beans were second in area with 0.89 million hectares in 2003. Wheat and sorghum covered around 150,000 hectares each, followed by 108,000 hectares of millet. Cassava stood at 50,000 hectares and irrigated rice at 10,000 hectares for the same year. While the area under cassava and sorghum has grown slightly, the area under wheat and millet has remained more or less the same over the period. The total area planted with rice—a fairly minor cereal crop in Kenya—decreased by 25 percent. It has since increased after expansion in coastal Districts and rehabilitation of rice schemes around Lake Victoria (Mutunga 2006).

Map 4.4 Food Crops as Percentage of all Cropland in Central and Western Kenya, 1997

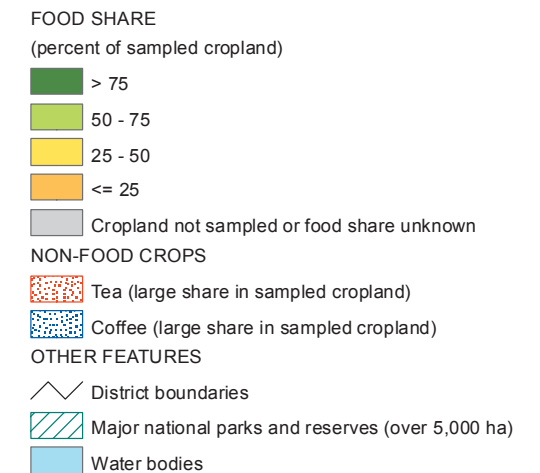


Sources: Administrative boundaries (CBS 2003), water bodies (FAO 2000), parks and reserves (IUCN and UNEP/WCMC 2006), cropland areas (FAO 2000), and percentage food crops in sampled croplands (WRI calculation based on ICRAF and DRSRS 2001).

This map depicts the share of cropland that is dedicated to food crops, irrespective of the overall cropland intensity shown in Map 4.2. By using only two categories (food and nonfood) and grouping the data into four broad data ranges, the map is relatively robust to the seasonal changes in specific crop choices caused by differences in rainfall, prices, demand, and labor availability.

Spatial patterns of food cropping do not necessarily mirror those of cropland intensity. Areas where more than 75 percent of farmers' cropland is dedicated to food crops (shown in dark green) are concentrated in high-potential Districts such as Trans Nzoia, Uasin Gishu, Lugari, upper Nandi, and Nakuru (maize and other cereals); Narok (wheat); and lower Kirinyaga (rice). High food-crop shares also occur in more marginal cropping areas such as the Districts bordering Lake Victoria and large parts of Machakos and Makeni Districts (but here low-yielding maize is the major contributor).

The lowest shares of food crops (25 percent, shaded in orange) cover the tea-growing areas (depicted by clusters of red points) along the Aberdare Range; Mount Kenya; and parts of eastern Bomet, Buret, Kericho, and Nyamira Districts. Areas with a food share of 25-50 percent (shown in yellow) include the coffee-growing zones of the Aberdare Range and Mount Kenya in Central Province (shown with clusters of dark blue points). In the west, for example, in Siaya, Kakamega, and Migori Districts, low shares of food crops are typically paired with sugarcane or tobacco crops. Areas with low shares of food crops (shown in yellow and orange) in Kitui District may be temporary, reflecting large shares of fallow cropland during the 1997 season of the aerial surveys.



Note: The map combines detailed crop information from 5,747 aerial photos for a growing season in 1997, each providing a sample point of detailed crop information. These samples are averaged to spatial units (polygons) of croplands from Kenya's most recent land-cover map (FAO 2000).

With a growing gap between production and consumption, maize imports have become increasingly important. Kenya went from being a net exporter of maize from 1986-87 through 1990-91, to a significant net importer from 1997-98 to present. Imports have ranged from 75,000 to 1.1 million metric tons per year, the latter number reflecting high demand because of drought-related crop failure (Nyoro et al. 2004). These official figures, however, do not include the considerable percentage of the maize trade that happens informally. Unrecorded

dealings with Kenya's neighboring countries—especially imports from Uganda, and to some extent from Tanzania—are estimated to have been as high as 150,000 tons per year in the early 1990s.

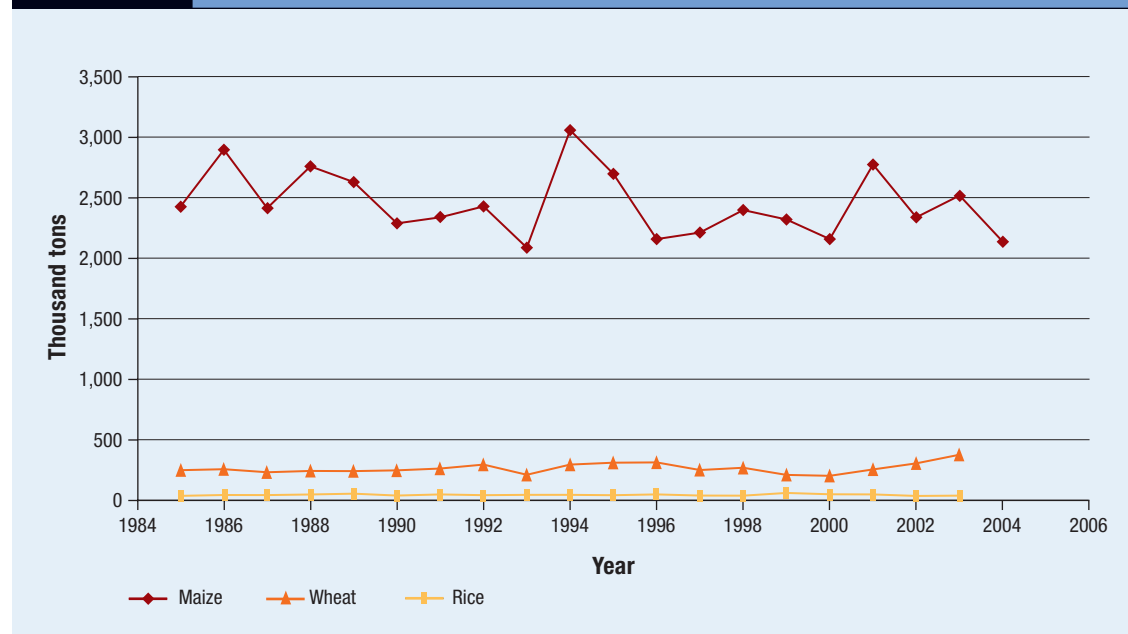
Trends in horticulture. Fruits and vegetables are important for both consumption and income in many rural households across Kenya. These crops have a relatively high value per unit of land, and have witnessed a great expansion in farm area over the past decade. In 2003, horticultural production of fruits (primarily mangoes, papayas, bananas, passion

fruits, pineapples, oranges, coconuts, and macadamia nuts) and vegetables (kale, cabbage, carrots, tomatoes, avocados, French beans, and indigenous vegetables) together covered an area of about 250,000 hectares (Figure 4.3).

Between 1989 and 2003, the area under vegetables and fruit crops grew by about a third. Growth in output and value were also significant over this period. This is also reflected in the export statistics, which have shown tremendous growth in the last decade. However, over 90 percent of all fruit

and vegetables produced during this period were consumed domestically. While most smallholders across Kenya (with the exception of arid regions) produce horticultural products, fewer than 2 percent of them produce for the export market, and Kenya exports little produce to regional markets (Muendo et al. 2004).

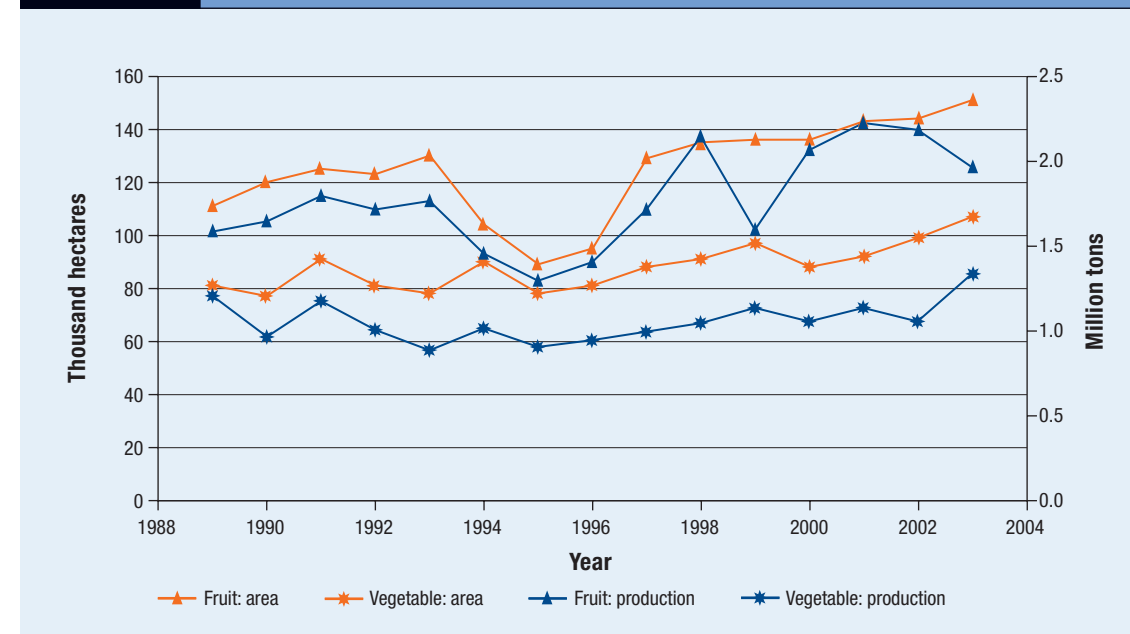
Figure 4.2 National Production of Maize, Wheat, and Rice, 1985 – 2004



Sources: CBS (1986, 1995, 2001, and 2005) and FAO (2006).

