



# MAFAP SPAANA

Monitoring African Food and Agricultural Policies  
Suivi des politiques agricoles et alimentaires en Afrique

## **ANALYSIS OF INCENTIVES AND DISINCENTIVES FOR COFFEE IN KENYA**

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JULY 2013



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## 1. PURPOSE OF THE NOTE

This technical note aims to describe the market incentives and disincentives for coffee producers in Kenya. For this purpose, yearly averages of farm-gate and wholesale prices are compared with reference prices calculated on the basis of the price of the commodity in the international market. The price gaps between the reference prices and the prices along the value chain indicate to which extent incentives (positive gaps) or disincentives (negative gaps) are present at the farm-gate and wholesale level. In relative terms, the price gaps are expressed as Nominal Rates of Protection (NRP). These key indicators are used by MAFAP to highlight the effects of policy and market development gaps on prices.

The note starts with a brief review of the commodity's production and consumption as well as trade and policies affecting the commodity. It also provides a detailed description of how the key components of the price analysis have been obtained. Using this data, the MAFAP indicators are then calculated and interpreted in light of existing policies and market characteristics. The analysis is commodity and country specific and covers the period 2005-2010. The indicators have been calculated using available data from different sources for this period and are described in Chapter 3.

The outcomes of this analysis can be used by those stakeholders involved in policy-making for the food and agricultural sector. They can also serve as input for evidence-based policy dialogue at the country or regional level.

This technical note is not to be interpreted as an analysis of the value chain or detailed description of production, consumption or trade patterns. All information related to these areas is presented merely to provide background on the commodity under review, help understand major trends and facilitate the interpretation of the indicators.

Additionally, all information presented in this note is preliminary and still subject to review and validation.

## 2. POLICY CONTEXT

Coffee was for a long time Kenya's most important agricultural export, accounting for as much as 40% of the total value of exports in some years [Mitchell, 2011]. This situation has changed dramatically since coffee production peaked in 1988. In recent years, coffee accounted for only about 6% of agricultural exports, while horticulture and tea exports have increased substantially, accounting for 34% and 32% percent of agricultural exports, respectively (see Table 1).

**Table 1: Average value of exports, 2005-09**

| Category     | Value (b Ksh) | Share |
|--------------|---------------|-------|
| Total*       | 168.5         | 100%  |
| Tea          | 53.8          | 32%   |
| Horticulture | 56.7          | 34%   |
| Coffee       | 10.8          | 6%    |

\*Food, beverages, tobacco & horticulture

Source: SA Table 40, ES Table 7.6

Despite the decrease in coffee exports, coffee production is still a major cash crop in many parts of the central highlands of Kenya and parts of western Kenya. Therefore, understanding the reasons for its decline and whether it may be reversed remains an important issue.

**Table 2: Average area, production and yield, 2005-10**

|                              | Amount | Share |
|------------------------------|--------|-------|
| <b>Area (1,000 ha)</b>       | 162.0  | 100%  |
| <b>Cooperatives</b>          | 121.4  | 75%   |
| <b>Estates</b>               | 40.6   | 25%   |
|                              |        |       |
| <b>Production (1,000 mt)</b> | 48.0   | 100%  |
| <b>Cooperatives</b>          | 25.9   | 54%   |
| <b>Estates</b>               | 22.1   | 46%   |
|                              |        |       |
| <b>Yield (kg/ha)</b>         | 296    | 100%  |
| <b>Cooperatives</b>          | 213    | 28%   |
| <b>Estates</b>               | 543    | 72%   |

Source: ES 2011, Table 8.13

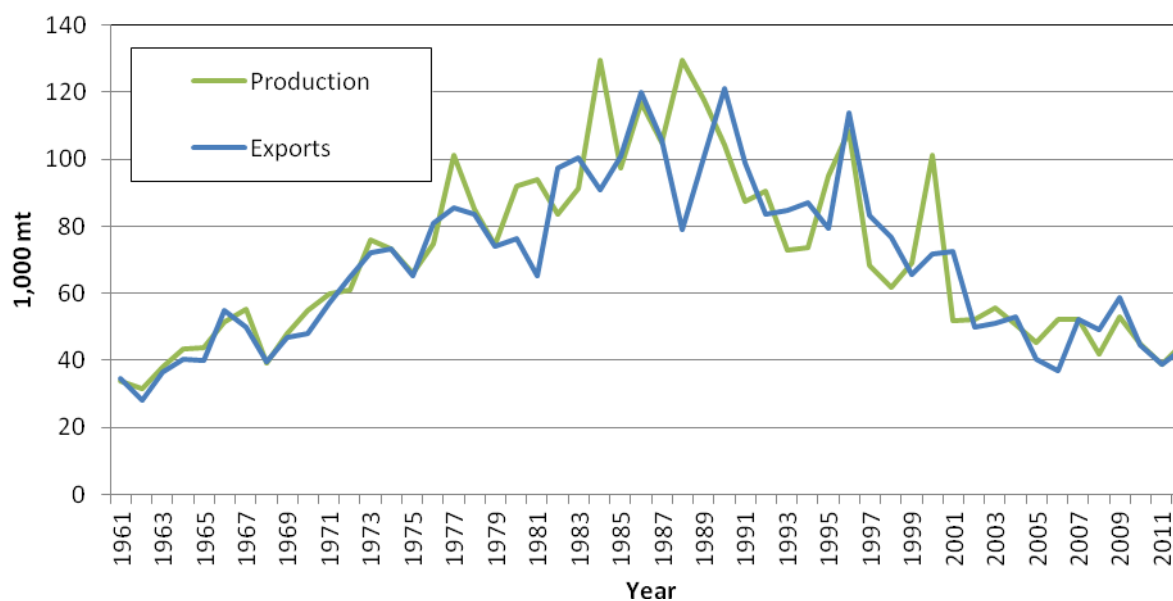
### a. Production

The main coffee producing regions in Kenya are on deep, fertile and acidic volcanic soils found in the highlands between 1 400 to 2 000 meters above sea level. These regions produce high quality, milder Arabica coffees that are known for their intense flavor, full body and pleasant aroma. The climate in these regions is mild, with an average temperature of less than 19°C and an annual precipitation of at least 1 000 mm. In central Kenya, annual rainfall is distributed in a bimodal pattern that results in two distinct flowerings each year, shortly after the beginning of the long rains in March/April and October. Rainfall in western Kenya is more evenly distributed, resulting in

somewhat different Arabica coffees that compete with Jamaica blues. The main crop ripens from October to December, with the short rains crop harvest beginning in May.