While the total area under maize cultivation in Kenya has slowly but steadily increased, total maize production has stagnated. Yields have declined from 1.84 tons per hectare in the 1985-1990 period, to 1.71 tons in the 1990-1995 period, to 1.58 tons per hectare in the 1996-2004 period (Nyoro et al. 2004). Wheat and rice production data show no major changes in yields over the past decade. The trend line of total output parallels that of the area estimates.

Figure 4.3 National Production of and Area under Fruit and Vegetables, 1989 – 2003



Sources: CBS (1986, 1995, 2001, and 2005)

Between 1989 and 2003, the area of cropland under fruit production increased from 110,000 hectares to around 150,000 hectares, with a slight dip between 1993 and 1997. Vegetable production followed a similar trend, increasing from around 80,000 hectares in 1989 to over 100,000 hectares in 2003. Fruit and vegetable production data in million tons generally echo these area trends.

LIVESTOCK PRODUCTS

Livestock play a part in the livelihoods of Kenyans in almost every corner of the country. In the large sections of the country too dry to support much agriculture, pastoral households rely extensively on livestock for their living. In the more central areas, where dairy cattle can be kept alongside more intensive cropping, milk production is one of the most important livestock-related activities. Milk is also a critically important commodity from a health and nutrition standpoint. Maps 4.5 and 4.6 examine the levels of milk production in areas of central and western Kenya, showing where those levels exceed or are insufficient to meet the needs of current population levels.

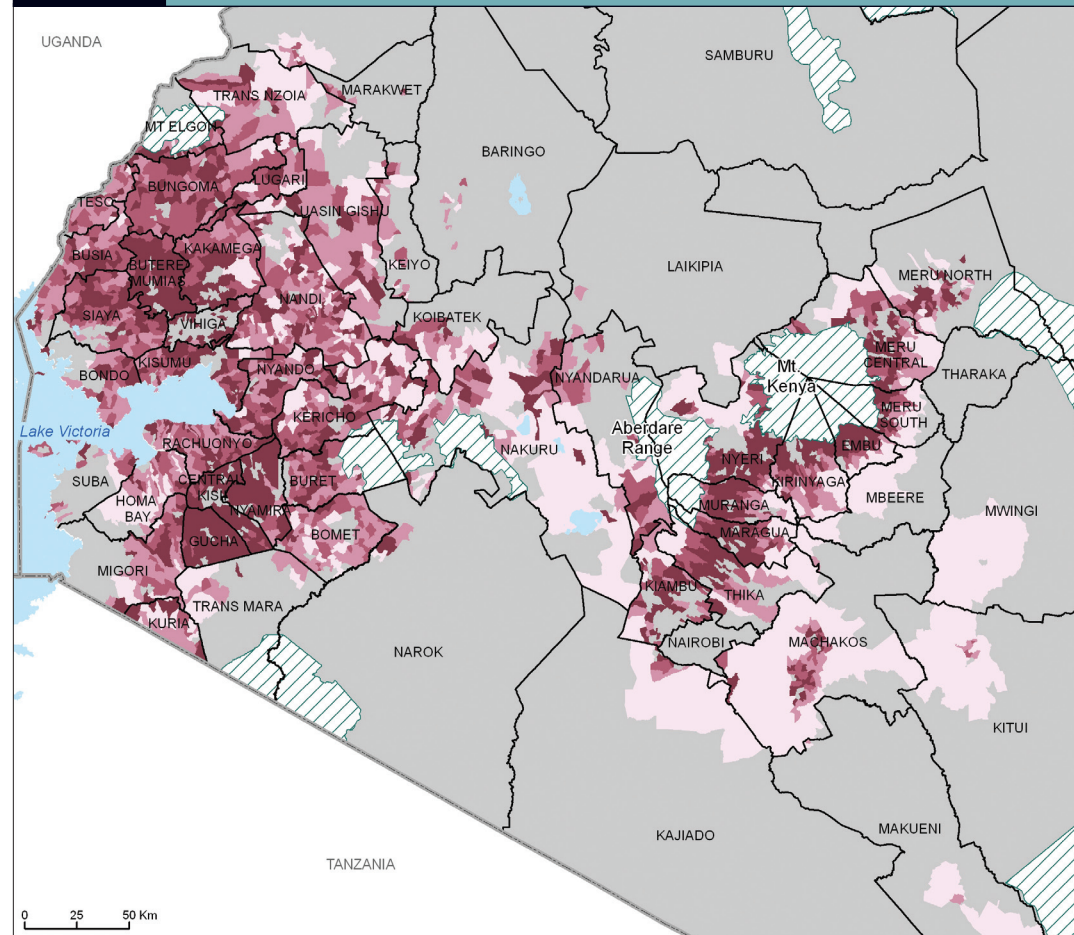
In the rangelands, livestock products contribute to most areas of household life. They provide multiple sources of food, are the major source of cash income in many areas, and serve as the primary source of savings for most pastoral households. Maps can be used to identify places where livestock production plays an especially important role. Maps 4.7 and 4.8 portray livestock densities and the share of cash income that livestock contributes.

Dairy in Central and Western Kenya

In a country where starches form the bulk of people's diets, milk is an especially important food. It is a source of high quality protein and micronutrients generally lacking in cereal-based diets, and is particularly important for children and child-bearing women. Kenyans love milk; they consume more of it than almost anyone else in the developing world. On average, each Kenyan drinks about 100 liters of milk a year, four times the average for sub-Saharan Africa (Staal 2004a).

Map 4.5

Milk Production per Square Kilometer in Central and Western Kenya, 2005

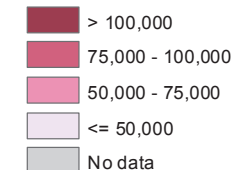


Sources: Administrative boundaries (CBS 2003), water bodies (FAO 2000), parks and reserves (IUCN and UNEP/WCMC 2006), and milk production per square kilometer (Baltenweck et al. 2005).

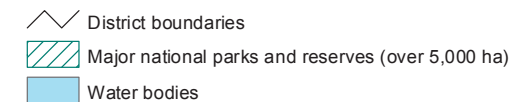
The output of milk, measured by the density of milk production (liters per square kilometer), varies across the highland and western regions. The highest densities (more than 100,000 liters per square kilometer per year) can be seen in the densely settled and farmed foothills east of the Aberdare Range and south and southeast of Mount Kenya. Similar high production densities are found in Gucha, Central Kisii, and Nyamira Districts, as well as in Butere-Mumias District. The drier lowland areas of Mbeere, Mwingi, Machakos, and Makueni Districts have lower outputs per square kilometer.