Kenya has a dual production system with about 3 300 large-scale coffee estates and over 600 000 smallholder producers organized into about 550 cooperatives. Smallholders account for 75% of the land planted to coffee but only slightly over half of production. Yields are much higher on the estates because of the more intensive use of fertilizers, pesticides, herbicides and fungicides, as well as irrigation. Smallholder farmers use fewer purchased inputs and practices such as mulching for water conservation and weed control.

**Figure 1: Coffee production and exports, 1961-2011**



Sources: USDA as reported on <http://www.indexmundi.com/agriculture/>

**Figure 2: Coffee production and price, 1980-2011**



**Sources:** production as in Figure 1; prices are the New York cash prices for "other mild Arabicas" of the International Coffee Organization, in the IMF commodities database. These are converted to 2010 USD/T using the US consumer price index.

Coffee production in Kenya increased at an average annual rate of 6.6% in Kenya between independence in 1963 and peak production in 1988. However, production declined 62% between 1989 and 2008-10. Yields increased at an average annual rate of 0.9% per year between 1963/64 and 1987/88 but declined at 5.5% per year between 1988/89 and 2009/10. At the same time, Coffee Berry Disease and Coffee Leaf Rust remain a major factor affecting cost/ yields for most varieties grown in Kenya.

There are a number of possible reasons for the decline in coffee production. Clearly, an important factor has to be the decline in world coffee prices between 1986 and 1992 as shown in Figure 2. Prices recovered partially between 1993 and 1997, but declined again between 1998 and 2002 to a level of less than 25% of their peak level over the 31 year time period shown in Figure 2.

The price decline only partly explains the problem because production in other countries has increased since 1992. Global coffee production resumed its long-term growth rate trend of about 1.35% per year after 1992. According to Gilbert [2005], the International Coffee Agreement (ICA) system, which operated from 1962-1989, resulted in restrictions in production that favored African Arabicas. Its dissolution resulted in a period of adjustment and a reduced African share of global coffee production, while Brazil and Vietnam increased their share in world markets based on a cost advantage for their value chains. In the case of Kenya, some of the growth before 1989 appears to be due to ICA restrictions on other producers rather than inherent competitiveness. Still this does not explain the long period of stagnation after 1992.

Another possible reason may have to do with productivity. Kenyan producers pay a cess of 1% on coffee sales to fund coffee research. In contrast, most other agricultural commodities are funded by the government and by the international community because research for these commodities is seen as a public good. This method of financing coffee research may have something to do with the

decline in coffee exports. Arguably, this results in underfunding for coffee research and discriminates against a potential income generating activity for smallholder farmers.

Most coffee in Kenya is still produced with two cultivars developed in the 1950s. A third cultivar developed before 1960 is used on lower altitudes. All these are susceptible to Coffee Leaf Rust and Coffee Berry Disease, which necessitates the use of fungicides. A resistant variety, Ruiru 11 was introduced around 1985, but it has not proved popular because it appears to produce an inferior quality coffee. Batian is a newer variety that may prove more successful. The development of new, resistant varieties of coffee is extremely important for increasing production, but may be inherently difficult. Producers may have hoped for a greater return on their investment with regard to the performance of past varieties.

Finally, there is the issue of the operation of the cooperatives themselves. The cooperatives are authorized to process and market smallholder coffee through the Nairobi Coffee Auction. Smallholder growers may have a choice in which cooperatives they belong to, but private coffee buyers are proscribed<sup>1</sup>. There are 8 marketing agents who represent growers at the auctions and about 50 dealers who buy coffee at the auctions and sell it to overseas customers. However, the largest part of the value chain after the farm gate is the responsibility of the cooperatives. The efficiency of the cooperatives is critical to the competitiveness of Kenyan coffee production, and there is some reason to believe, as shown in Figure 2, that considerable improvements could be made.

## **b. Consumption**

The authority to regulate coffee sales and marketing in Kenya has been vested into the Coffee Board of Kenya, which licenses other agents in the coffee value chains. The auction is managed by the Kenya Coffee Producers and Traders Association (KCPTA). The coffee itself moves forward in the value chain to its ultimate buyers in Kenya, the 50 or so dealers licensed to trade on the Nairobi Coffee Auction.

The final stage after the auction sale to the dealer is distribution and sale on the domestic market or export to a foreign buyer. However, less than 4% of coffee is sold for consumption in Kenya.<sup>2</sup> Despite producing some of the world's finest coffee, Kenyans generally prefer tea. Virtually all coffee is exported.

## **c. Marketing and Trade**

Until 2002, all small-scale growers had to sell their coffee through cooperatives.

Coffee estates in Kenya are vertically integrated operations that grow, process and market coffee through to the wholesale coffee auctions in Nairobi. This means that there is no separate farm gate and wholesale price, since market access costs are internal to the farm business. The same is true for smallholder coffee producers, since they market through a cooperative which undertakes primary processing and contracts secondary processing and marketing through to the coffee auction

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<sup>1</sup> The system is different from that in Uganda where smallholder growers have been able to sell coffee cherry to private sector traders since the mid 1990s. In Kenya they must sell to a cooperative and retain ownership until the processed coffee is sold at auction. In Uganda smallholder growers may be paid in cash for coffee cherry on delivery.

<sup>2</sup> See Kenya Coffee Traders Association website.



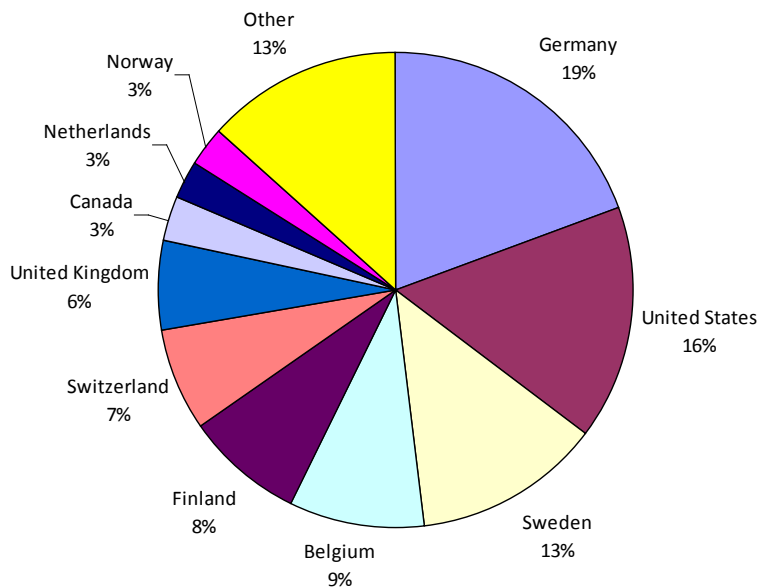
on their behalf. Small-scale growers also legally retain ownership of the coffee until the coffee is sold at auction. They are responsible for all processing and marketing costs incurred in their name, and these are deducted from the proceeds of the auction.