MILK PRODUCTION
(liters per sq. km per year)



OTHER FEATURES

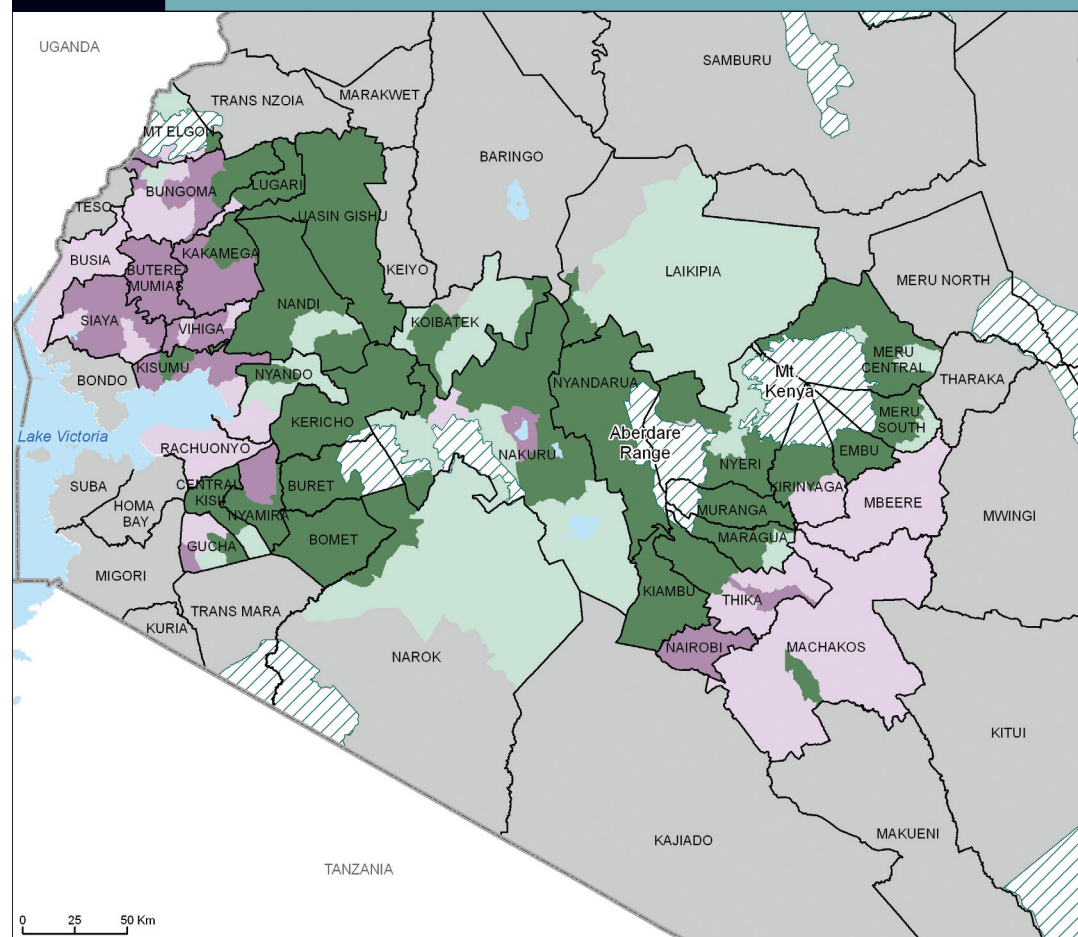


One million people are supported by the dairy sector in Kenya. There are over 600,000 dairy-producing households, the majority of which are smallholder farmers. These households generate an estimated 365,000 wage-paying jobs in addition to the family labor involved (Staal 2004b). An additional 40,000 people make a living transporting, selling, and processing milk, and providing farmers with fodder and other inputs.

Small-scale milk production has been found to be highly efficient: dairy smallholdings in Brazil, Kenya, and India sometimes earn higher profits per liter than larger farms (Delgado et al. 2003; Steve et al. 2006). In addition, dairy cattle enhance smallholder crop farming systems throughout Kenya: their manure adds nutrients to the soil, maintaining fertility and boosting crop yields.

This section looks at milk production in the central and western regions of Kenya, and at the existence of milk “surpluses” and “deficits” in these regions. Calculations of milk production (Map 4.5) were done by assessing the number of dairy cattle in an administrative area, and extrapolating out liters of milk per area. Demand for milk was calculated simply by estimating the milk needs per person, and applying that number to the population density of each area. Areas with more milk produced than needed by the population are considered “surplus” areas, while those with more demand than can be met by current production are considered to be in “deficit” (Map 4.6). Many areas of the country produce more milk than they need locally. Hence, establishing good transportation and marketing systems for dairy could go a long way toward increasing the availability of milk in deficit areas.

Map 4.6 Milk Surplus and Deficit Areas in Central and Western Kenya, 1997



Sources: Administrative boundaries (CBS 2003), water bodies (FAO 2000), parks and reserves (IUCN and UNEP/WCMC 2006), and milk surplus and deficit areas (Baltenweck et al. 2005).

There are many areas of Kenya—particularly in the central highlands and Rift Valley—that produce more milk than they need locally. Milk surpluses are more closely related to population than production levels. Nakuru District has large sections with milk surpluses (shown in light and darker green), despite having generally lower levels of production per unit area. Areas north of Lake Victoria, in Nyanza and Western Provinces, which have high levels of milk output per square kilometer (Map 4.5), do not produce enough milk to meet the needs of the local population. Note that this pattern does not necessarily reflect a high milk output per cow. In many of these areas, milk-producing households are settled densely in a small area, resulting in a high aggregated milk output per square kilometer. For example, many farmers in Siaya and Kisumu Districts rely on low-yielding indigenous breeds. Milk deficits are also found in drier areas such as Machakos and Mbeere Districts, where milk production per unit area is low.



MILK PRODUCTION SURPLUS AND DEFICIT

- High surplus (> 10,000 liters per sq. km per year surplus)
- Slight surplus (<= 10,000 liters per sq. km per year surplus)
- Slight deficit (<= 10,000 liters per sq. km per year deficit)
- High deficit (> 10,000 liters per sq. km per year deficit)
- No data

OTHER FEATURES

- District boundaries
- Major national parks and reserves (over 5,000 ha)
- Water bodies

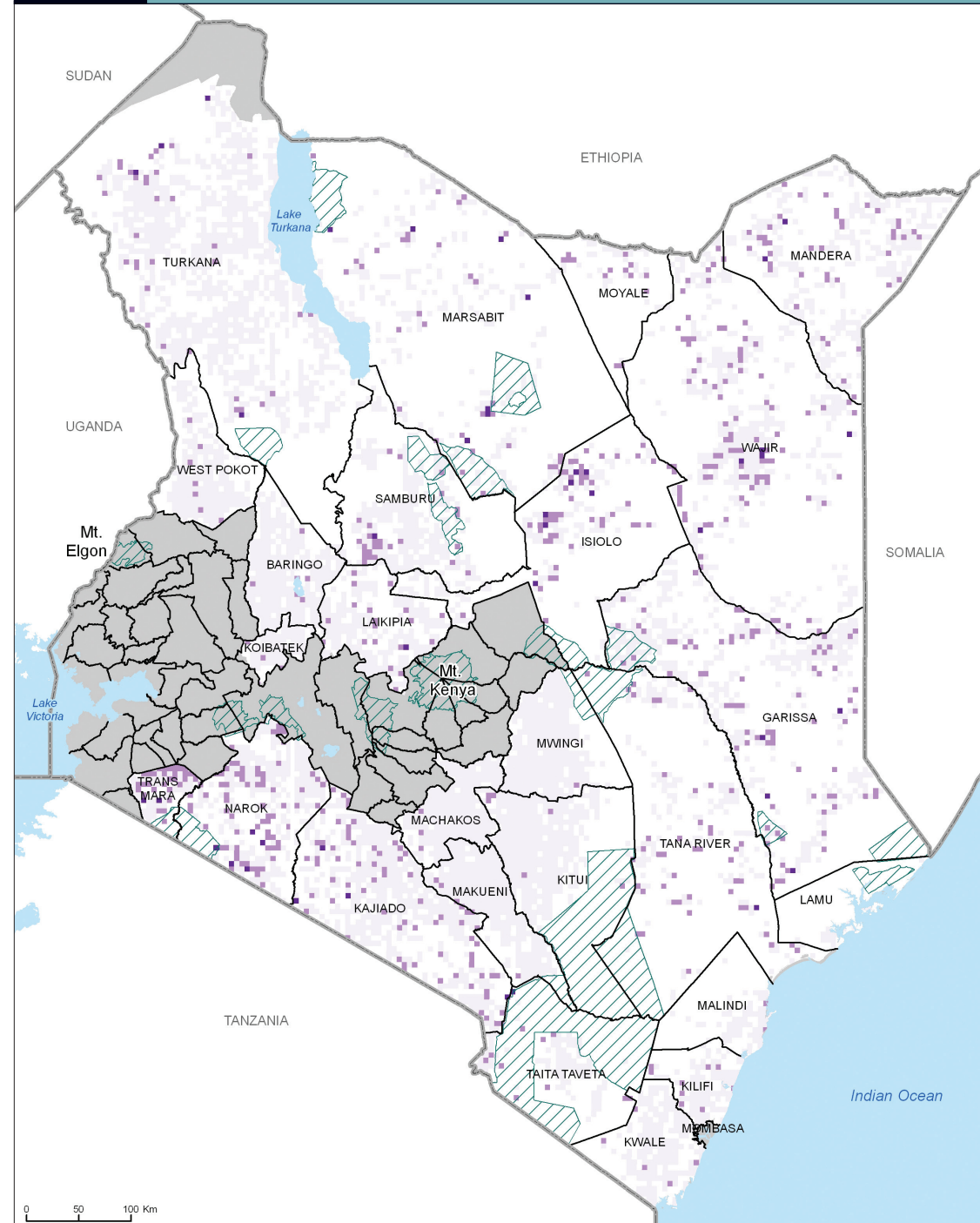
Livestock in the Rangelands

Kenya's semi-arid and arid rangelands cover more than 80 percent of its land area (SoK 2003), corresponding closely to Kenya's lowest human population densities and higher livestock densities. Whereas dairy cattle predominate in the more central areas, the rangelands are primarily pastoral. Camels are an important livestock species in the northern areas, while cattle, sheep, and goats are found throughout the rangelands. In large parts of the drier rangelands, livestock are shifted to follow the availability of fodder and rain. In some parts of the country, these patterns have begun to change with the introduction of fixed water points (see Map 5.8 in Chapter 5 which shows water sources and livestock densities for the northern rangelands).