Both estates and cooperatives employ one of the eight licensed marketing agents to represent them at the coffee auctions. The coffee is purchased by one or more of about 50 licensed coffee dealers.

The coffee dealers may store an individual auction lot or sell it immediately on either the domestic or export market, depending on the volume and delivery requirements of their buyers. In any case, the dealer adds value through re-grading, sorting according to texture and color, gravity separation, hand-picking and blending to match the needs of his customers. The dealer also re-bags the coffee in either 60kg bags or bulks it into 300-350kg bags and packs the bags in 21 ton containers for transport to the inland container yard in Mombasa from where it is exported.

Kenyan coffee over the last five years has been exported to 70 different destinations. The top three destinations, accounting for 48% of the total value of coffee exports, are Germany, the United States and Sweden, with shares of 19%, 16% and 13%, respectively (see Figure 3). The International Coffee Organization (ICO) regularly publishes prices for four main types of coffee – *Columbian milds*, *other milds*, *Brazilian naturals* and *Robustas*. The first three are Arabicas, with *Columbia milds* enjoying a premium of about 10% over *other milds*. Columbia has established the Columbia country-of-origin as an effective brand signifying high quality. Kenyan Arabicas are considered in the *other milds* category, which enjoys a slight premium over Brazilian naturals. *Robustas* currently sell for less than half the price for *other milds*.

**Figure 3: Average share of the value of exports by destination, 2006 - 2010**



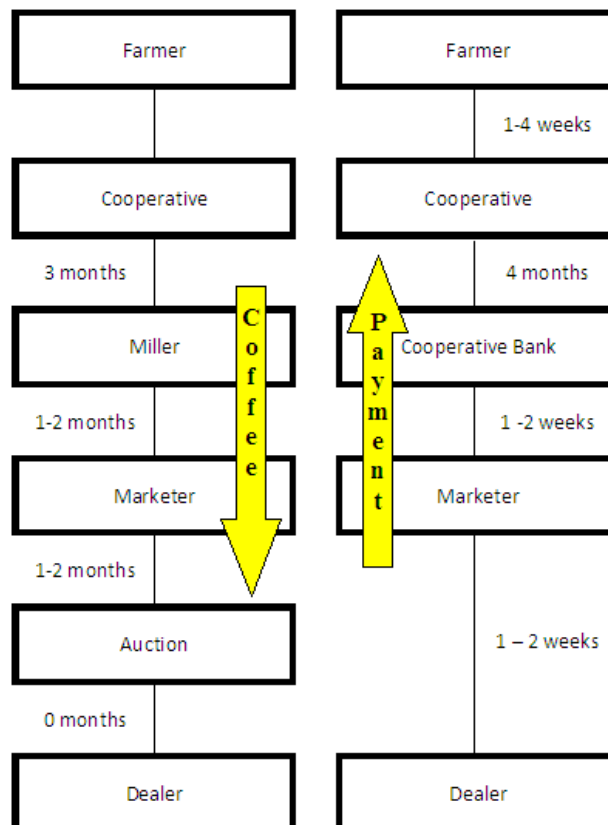
Source: GTA database

An article in the African Executive in 2004 complained about the lack of a Kenya brand in international markets compared to Ethiopia, where coffee farmer groups have established Sidamo and Yirgacheffe as brand names. Additionally, until 2006, all coffee sales had to go through the Nairobi Coffee Exchange, where it is purchased by the licensed coffee dealers through competitive bidding. Since then, a direct sales mechanism has been allowed, and the Coffee Board of Kenya has implemented a coffee brand initiative, but it is too early to tell whether this will generate price premiums for growers or become merely another expense deducted from their prices.

Direct sales allow a grower to directly negotiate a sale with a buyer outside Kenya. However, the procedure for direct sales is similar to that followed for auctions with regard to the role of marketing agents, permits, certificates, inspections and fees. The grower must negotiate a three-party contract that includes the buyer and one of the eight licensed coffee marketing agents.

The marketing agent must then register three copies of the sales contract with the Board, store the coffee in his registered warehouse and submit a 200gm sample of the coffee for quality analysis and arbitration purposes. The Board subsequently arranges to physically inspect the coffee at the designated warehouse to verify the quality, quantity and value.

**Figure 4: Coffee value chain**



The agent must obtain a Certificate of Inspection, a Certificate of Origin issued by the Board as required by the ICO, a regular coffee movement permit and a special movement permit for direct sales. The movement permits are needed to transport the coffee from the warehouse to the port. A copy of his marketing agent's license must accompany the coffee being exported.

The agent must pay a levy of 1% to the Coffee Board of Kenya, 2% to the Coffee Research Foundation and a 1% Coffee Cess, which is divided among the Kenya Roads Board and local authorities. In addition, fees are charged for registering the sales contract as well as each permit and certificate.

This new system has allowed the emergence of *terroir* growers that produce a high quality coffee for connoisseur consumers at a premium price. One such grower produces a coffee “jammed with blackberry and blueberry sumptuous body with a long resonating finish,” according to the following web site: <http://store.terroircoffee.com/coffees/mamutokenya.html>. However, this is such a niche market that for most small-scale growers, it is likely that the system is effectively the same as it was before the 2006 reform.

#### **d. Description of the Value Chain and Processing**

Coffee berries are referred to as “coffee cherries” when they are ready to be harvested because they turn a bright red color. Farmers deliver their coffee to their cooperatives, which use the same “wet” processing method as the estate. The first stage in processing is to separate better quality beans from lower quality beans through a water density separation; the better quality, heavier beans sink. The outer skin is removed by “pulping” machines, which also separate the beans into three further grades. The coffee beans are then soaked or “fermented” to remove the fruity mucilage layer that clings to the coffee parchment layer. It is then dried on special tables and regularly turned to obtain the colour for which Kenya coffee is known.

It is only after drying that the coffee from different growers is merged and bagged. The cooperative then decides when and how often to deliver it to one of the 7 licensed commercial coffee mills or several private mills. The whole process with the cooperative can take as long as three months.

The parchment layer surrounding each bean is removed at the mills followed by further mechanical grading into seven separate grades according to size, weight and shape of the bean. Processing by the miller can take as long as two months. When milling is complete, the bagged coffee is shipped to a Nairobi warehouse adjacent to the auction house. There, samples are drawn by each of the three commercial operators, who act as marketers, and are sent to the approximately 50 members of the Nairobi exchange.