The maps in this section use two indicators to tell the story of livestock management in Kenya. This section looks first at where in the rangelands livestock are being raised (Map 4.7). Distinct patterns emerge: in parts of the Rift Valley and Districts such as Machakos, Mwingi, and Kitui, low-density livestock rearing occurs, this is spread consistently across the area, overlapping with marginal cropping activity, or—in Turkana, for example—reflecting the presence of fixed water points. In the more arid areas, livestock distribution becomes patchier as pastoral systems take over; people and animals move around more and there is little or no cropping. The other indicator examined is the contribution of livestock to household incomes (Map 4.8). The data on cash income come from “expert opinion” for small administrative areas within each District, giving a sense of the relative importance of different activities and products for livelihoods and subsistence.

Map 4.7

Livestock Density in the Rangelands, 1994-96



Sources: Administrative boundaries (CBS 2003), water bodies (FAO 2000), parks and reserves (IUCN and UNEP/WCMC 2006), and livestock density (ILRI calculation based on DRSRS 2003, Grunblatt et al. 1995, Grunblatt et al. 1996).

The map shows some of the highest livestock densities in Trans Mara and parts of Narok Districts—in rangelands that receive more rainfall and are close to the cropping boundaries for most crops. Livestock can be found throughout most rangelands of West Pokot, Baringo, Machakos, Makueni, Kitui, and Mwingi Districts, and the coastal area in Kwale and Kilifi Districts. Densities are much lower here and represent either marginal croplands or agropastoral areas (Map 4.1).

Note: Species numbers are aggregated (using a *tropical livestock unit* which is equivalent to an animal weight of 250 kilograms) to squares of 5 kilometers by 5 kilometers and then averaged by square kilometer. Livestock includes cattle, sheep, goats, camels, and donkeys that were observed during low-altitude flights.

LIVESTOCK DENSITY

(tropical livestock unit per sq. km)

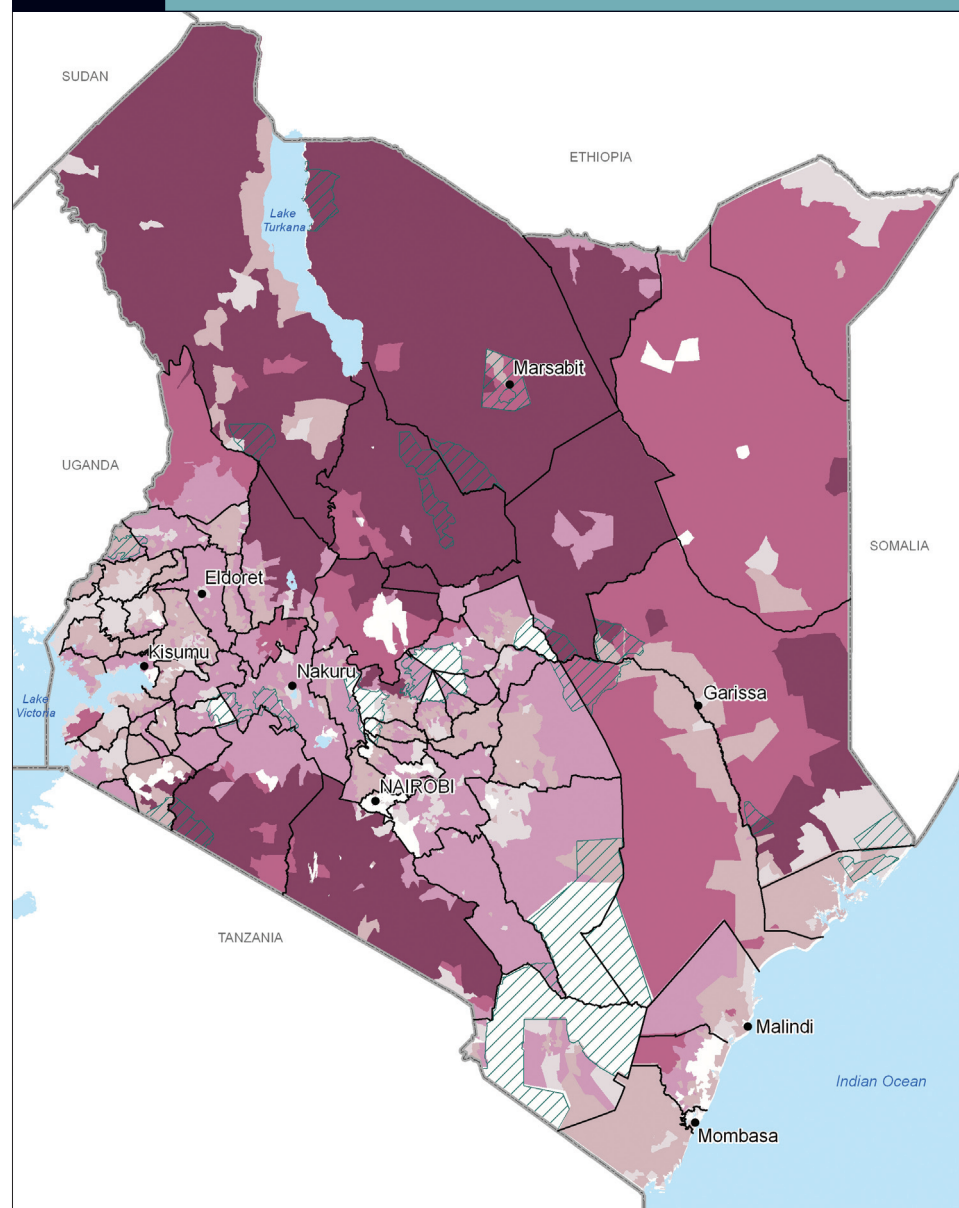
- > 175
- 50 - 175
- 0 - 50
- No observation of animals
- Non-rangeland areas or no data

OTHER FEATURES

- District boundaries
- Major national parks and reserves (over 5,000 ha)
- Water bodies

Livestock provide a range of important products to rural households: meat, milk, and blood are consumed or sold, as are hides and skins. Manure is applied to crops in areas of the rangelands where sufficient water is available for limited cropping; closer to cities, it is also sold. Finally, livestock serve both as a bank account and an insurance strategy in the pastoral rangelands. Herd loss is a major risk factor in these areas. With limited alternative insurance or investment options available, herd accumulation is an important means of managing risk in pastoral households (Gebru and McPeak, 2004).

Map 4.8 Share of Cash Income from Livestock, 2003-05



Sources: Administrative boundaries (CBS 2003), cities (SoK and ILRI 2000), water bodies (FAO 2000), and share of cash income from livestock (ALRMP et al. 2006).

The map indicates that livestock activities play a role almost everywhere in Kenya, but they are a particularly important source of cash income in the drier parts of the country, where there are few other sources of income. Areas where more than 50 percent of cash is from livestock include the semi-arid and arid lands of southern, eastern, northern, and northeastern Kenya. It is also notable that the percentage of total cash income coming from livestock is substantial throughout much of central Kenya, ranging from 25 to 50 percent. Along the coast and around Lake Victoria (areas with very high poverty incidence), livestock generally contribute less than 25 percent of total cash income.

Note: Data on livelihood zones are based on questionnaires sent to key food security experts (generally about 6-10 persons) in each District. In some cases where further clarification was necessary, questionnaires were sent to experts below District level (Division). This group of experts classified each of Kenya's 6,632 Sublocations by their predominant livelihood strategy and other livelihood characteristics including different sources of cash income.

CASH INCOME FROM LIVESTOCK
(percent of total income)

- > 75
- 50 - 75
- 25 - 50
- 10 - 25
- 0 - 10
- No cash income from livestock

OTHER FEATURES

- District boundaries
- Major national parks and reserves (over 5,000 ha)
- Water bodies

FOOD FROM THE WILD

Wild animals and plants are an important source of food and livelihoods in most parts of Kenya. Gathering nuts, fruits, and tubers; collecting honey; and hunting wildlife—including rodents, guinea fowl, and other birds, as well as larger animals such as antelope—remain important to many. These wild resources become particularly critical in times of drought, hunger, or whenever other resources become unreliable.