The three commercial operators, established under the Coffee Act, include the Kenya Producers Coffee Union (KPCU), Socfinaf and Thika Coffee Mills. Their responsibilities are to prepare, warehouse and warrant coffee in preparation for auction. This involves making samples available for the 50 or so licensed dealers prior to auction, representing growers during auction and collecting and distributing proceeds following final sales. If a dealer doubts the accuracy of any of the 500 plus samples received in a given week, he can go to the warehouse to resample. The marketers receive a flat fee of USD 50/ton for their services, but clearly a selection of miller is also a selection of the marketer associated with each miller. Up to four months can pass between delivery to the miller and sale at auction.

Passing the proceeds back to the grower can take a considerable amount of time once payments are made to the bank representing the cooperative. The payments may sit there for as long as four months before they are credited to the cooperative net of any loan repayments for individual members of the cooperative. The cooperative then pays individual growers in one to four weeks.

One of the problems in Kenya is the cooperative bank fees and interest charges on loans to growers can result in high effective rates of interest. Furthermore, cooperative banks / cooperatives have also been known to make some dubious investments on behalf of growers<sup>3</sup>.

#### **e. Policy Decisions and Measures**

There are three main policy measures affecting the production and sale of Kenyan coffee – the system of marketing regulations and fees described in the previous sections, border measures affecting imports and the Coffee Development Fund (CDF). In addition, there is a small amount of EU funding for equipment and training for the Coffee Research Foundation.

Regulations to verify quality and quantity are sometimes needed in agricultural markets to reduce disputes and other transaction costs when buyers and sellers are in different locations. However, this is only partially the case for Kenya coffee, where much of the regulation seems to be related to the issue of determining and verifying that fees and levies are correctly assessed. As such, they can be seen as an excise tax at the wholesale level on coffee production.

Kenya has in place a 25% tariff on imported coffee. There is a special exemption for imported coffee sold at the Nairobi auctions and subsequently exported. Since Kenya is a coffee exporter and consumes a negligible amount, these measures have no impact on prices in Kenya.

The Coffee Development Fund (CDF) was established by the government in May 2006 as a financing vehicle for revitalizing the coffee sub-sector. Its mandate is to provide sustainable, affordable credit to coffee farmers for farm inputs, farming operations and income stabilization. Most of loans go to smallholders organized in cooperatives. Currently, the CDF provides about USD 13 million in loans divided among about 61 000 coffee farmers. According to Patrick Nyaga, the CDF Managing Trustee, the sector needs about USD 125 Million to meet the needs of coffee farmers.

The interest rate charged on loans is 10%, while the average inflation rate between 2006 and 2010 was about 9%. The total subsidy element of this program, therefore, is relatively small, assuming reasonably good default rates.

These loans appear to be available to growers over and above those available through the cooperative banks, which are assumed to be free of subsidy. However, that may change in 2012 if a recent announcement concerning non-repayment of cooperative loans is implemented.

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<sup>3</sup> See articles by Kennedy [2005] and Mitchell [2011] for descriptions of management problems with some Kenyan coffee cooperatives.

### 3. DATA REQUIREMENTS, DESCRIPTION AND CALCULATION OF INDICATORS

To calculate the indicators needed to estimate incentives or disincentives to production (NRP, NRA) as well as the Market Development Gaps (MDGs), several types of data are needed. They were collected and are presented and explained hereafter.

#### TRADE STATUS OF THE PRODUCTS

As mentioned above, Kenya has been a coffee exporter throughout 2005-2010. Coffee imports during the period 1961-2010 have exceeded 1% of production in only two years, 1975 and 1976. Nearly all of production is exported.

#### BENCHMARK PRICES

Benchmark export prices for Kenya are based upon official exports over the period as recorded in *KNBS Statistical Abstract 2010*, Table 46, and *Economic Survey 2011*, Table 7.5. The average price is the result of dividing export value by export quantity. These are converted to USD/T by the average exchange rate for the year in the monthly IMF database exchange rate database.

#### DOMESTIC PRICES

Excellent data on wholesale prices are available for Kenya both in various KNBS publications and directly from the auctions. However, it is very difficult to reconcile wholesale prices with export prices and appropriate farm-level prices.

The auctions in particular have monthly data online for 26 grades (including three “unwashed” grades) of coffee dating back to 2001 in USD/T. The auction season runs from October 1 to September 30, so annual prices published correspond to this period. KNBS reports the average auction price in Ksh. For example, the KNBS for 2009 appears to be average auction price for grades of coffee (possibly excepting unwashed grades) for the period October 2008 to September 2009. This KNBS price seems to best match the derived export prices for the 2009 calendar year, and three months is a reasonable time lag between auction and FOB Mombasa.

The lags back to farm level are even greater because, as shown in Figure 3, coffee sold at auction in the period October 2008 to September 2009 was likely harvested in the previous year. Since growers retain formal ownership between farm and auction, the coffee delivered in November 2008 might not be sold and exported until 2010.

However, data are not available for the price the farmer actually receives after all the deductions for processing and marketing his crop. Instead, these are calculated residually from the observed wholesale prices and estimated market access costs, so the timing issue at farm level does not arise here although it must be an issue for coffee growers.

## EXCHANGE RATES

The exchange rate between the Kenya shilling and the United States dollar has been taken from the IMF database on exchange rates. The average of the exchange rate for each year has been calculated from the monthly data reported in the database.

## ACCESS COSTS

As described above, coffee estates in Kenya are vertically integrated operations that grow coffee and process and market coffee through to the wholesale coffee auctions in Nairobi. Small-scale growers are vertically integrated through to wholesale because they are not considered to have sold the coffee until it is auctioned, and, of course, they are responsible for all processing and marketing costs incurred on their behalf.

It is possible, however, to have estimates of market access costs and estimate what the farm gate price might be if processing and marketing was not vertically integrated. Access costs here are based upon a 2005 study by Deloitte for the World Bank, published in the *Kenya Growth and Competitiveness*, Report No. 31387-KE and a somewhat more detailed version is available at <http://www.matching-grant.or.ke/deloitte/Documents>.

The Deloitte study shows 2001/2002 costs in USD/kg from farm level through auction for smallholder growers and coffee estates, including primary processing costs, secondary processing costs, marketing fees, auction fees, statutory charges, trucking and handling from the auction to port and gross margins and tertiary processing costs by the dealer. All of these were converted into Ksh/kg and adjusted to corresponding values for 2005-2010 using different price indices for transportation costs, processing costs and for wholesale and retail trade. This allows for the calculation of access costs between the border and the auction and between the auction and the farm gate. The farm gate price, as mentioned previously, is calculated as the difference between the auction price and farm to auction market access costs.