Case studies and general observations suggest that the use of wild animals and plants is common in the daily lives of many Kenyans, but the magnitude of the harvesting efforts, their importance during different seasons, and their significance to particular groups (very poor households, women, etc.) are less well understood at the national level. Kenya's official statistical system collects information on the quantity and value of its fisheries. Hunting and gathering activities, however, are greatly under-reported because most products are either directly consumed in households or sold through local informal markets. The fact that hunting of most wildlife is illegal accentuates this information deficit.

Understanding the relationship between harvesting rates for fish, wildlife, or plants and the rate at which these ecosystem products are replenished is essential to sustaining their use over the long term. When harvest rates exceed replacement rates, it undermines the capacity of ecosystems to continue to provide these products, thus jeopardizing livelihoods and food security.

The following sections present maps that show where fishing (both from freshwater bodies and the Indian Ocean), and hunting and gathering activities are important. The gathering activities presented in the maps do not solely include food, but also other products such as building materials and traditional medicines, which either provide direct benefits to families or boost cash income.

The maps rely on recent surveys in which experts characterized small administrative areas by the dominant activities contributing to livelihoods and food security of the majority of families in that area (ALRMP et al. 2006). It is a first approximation of where fishing, and hunting and gathering are important for livelihoods. However, reliance on wild animals and plants may be even more significant for certain groups or at certain times, a fact easily masked by the administrative averages shown in the maps.

In almost all areas throughout Kenya, hunting and gathering plays some role in people's livelihoods (see Map 4.11). While other activities such as cropping, raising livestock, fishing, or wage labor may account for a greater share of the day's activities, hunting and gathering can still contribute significantly to a family's cash income, especially in communities located in the arid and semi-arid regions of the country. Even in more crop-dominated Districts, hunting and gathering can contribute as much as 20 to 40 percent of a family's cash income in selected communities.

Fishing is concentrated in communities close to Kenya's major lakes, permanent rivers, and along the Indian Ocean and plays no role in the rest of the country. In some of these communities, it can contribute more than 50 percent of families' cash incomes.

Fishing and Fish Farming

Fish provide an important source of food for Kenyans, particularly along lakes, rivers, and the coast. Map 4.9 highlights areas where fishing makes an important contribution to livelihoods. As seen in Table 4.1, the vast majority (96 percent) of fishing activity in Kenya is freshwater fishing, and most of that occurs on Lake Victoria.

Declining fish stocks are a serious problem for the nearly 40,000 people who fish for a living. Total fish production in the country decreased from 214,712 metric tons in 1999 to 164,261 metric tons in 2001 (MoLFD 2001).

The development of aquaculture, or fish farming, has been fairly stagnant in recent years, but has started to attract renewed interest recently. The Department of Fisheries is actively promoting the transfer of pond management technology from its research farm to interested fish farmers through participatory on-farm trials (MoLFD 2001).

The Kenyan coastal region covers seven Districts, and its territorial waters cover 12 nautical miles. In this area more than 5,400 artisanal fishers operate, largely during the September to March period when the waters are generally calm (MoLFD 2001). The majority of the fishing vessels used are dugout canoes powered by wind, sails, and paddles.

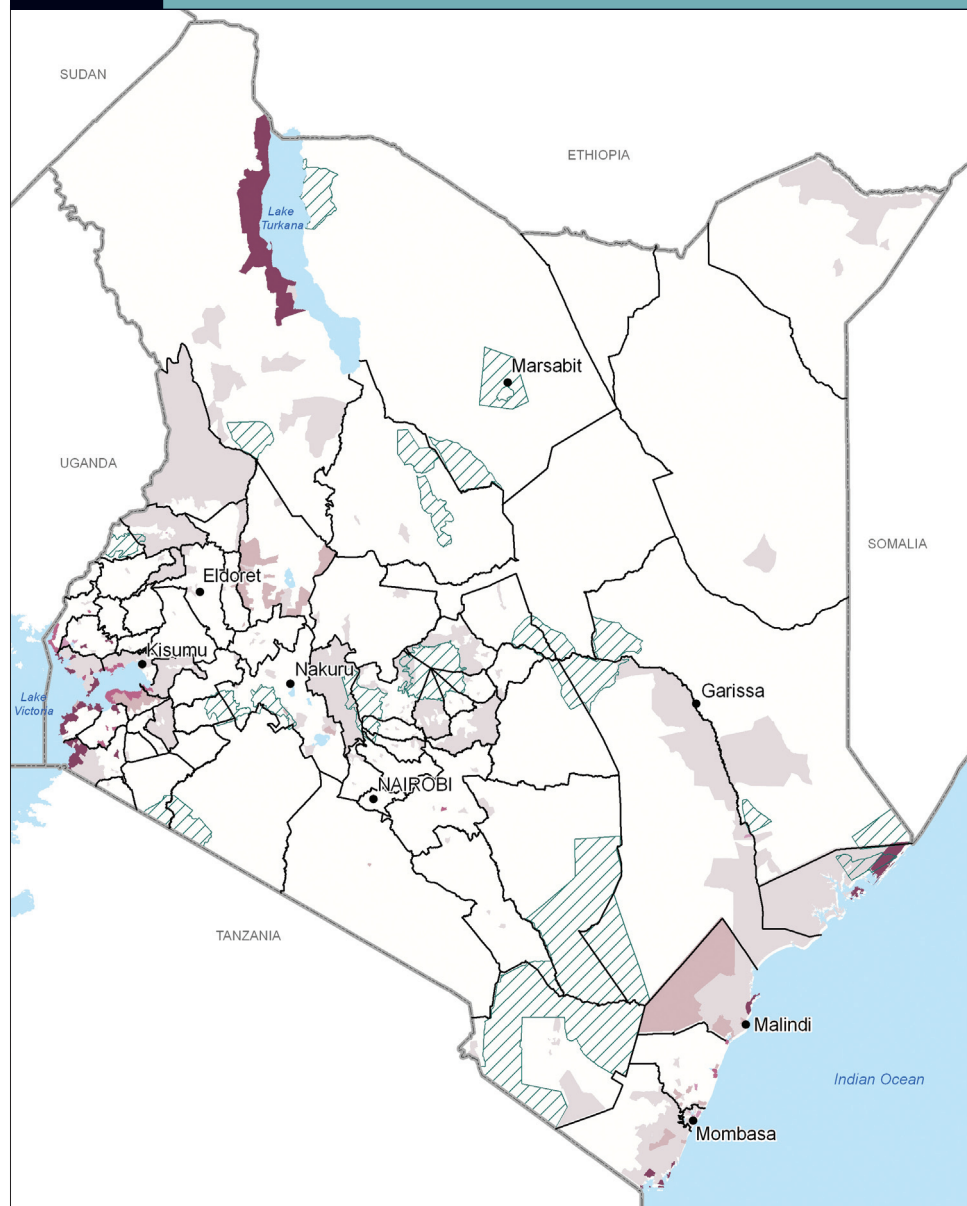
Table 4.1 Fish Landings, Fisherfolk, and Fishing Vessels By Major Supply Area, 2001

	FISH LANDINGS					
SOURCE	QUANTITY		VALUE		FISHERFOLK (NUMBER)	FISHING VESSELS (NUMBER)
	(TONS)	(PERCENT)	(KSH MILLION)	(PERCENT)		
Lake Victoria	151,804	92	7,253.1	92	33,037	10,014
Lake Turkana	3,787	2	49.6	1	234	78
Lake Baringo	117	–	2.9	–	75	25
Lake Jipe	65	–	2.5	–	65	35
Lake Naivasha	5	–	0.3	–	57	19
Tana River Dams	232	–	8.1	–	372	124
Fish Farming	998	1	98.8	1		
Other Areas	802	–	36.6	–		
Total Freshwater	157,810	96	7,452.1	94	33,840	10,295
Marine Fishing	6,451	4	461.9	6	5,463	1,881
TOTAL	164,261	100	7,913.8	100	39,303	12,176

Source: MoLFD (2001).

Note: Total value of all fish landings (Ksh 7.9 billion) equals US\$ 113.1 million (at US\$ 1 = Ksh 70).

Map 4.9 Share of Cash Income from Fishing, 2003-05



Sources: Administrative boundaries (CBS 2003), cities (SoK and ILRI 2000), water bodies (FAO 2000), and share of cash income from livestock (ALRMP et al. 2006).

There are very few areas in Kenya where a substantial amount of income comes from fishing. The areas where it predominates (shown in dark purple) are found along the shores of Lake Victoria south of Kisumu, along the western shore of Lake Turkana, and at marine fishing sites in Malindi and towns further north on the coast. Elsewhere, fishing typically provides less than 10 percent of total cash income. It contributes less than 5 percent of cash income along most of the southeastern coast, with slightly higher levels further inland of Malindi and south of Mombasa.

Note: Data on livelihood zones are based on questionnaires sent to key food security experts (generally about 6-10 persons) in each District. In some cases where further clarification was necessary, questionnaires were sent to experts below District level (Division). This group of experts classified each of Kenya's 6,632 Sublocations by their predominant livelihood strategy and other livelihood characteristics including different sources of cash income.

CASH INCOME FROM FISHING

(percent of total income)

- > 50
- 25 - 50
- 10 - 25
- 5 - 10
- 0 - 5
- No cash income from fishing

OTHER FEATURES

- District boundaries
- Major national parks and reserves (over 5,000 ha)
- Water bodies

Hunting and Gathering

While a minority of Kenya's 72 tribes have always hunted wild animals for food (mostly buffalo, impala, gazelle, giraffe, and monkeys), it appears that illegal hunting of wild animals may be on the increase, and that relatively inexpensive "bushmeat" (selling for around Ksh 80 (\$US 1.14) per kilogram) is now widely available to poor consumers for purchase or barter. The antipoaching staff at the Kenya Wildlife Service reports that as many as 1 million animals are now dying in illegal snares each year, and in the past five years, 48,900 snares were recovered throughout Kenya's protected areas (Pflanz 2005).

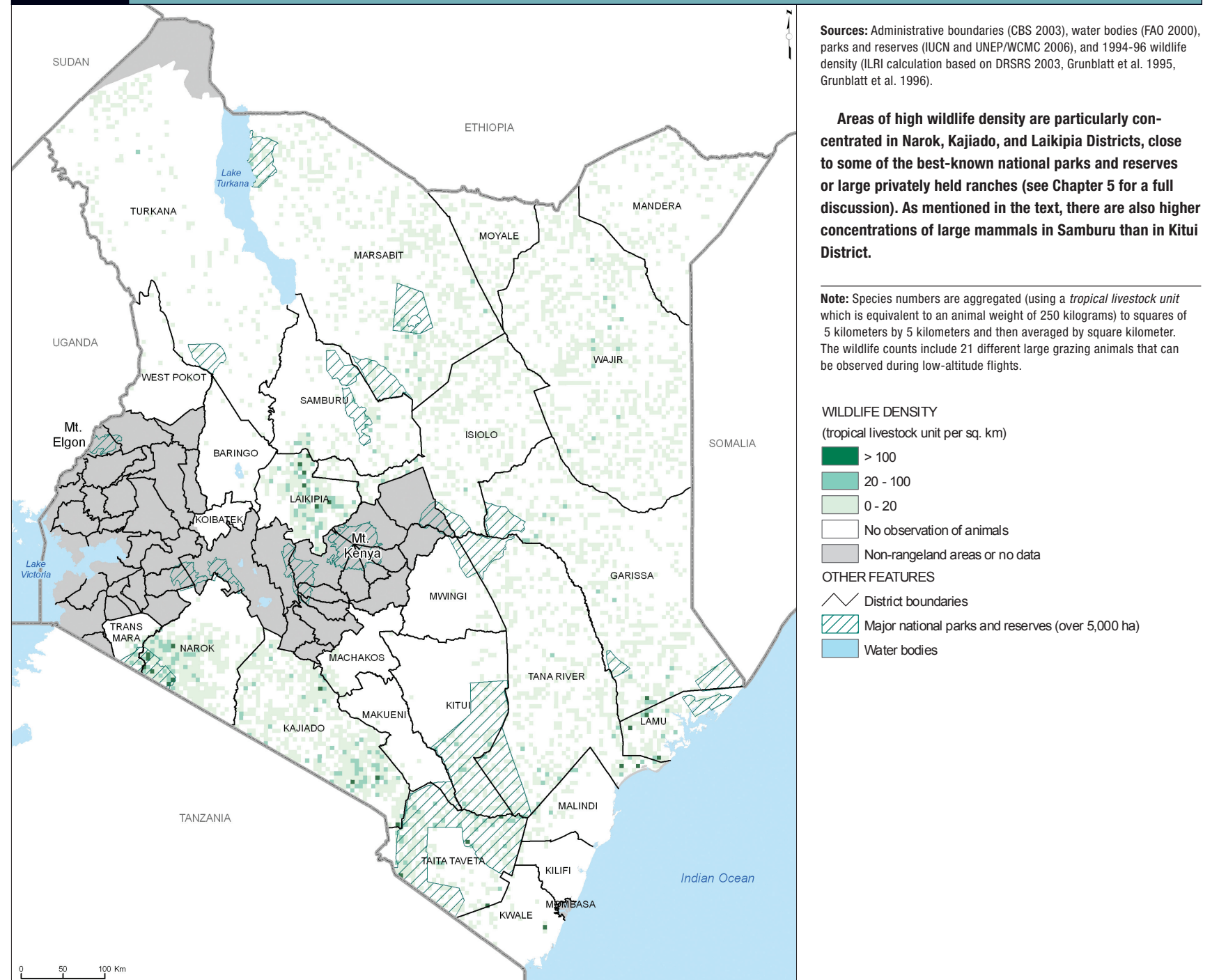
A recent survey compared the use and trade of illegal bushmeat in Kitui and Samburu Districts. The survey found that 80 percent of Kitui households consume an average of 14 kg of bushmeat each month, representing the bulk of all meat consumed (TRAFFIC 2000). The value of this meat is equivalent to about one third of a typical household's monthly income. Bushmeat is less than half as expensive as domestically raised meat in Kenya. Affordability was the main reason rural Kenyan households indicated bushmeat as their most important protein source. The study also found that the poorer the household, the greater its reliance on bushmeat (TRAFFIC 2000).

In Samburu District, monthly household consumption was significantly lower (1.1 to 1.4 kg) than in Kitui District. Hunting was exclusively for home consumption (unlike in Kitui, where 25 percent was traded) and families ate larger antelope species which are relatively abundant in local hunting areas. Kitui households had to rely more on a local supply of small mammals and birds, supplemented by traded bushmeat for larger, higher-priced species.

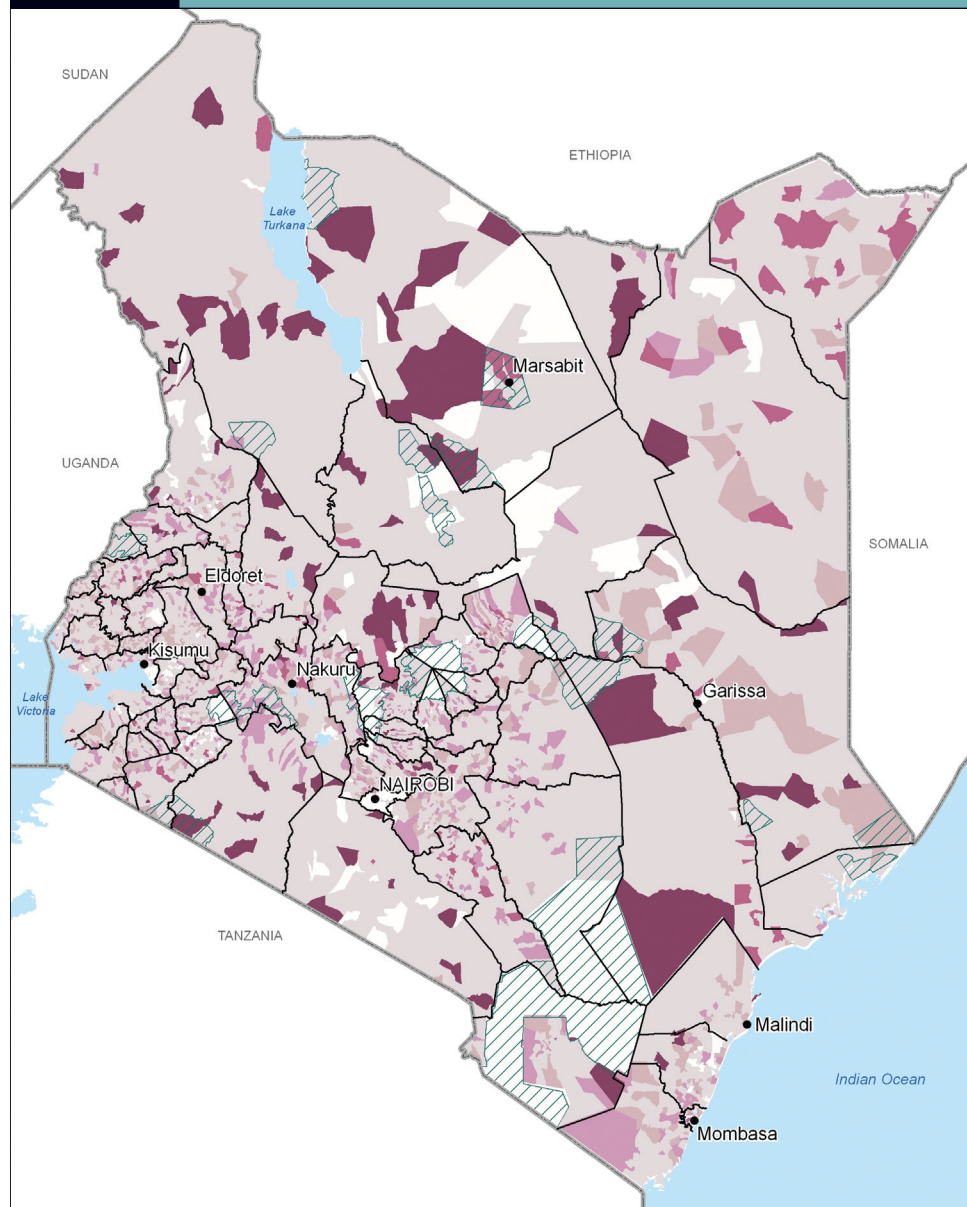
One reason for these differences in bushmeat consumption patterns is the abundance of particular animal species. Another reason stems from differences of culture and history. For example, Samburu and Maasai pastoralists, who in the past relied only to a limited extent on bushmeat, have begun to utilize the resource more in recent years as human population pressure has increased and the standards of living based on livestock production has declined (Nkedianye 2003; TRAFFIC 2000).