Market access costs for each major component are shown in Table 3.

Two alternative sets of fees and charges are estimated. Statutory marketing charges are reduced to zero for all growers. All of these charges are somewhat unusual and are not levied on maize and most other agricultural commodities. The CGIAR system also provides high quality research for food crops, but there are no similar international bodies for crops like coffee, which potentially provide relatively high income generating opportunities in rural areas. Marketing costs for food crops like maize may be subsidized through marketing boards such as the NCPB in Kenya instead of taxed to provide rural infrastructure.

Some of the elements of the marketing system seem designed to assess and collect taxes and fees. It seems likely that reducing statutory charges to zero would allow changes in the marketing system that would reduce other costs and make it possible to pay producers much more quickly. However, no attempt has been made to estimate this type of knock-on benefit.

**Table 3: Market access costs by component, 2005-2010**

| Cost item   | 2005   | 2006   | 2007   | 2008   | 2009   | 2010   |
|---|--------|--------|--------|--------|--------|--------|
| <b>Smallholder Processing</b>                     |        |        |        |        |        |        |
| Transport   | 2,957  | 3,235  | 3,242  | 3,894  | 3,481  | 3,623  |
| Processing  | 29,299 | 30,408 | 32,997 | 35,526 | 42,971 | 45,109 |
| Packing   | 1,924  | 1,996  | 2,167  | 2,332  | 2,821  | 2,962  |
| Maintenance                                       | 5,413  | 5,618  | 6,097  | 6,564  | 7,939  | 8,335  |
| Transport   | 3,490  | 3,819  | 3,827  | 4,596  | 4,108  | 4,276  |
| Secondary Processing                              | 5,861  | 6,083  | 6,601  | 7,106  | 8,596  | 9,024  |
| SUBTOTAL  | 48,945 | 51,159 | 54,930 | 60,018 | 69,916 | 73,327 |
| <b>Estate Processing</b>                          |        |        |        |        |        |        |
| Transport   | 1,015  | 1,111  | 1,113  | 1,337  | 1,195  | 1,244  |
| Processing  | 11,737 | 12,181 | 13,218 | 14,231 | 17,214 | 18,070 |
| Packing   | 568    | 590    | 640    | 689    | 834    | 875    |
| Maintenance                                       | 2,170  | 2,252  | 2,444  | 2,632  | 3,183  | 3,341  |
| Transport   | 584    | 639    | 640    | 769    | 687    | 715    |
| Secondary Processing                              | 5,590  | 5,802  | 6,296  | 6,779  | 8,199  | 8,607  |
| SUBTOTAL  | 21,665 | 22,575 | 24,352 | 26,436 | 31,312 | 32,853 |
| <b>Marketing fee</b>                              | 4,496  | 4,682  | 4,929  | 5,600  | 5,940  | 6,201  |
| <b>Auction fee</b>                                | 279    | 290    | 306    | 347    | 368    | 384    |
| <b>Statutory Charges</b>                          | 5,029  | 6,979  | 7,274  | 9,807  | 9,569  | 15,003 |
| <b>Market Access Costs: Farm Gate to Auction*</b> |        |        |        |        |        |        |
| Smallholder                                       | 53,720 | 56,132 | 60,164 | 65,966 | 76,224 | 79,913 |
| Estate  | 26,440 | 27,547 | 29,586 | 32,384 | 37,620 | 39,438 |
| <b>Market Access Costs: Auction to Border</b>     |        |        |        |        |        |        |
| Processing, Margins                               | 23,324 | 24,288 | 25,567 | 29,050 | 30,812 | 32,167 |
| Trucking / THC                                    | 3,770  | 4,125  | 4,134  | 4,964  | 4,437  | 4,619  |
| SUBTOTAL  | 27,094 | 28,413 | 29,700 | 34,015 | 35,250 | 36,785 |

Source: MAFAP calculations. \*Excluding statutory charges.

Secondly, primary processing for smallholders are reduced to the same level as that of the estates. The higher processing costs appear to be associated with the management of the cooperatives. Better management and more competition at the primary processing level should effectively eliminate the gap between smallholder and estate processing costs.

#### **EXTERNALITIES**

No externalities are estimated for the coffee value chains.

#### **BUDGET AND OTHER TRANSFERS**

Three programs providing budget transfers to coffee producers were found in Kenya over the 2005-2010 period. The CDF is an input subsidy program. The annual benefit to farmers is assumed to be equivalent to 10% of the CDF fund amount to allow for defaults and interest rate subsidy elements. The total fund amount is assumed to be USD 13 million throughout 2006-2010. The entire amount of

the benefit is assumed to be shared among smallholder growers. The resulting subsidy per unit is shown in Table 5.

The statutory levies at 4% of the value of sales at auction could be regarded as a tax or negative subsidy. However, since these are factored into market access costs, they are not included in the estimate of budget and other transfers. Also, no transfer is included for EU support for the Coffee Research Foundation since amounts are very small and provide no benefit to farmers in the near term.

**Table 4: Budgetary and other transfers to smallholder growers**

|                                  | Unit  | 2005   | 2006   | 2007   | 2008   | 2009   | 2010   |
|----------------------------------|-------|--------|--------|--------|--------|--------|--------|
| <b>Estimated Total Subsidy</b>   | mKsh  | 0      | 94     | 88     | 90     | 101    | 103    |
| <b>Estimated Coop Production</b> | T     | 26,665 | 27,544 | 27,792 | 20,809 | 26,293 | 10,327 |
| <b>Interest rate subsidy</b>     | Ksh/T | 0      | 3,403  | 3,149  | 4,322  | 3,824  | 9,974  |

Source: MAFAP calculations

## QUALITY AND QUANTITY ADJUSTMENTS

Growers deliver cherry coffee, which loses 80-84% of its weight in processing and changes considerably with respect to quality. However, coffee ownership of green coffee beans at auction is attributed back to the grower, so no adjustment is made for the quality and quantity in the farm to wholesale part of the chain.

Since coffee is exported and actual export price data are available, no adjustment in the price of coffee is made (Under reporting value on export is possible, but there is no evidence on this). However, there are still considerable time lags possible so that coffee sold in one auction year may be exported in one or more calendar years. Therefore, it is difficult to match the export price with the auction price, especially since the margin between the two is a relatively small share of the price. Consequently, the average quality on export is adjusted so that the market access cost is consistent with the price at auction.

## CALCULATION OF INDICATORS

The indicators and the calculation methodology used are described in Box 1. A detailed description of the calculations and data requirements is available on the MAFAP website or by clicking [here](#).



### Box 1: MAFAP POLICY INDICATORS

MAFAP analysis uses four measures of market price incentives or disincentives. *First*, are the two observed nominal rates of protection, one at the wholesale level and one at the farm level. These compare observed prices to reference prices free from domestic policy interventions.

Reference prices are calculated from a benchmark price, such as an import or export price, expressed in local currency and brought to the wholesale and farm levels with adjustments for quality, shrinkage and loss and market access costs.

The **Nominal Rates of Protection - observed (NRPo)** is the price gap between the domestic market price and the reference price divided by the reference price at both the farm and wholesale levels:

$$NRPo_{fs} = \frac{(P_{fs} - RPo_{fs})}{RPo_{fs}}; \quad NRPo_{wh} = \frac{(P_{wh} - RPo_{wh})}{RPo_{wh}};$$

The  $NRPo_{fs}$  captures all trade and domestic policies, as well as other factors affecting market incentives and disincentives for the farmer. The  $NRPo_{wh}$  helps identify where incentives and disincentives may be distributed in the commodity market chain.

*Second*, are the **Nominal Rates of Protection - adjusted (NRPa)** in which the reference prices are adjusted to eliminate distortions found in developing country market supply chains. The equations to estimate the adjusted rates of protection follow the same general pattern:

$$NRPa_{fs} = \frac{(P_{fs} - RPa_{fs})}{RPa_{fs}}; \quad NRPa_{wh} = \frac{(P_{wh} - RPa_{wh})}{RPa_{wh}};$$

MAFAP analyzes market development gaps caused by market power, exchange rate misalignments, and excessive domestic market costs, which contribute to the  $NRPo$  and  $NRPa$  indicators. Comparison of the different rates of protection identifies where market development gaps can be found and reduced.

Due to the dual nature of the coffee value chains, with the estates managing their processing price gaps, nominal rates of protection are estimated separately for estates and small growers.

**Table 5: MAFAP price gaps for coffee in Kenya 2005-2010 (Ksh/T)**

|                                 | 2005    | 2006    | 2007    | 2008    | 2009    | 2010    |
|---------------------------------|---------|---------|---------|---------|---------|---------|
| Trade status for the year       | X       | X       | X       | X       | X       | X       |
| <b>SMALLHOLDER</b>              |         |         |         |         |         |         |
| Observed price gap at wholesale | 130,869 | 181,348 | 189,207 | 254,833 | 249,552 | 391,032 |
| Adjusted price gap at wholesale | 131,020 | 181,513 | 189,372 | 255,032 | 249,729 | 391,217 |
| Observed price gap at farm gate | 77,149  | 125,216 | 129,043 | 188,867 | 173,328 | 311,119 |
| Adjusted price gap at farm gate | 99,718  | 148,663 | 154,448 | 216,276 | 206,310 | 345,739 |
| <b>ESTATE</b>                   |         |         |         |         |         |         |
| Observed price gap at wholesale | 130,869 | 181,348 | 189,207 | 254,833 | 249,552 | 391,032 |
| Adjusted price gap at wholesale | 131,020 | 181,513 | 189,372 | 255,032 | 249,729 | 391,217 |
| Observed price gap at farm gate | 104,428 | 153,800 | 159,621 | 222,449 | 211,932 | 351,594 |
| Adjusted price gap at farm gate | 104,643 | 154,035 | 159,856 | 222,732 | 212,185 | 351,857 |

Source: Own calculations using data as described above.

**Table 6: MAFAP nominal rates of protection (NRP) for coffee in Kenya 2005-2010 (%)**

|                                 | 2005   | 2006   | 2007   | 2008   | 2009   | 2010   |
|---------------------------------|--------|--------|--------|--------|--------|--------|
| Trade status for the year       | X      | X      | X      | X      | X      | X      |
| <b>SMALLHOLDER</b>              |        |        |        |        |        |        |
| Observed NRP at wholesale       | -3.9%  | -3.8%  | -3.9%  | -3.8%  | -4.1%  | -4.1%  |
| Adjusted NRP at wholesale       | -4.0%  | -3.9%  | -4.0%  | -3.9%  | -4.2%  | -4.1%  |
| Observed NRP at farm gate       | -6.7%  | -5.5%  | -5.7%  | -5.1%  | -6.0%  | -5.1%  |
| Adjusted NRP at farm gate       | -27.8% | -20.4% | -21.2% | -17.1% | -21.0% | -14.6% |
| <b>ESTATE</b>                   |        |        |        |        |        |        |
| Observed price gap at wholesale | -3.9%  | -3.8%  | -3.9%  | -3.8%  | -4.1%  | -4.1%  |
| Adjusted price gap at wholesale | -4.0%  | -3.9%  | -4.0%  | -3.9%  | -4.2%  | -4.1%  |
| Observed price gap at farm gate | -4.9%  | -4.5%  | -4.6%  | -4.3%  | -4.9%  | -4.5%  |
| Adjusted price gap at farm gate | -5.1%  | -4.6%  | -4.8%  | -4.5%  | -5.0%  | -4.6%  |

Source: Own calculations using data as described above.

**Table 7: MAFAP Market Development Gaps for coffee in Kenya 2005-2010 (Tzsh per Mt)**

|   | 2005        | 2006        | 2007        | 2008        | 2009        | 2010        |
|---|-------------|-------------|-------------|-------------|-------------|-------------|
| Trade status for the year                                     | X           | X           | X           | X           | X           | X           |
| <b>SMALLHOLDER</b>  |             |             |             |             |             |             |
| International markets gap (IRG)                               | -           | -           | -           | -           | -           | -           |
| Exchange policy gap (ERPG)                                    | -           | -           | -           | -           | -           | -           |
| Access costs gap to point of competition (ACG <sub>wh</sub> ) | (150.81)    | (164.99)    | (165.34)    | (198.58)    | (177.50)    | (184.74)    |
| Access costs gap to farm gate (ACG <sub>fg</sub> )            | (22,418.65) | (23,281.40) | (25,240.56) | (27,209.59) | (32,804.79) | (34,434.49) |
| <b>ESTATE</b>   |             |             |             |             |             |             |
| International markets gap (IRG)                               | -           | -           | -           | -           | -           | -           |
| Exchange policy gap (ERPG)                                    | -           | -           | -           | -           | -           | -           |
| Access costs gap to point of competition (ACG <sub>wh</sub> ) | (150.81)    | (164.99)    | (165.34)    | (198.58)    | (177.50)    | (184.74)    |
| Access costs gap to farm gate (ACG <sub>fg</sub> )            | (63.97)     | (69.98)     | (70.13)     | (84.23)     | (75.29)     | (78.36)     |

ND: No data available for calculation

Source: Own calculations using data as described above.