Map 4.10 shows the density of wildlife (specifically large animals that graze in the open) in the rangeland areas of Kenya. It is difficult to tell precisely where bushmeat is being taken, but by using this map of large mammals as a proxy for bushmeat hunting, it is possible to tell where hunting is likely to play a large role in livelihoods. Map 4.11 shows the percentage of total household income that comes from hunting and gathering activities. Because it includes gathering activities in addition to hunting, its spatial patterns differ somewhat from the map of wildlife density.

Map 4.10 Wildlife Density in the Rangelands, 1994-96



Map 4.11 Share of Cash Income From Hunting and Gathering, 2003-05



Sources: Administrative boundaries (CBS 2003), cities (SoK and ILRI 2000), water bodies (FAO 2000), and share of cash income from livestock (ALRMP et al. 2006).

The map demonstrates two important things: first, income from hunting and gathering plays a role almost everywhere in Kenya (there are very few white areas, where such income contributes nothing to family income). Second, the prevalence of these activities is mixed; areas where hunting and gathering provide a very large percentage of cash income (>60 per cent) are scattered across different regions of the country. Several of these areas border the edges of major national parks, but others, such as sections in the northern rangelands close to Lake Turkana, are further afield. Throughout the highlands, and in Nyanza and Western Provinces, there is a diverse mix of reliance on hunting and gathering activities. (Note that the map does not include income from collection and sale of woodfuel.)

Note: Data on livelihood zones are based on questionnaires sent to key food security experts (generally about 6-10 persons) in each District. In some cases where further clarification was necessary, questionnaires were sent to experts below District level (Division). This group of experts classified each of Kenya's 6,632 Sublocations by their predominant livelihood strategy and other livelihood characteristics including different sources of cash income.

CASH INCOME FROM HUNTING AND GATHERING
(percent of total income)

- > 60
- 40 - 60
- 20 - 40
- 10 - 20
- 0 - 10
- No cash income from hunting and gathering

OTHER FEATURES

- District boundaries
- Major national parks and reserves (over 5,000 ha)
- Water bodies

Kenya's *Economic Recovery Strategy for Wealth and Employment Creation, 2003–2007* states that economic recovery must build on investments and improvements in the agriculture sector (GoK 2003). With this in mind, many of the nation's agricultural policies are currently under revision. Spatial indicators of food production patterns such as those presented in this chapter, when combined with other maps and indicators on credit, road infrastructure, and poverty, can help to inform this policy revision and contribute to implementing the *Economic Recovery Strategy*. Below are some suggestions for how the information in this atlas can contribute to a few of the specific interventions (highlighted in italics) proposed in the *Economic Recovery Strategy*.

- ▶ ***Diversify enterprises and crop uses:*** Maps can show where production and use of nontraditional crops coincide with high poverty levels and good road access. This can be compared to the crops and food sources farmers in these areas currently rely on to help devise diversification strategies.
- ▶ ***Promote dairy, goats, and other small stock:*** Areas with high poverty densities, high poverty rates, and a production shortfall of milk for local markets (as shown in Maps 4.5 and 4.6) could be the most promising areas to boost dairy outputs and at the same time improve nutritional and income levels of households in poorer communities.

▶ ***Support development of facilities for milk processing:***

By combining maps of milk production, milk demand, road infrastructure, and poverty levels, planners could locate milk-processing facilities to boost market integration in areas with high poverty levels.

- ▶ ***Establish new irrigation infrastructure:*** Information on existing irrigation efforts (as in Map 3.12, Chapter 3, showing large and small-scale irrigation points), combined with maps of irrigation potential and other water uses, can identify areas that have fewer trade-offs (and potential conflicts) with other water users. In combination with information on levels of food security and poverty, new irrigation infrastructure could target less food-secure and poorer communities.

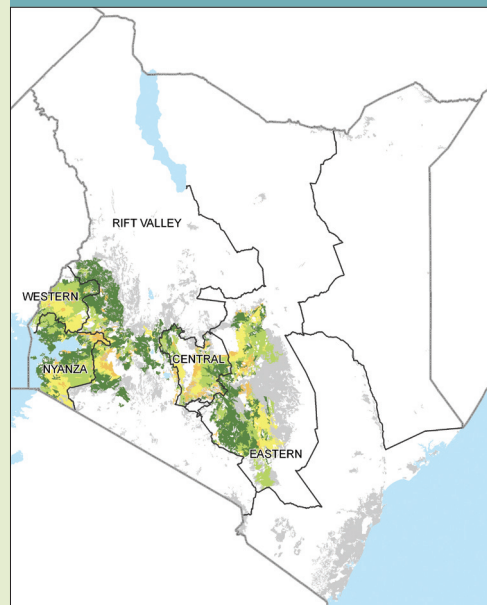
In addition to helping to implement the *Economic Recovery Strategy*, geospatial information on food production can contribute to achieving the country's multiple targets under the Millennium Development Goals (MDGs), such as reducing poverty and hunger. The recent assessment on the needs and costs to achieve the MDGs in Kenya (MoPND et al. 2005) established that, in order to meet the hunger eradication goal as set in the MDGs, Kenya must invest some Ksh 154 billion (US\$ 2.2 billion at US\$ 1 = Ksh 70) in areas such as improving soil fertility, water harvesting and utilisation, extension services, rural roads and energy, schools and pre-school feeding programs, agricultural research, and capacity building over the next ten years. Making such investments will benefit from a solid information base to ensure that resources target the right households and areas. For example,

decision-makers could use food mapping to shed light on the following questions:

- ▶ Which areas are degraded and could most benefit from increased soil fertility? How do these areas coincide with different livelihood strategies?
- ▶ Where could better water harvesting techniques reduce vulnerability to crop failures?
- ▶ On what sources of food do people currently rely? What kind of crops are farmers growing now and what could they grow in the future?
- ▶ Where would rural access roads help poor communities to become more competitive with locally produced goods?

Box 4.3 Creating a Poverty and Demographic Profile for Croplands With Different Magnitudes of Food Cropping

Map 4.12 Food Cropping in Five Provinces, 1997



FOOD SHARE
(percent of sampled cropland)

- > 75
- 50 - 75
- 25 - 50
- <= 25
- Cropland not sampled or food share unknown

The decision to grow cash crops or food crops greatly affects food security, income levels, and the well-being of farmers. Understanding these crop choices at an aggregated country level could improve policies to revitalize Kenya's agriculture. Or it might better target agricultural programs, thereby increasing access to agricultural inputs for communities with high poverty rates or those at greater risk of food insecurity.

Household surveys show that most Kenyan farming families choose a highly diversified mixture of crops. Almost all families grow maize, but maize does not contribute more than one quarter of total income for most households. It is generally combined with other food crops and cash crops that provide higher returns to land and labor, such as horticultural crops, sugar, tea, and coffee. The decision to keep a high share of cropland in food crops—especially when it

includes the staple crop maize and very few other crops—could indicate subsistence farming, which is generally associated with higher poverty rates.

Combining maps that show the degree to which farmers have dedicated their cropland to food versus cash crops (Map 4.4) with poverty maps could provide insights into possible relationships between the intensity of food cropping and poverty rates. Since the underlying data for these maps are in GIS format, they can also be used to create a poverty profile for different food cropping zones. Map 4.12 shows the level of food cropping for five Provinces. Table 4.2 classifies the land area of each Province into six classes that show whether areas are cropped and to what degree croplands are covered with food crops. For each of the classes, the table provides estimates of total population and population density, and estimates of the number of poor and the average poverty rate.

What Do the Map and Poverty Profile Show?

- ▶ At this aggregation, there does not appear to be a simple, straightforward association of high poverty with the choice of farmers to maintain a high share of food crops versus cash crops. The differences in the poverty rates between the five Provinces—ranging from 32 percent in Central Province to 64 percent in Nyanza Province—are much greater than the differences in poverty rates between the different food cropping zones within each Province.
- ▶ Nonetheless, in all but one Province, poverty rates tend to be slightly higher for the areas where farmers grow more than 75 percent food crops. The exception is the Rift Valley. Rift Valley Province includes Kenya's more productive cereal growing areas and cereals grown for cash income.
- ▶ This suggests that additional information on the number and types of specific crops grown (for example whether food crops are high-value vegetables or dryland cereal crops) is required to illuminate the spatial patterns of food cropping and poverty.

Similar profiles can be constructed overlaying other food-related or livelihood maps from this chapter with indicators of human well-being presented in Chapter 2. For example, comparing poverty maps with maps showing selected livelihood strategies, such as hunting and gathering, or fishing, could help to identify areas where poor communities are particularly vulnerable to ecosystem degradation and loss of environmental income.

Table 4.3 People, Poverty, and Food Cropping

PROVINCE	AREAS WITHOUT CROPLAND AND FOOD SHARE IN SAMPLED CROPLAND AREAS	AREA (SQ. KM)	NUMBER OF PEOPLE (000)	AVERAGE POPULATION DENSITY (NUMBER OF PEOPLE PER SQ. KM)	NUMBER OF POOR (000)	AVERAGE POVERTY RATE (PERCENT)	KSH NEEDED PER MONTH TO REACH POVERTY LINE ¹ (MILLIONS)
EASTERN							
	No Cropland	118,134	670	6	359	54	93.2
	Cropland not sampled	15,141	716	47	425	59	120.8
	Food Crops 0 - 25%	2,411	152	63	89	58	24.9
	Food Crops 25 - 50%	5,485	852	155	483	57	133.2
	Food Crops 50 - 75%	7,596	699	92	424	61	122.0
	Food Crops > 75%	8,729	1,077	123	667	62	199.0
	TOTAL 9 Districts	157,495	4,166	26	2,445	59	693.1
CENTRAL							
	No Cropland	3,675	351	96	110	31	16.3
	Cropland not sampled	2,001	435	217	128	29	19.7
	Food Crops 0 - 25%	1,383	414	299	123	30	15.1
	Food Crops 25 - 50%	1,624	587	361	187	32	23.4
	Food Crops 50 - 75%	2,745	1,062	387	338	32	44.0
	Food Crops > 75%	1,796	382	213	138	36	21.8
	TOTAL 6 Districts	13,224	3,231	244	1,023	32	140.3
RIFT VALLEY							
	No Cropland	145,696	1,969	14	968	49	245.6
	Cropland not sampled	16,961	1,122	66	505	45	111.3
	Food Crops 0 - 25%	3,156	242	77	123	51	29.8
	Food Crops 25 - 50%	3,320	438	132	221	50	52.4
	Food Crops 50 - 75%	3,514	400	114	195	49	42.8
	Food Crops > 75%	11,978	1,852	155	865	47	218.5
	TOTAL 6 Districts	184,625	6,022	33	2,877	48	700.3

Continued

Table 4.3 People, Poverty, and Food Cropping — continued

PROVINCE	AREAS WITHOUT CROPLAND AND FOOD SHARE IN SAMPLED CROPLAND AREAS	AREA (SQ. KM)	NUMBER OF PEOPLE (000)	AVERAGE POPULATION DENSITY (NUMBER OF PEOPLE PER SQ. KM)	NUMBER OF POOR (000)	AVERAGE POVERTY RATE (PERCENT)	KSH NEEDED PER MONTH TO REACH POVERTY LINE ¹ (MILLIONS)
NYANZA							
	No Cropland	806	208	258	134	65	65.9
	Cropland not sampled	804	202	252	132	65	47.6
	Food Crops 0 - 25%	682	125	183	73	58	20.5
	Food Crops 25 - 50%	2,519	662	263	411	62	129.6
	Food Crops 50 - 75%	3,627	1,604	442	1,004	63	303.3
	Food Crops > 75%	4,107	1,064	259	712	67	251.4
	TOTAL 12 Districts	12,544	3,866	308	2,466	64	818.3
WESTERN							
	No Cropland	1,061	126	119	78	62	23.0
	Cropland not sampled	416	106	254	61	58	16.3
	Food Crops 0 - 25%	435	138	318	82	60	23.0
	Food Crops 25 - 50%	2,224	1,077	484	646	60	190.4
	Food Crops 50 - 75%	3,079	1,148	373	668	58	181.9
	Food Crops > 75%	1,242	410	330	245	60	68.7
	TOTAL 6 Districts	8,457	3,006	355	1,781	59	503.3
	TOTAL 39 Districts	376,346	20,290	54	10,593	52	2,855.4²

Sources: Poverty and demographic estimates (1999) are WRI/ILRI calculation based on CBS 2002 and CBS 2003. Area without cropland, cropland not sampled, and food crop area percentages are WRI calculation based on data for Map 4.4 (ICRAF and DRSRS 2001; FAO 2000).

Note: ¹ The poverty gap measures the average expenditure shortfall (gap) for the poor in a given administrative area relative to the poverty line. It is a crude estimate of the minimum amount of resources needed to eradicate poverty (see Chapter 2).

² The total amount needed to close the poverty gap for one month in the 39 Districts (Ksh 2.9 billion) equals about US\$ 40.8 million (at US\$ 1 = Ksh 70).

SUMMING UP

- Crop production, livestock, fishing, and hunting-gathering are important sources of food and livelihoods in rural Kenya.
- In terms of total area and numbers, smallholders dominate Kenya's rainfed agriculture. Most rural households grow maize to help feed their families and rely on the market for food security (between 25 and 70 percent of smallholder income is from non-farm sources). A significant proportion of Kenya's crops are planted in areas with a high likelihood of insufficient rains.
- A mix of dairy cattle, food, and cash crops dominates high-potential agricultural lands in central and western Kenya. Similar mixed farming along Lake Victoria and large parts of Laikipia, Machakos, Mwingi, Kitui, Makueni, Taita Taveta, Kwale, Kilifi, and Malindi Districts is more marginal. Here rainfall is more erratic or soils are less fertile, resulting in lower yields and incomes.
- Croplands with high shares of food crops (more than 75 percent) are concentrated in high-potential Districts such as Trans Nzoia, Uasin Gishu, Lugari, upper Nandi, and Nakuru (maize and other cereals); Narok (wheat); and lower Kirinyaga (rice). High shares of food crops (low-yielding maize) are also prevalent in the more marginal croplands mentioned above.
- In terms of cropped area, maize is Kenya's most important food crop. It is planted throughout the country, from high-yielding areas to riskier, semi-arid zones. Large-scale farms produce over 80 percent of the domestically marketed maize. National average maize yields have declined over the past two decades.
- Fruits and vegetables—high value crops—have greatly expanded in farm area over the past decade and reached 250,000 hectares in 2003.
- One third of urban dwellers in Kenya are growing subsistence crops and raising livestock in urban areas, and two thirds are farming in either urban or rural areas, or both.
- On average, each Kenyan drinks about 100 liters of milk a year, produced by 600,000 households, primarily from central and western Kenya. The central highlands and Rift Valley have a milk surplus, while large parts of Nyanza and Western Provinces do not produce enough milk to meet local demand.
- In the more arid rangelands, livestock are shifted to follow the availability of fodder and rain (pastoral livestock raising). Cropping combined with pastoral livestock raising (agropastoral) tends to occur around more permanent water sources or where intermittent rainfall is sufficient in a good rainfall year to grow some crops.
- Nearly 40,000 people fish for a living—sometimes combined with livestock raising or food cropping—in selected areas along Lake Victoria, Lake Turkana, and the Indian Ocean. About 92 percent of the fish landed in Kenya is from Lake Victoria.
- Gathering nuts, fruits, and tubers; collecting honey; and hunting wildlife—including rodents, guinea fowl, and other birds, as well as larger animals such as antelope—all are important sources of food. While data on hunting for wild animals are incomplete, household survey data for two Districts suggest that bushmeat provides important and affordable protein to families. An estimated 1 million animals are dying in illegal snares every year.