## 4. INTERPRETATION OF THE INDICATORS

The price gaps in the estate coffee grower value chain are shown in Figure 5, while the nominal rates of protection are shown in Figure 6.

### PRICE GAPS AND NOMINAL RATES OF PROTECTION FOR COFFEE ESTATES

The observed nominal rates of protection are negative 4% of the value of production at wholesale in all years. A negative number indicates a disincentive for the sector. This is because these rates are based entirely on the various statutory levies on coffee expressed as a percent of the auction price. The price of coffee increased sharply over the period 2005-2010, so the absolute amount of these levies increased proportionately, as indicated by the observed price gaps at wholesale in Figure 5.

The adjusted rates at wholesale are slightly more negative because of the adjustments for the effect of levies and unofficial charges on transportation margins.

The effect of statutory charges at the farm level is greater than at wholesale because the levies are a larger share of farm prices. Farm level prices were about 80% of auction prices in 2005, so the 4% levies translate into a negative 5% rate of protection at farm level. Both coffee prices and farm-gate to wholesale market access costs increased sharply between 2005 and 2010, but coffee prices increased more rapidly, amounting to 90% of the auction prices in 2010. As a result, the observed farm level NRP falls slightly to USD 4.5%. Again, only small transportation related adjustments are made to market access costs for the market development gap, so the adjusted rates are nearly identical to the observed rates for the estates.

### PRICE GAPS AND NOMINAL RATES OF PROTECTION FOR SMALL-SCALE GROWERS

While the story for estate growers is not ideal, it is significantly less positive for small-scale growers. The price gaps and nominal rates of protection, in Figures 7 and 8 respectively, are identical at the wholesale level to those of the estates since the two value chains merge at the wholesale auction. The observed price gap at the farm level is also identical to that of the estates since it is entirely due to the levies.

However, the levies have a greater impact in relative terms on small-scale growers, as shown by the observed farm level nominal rates of protection, which were negative 7% in 2005, almost double the levy rate. There is a small offset for small-scale growers in the form of the CDF. The CDF benefit amounts to between 2% and 3% of the price between 2006 and 2010. Despite the CDF, the observed farm level price gaps show an increasing trend because of high coffee prices, but a decreasing observed nominal rate of protection because prices are increasing faster than market access costs as is the case for the estate value chain.

Figure 5

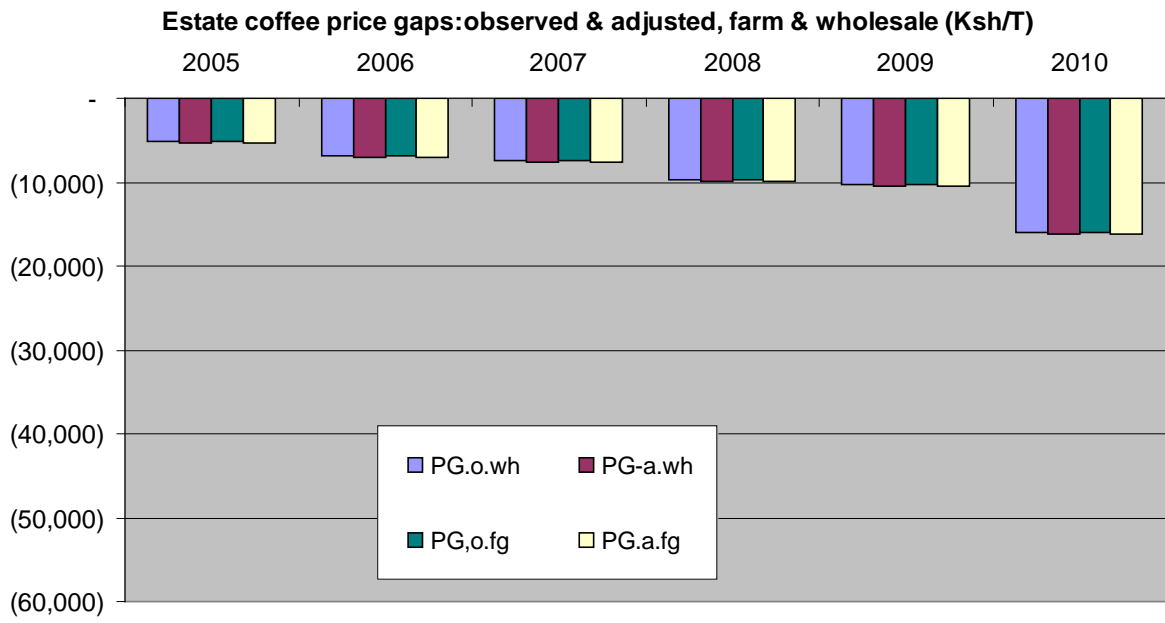


Figure 6

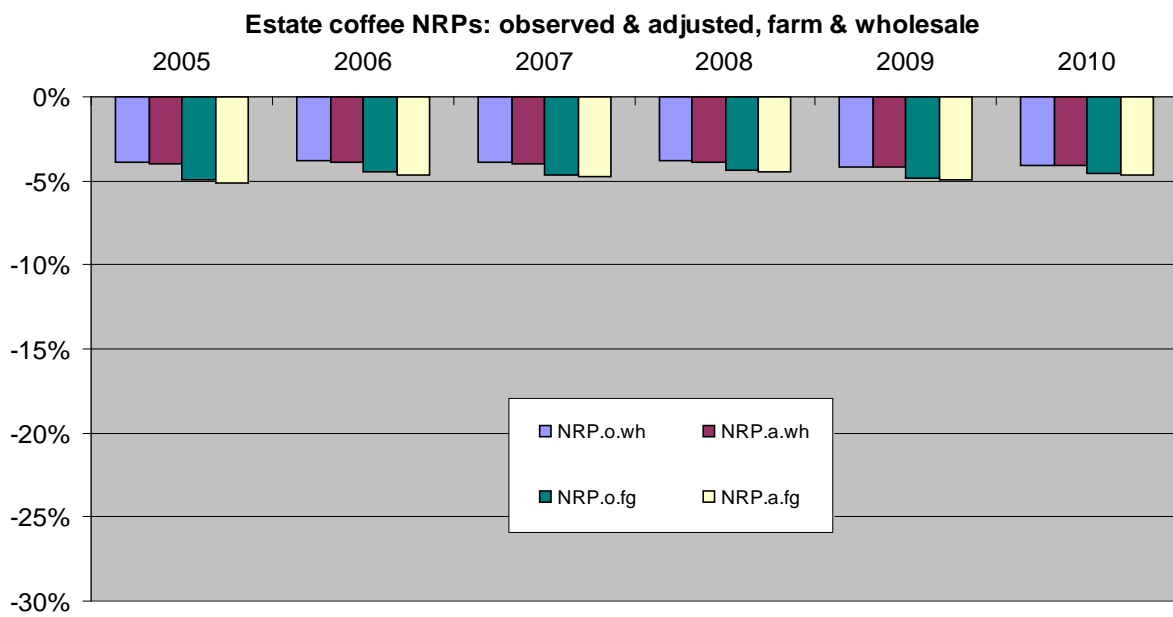


Figure 7

Smallholder coffee price gaps: observed & adjusted, farm & wholesale (Ksh/T)

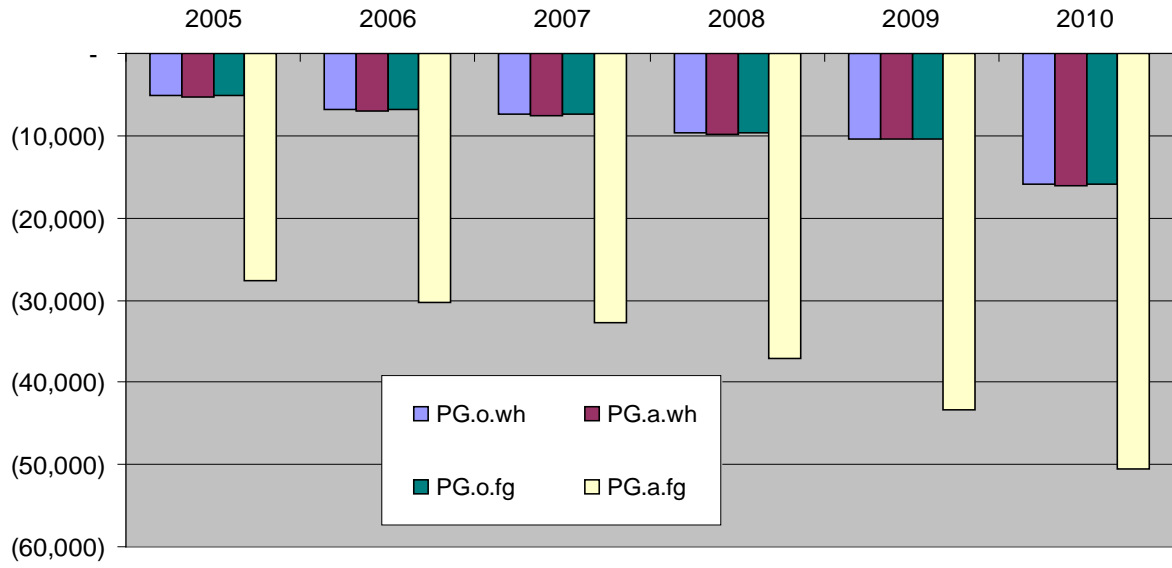
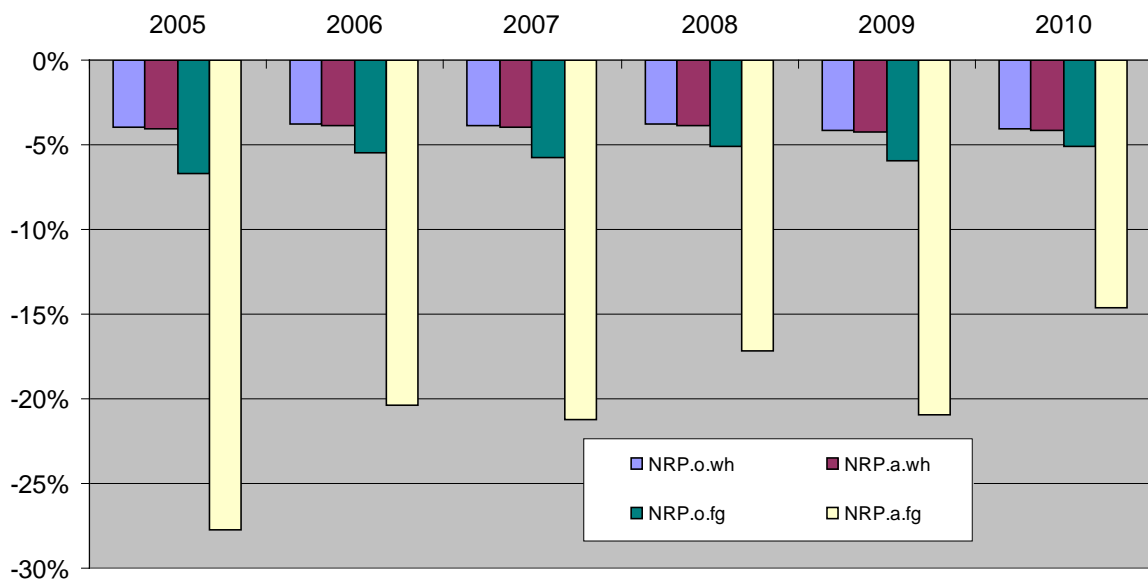


Figure 8

Smallholder coffee NRPs: observed & adjusted, farm & wholesale



The big difference is for the adjusted price gaps and nominal rates of protection. Farm level prices are much lower for the small-scale coffee growers than they are for the estates. The differences in farm-gate prices are a consequence of the higher primary processing costs, which is a market development gap. Instead, the system for processing coffee cherry and bringing it to market at the auctions is highly regulated, leading to abuse and providing few real options for small-scale growers. This market development gap significantly reduces incentives for small-scale coffee growers in Kenya. The negative adjusted rate of protection from both the levies and excessive primary processing costs amounts to a disincentive equivalent to a price reduction averaging 20% from 2005 to 2010. (The disincentive varies from 15% to 28% of price.)

The net effect on growers is shown in Figures 9 and 10. The bottom line shows observed farm level price. The middle line shows the reference price at the farm level, and it shows the price farmers would receive without the price policies in effect. The reference price is higher than the observed price, indicating negative support. The top line shows the adjusted price. Market access costs are significantly higher than normal levels for small-scale coffee growers, creating the market development gap shown in Figure 10.

The market development gap for the estates is negligible, but has a large impact on producer prices for small-scale growers.

Figure 9

Estate coffee farm level prices: observed, reference and adjusted (Ksh/T)

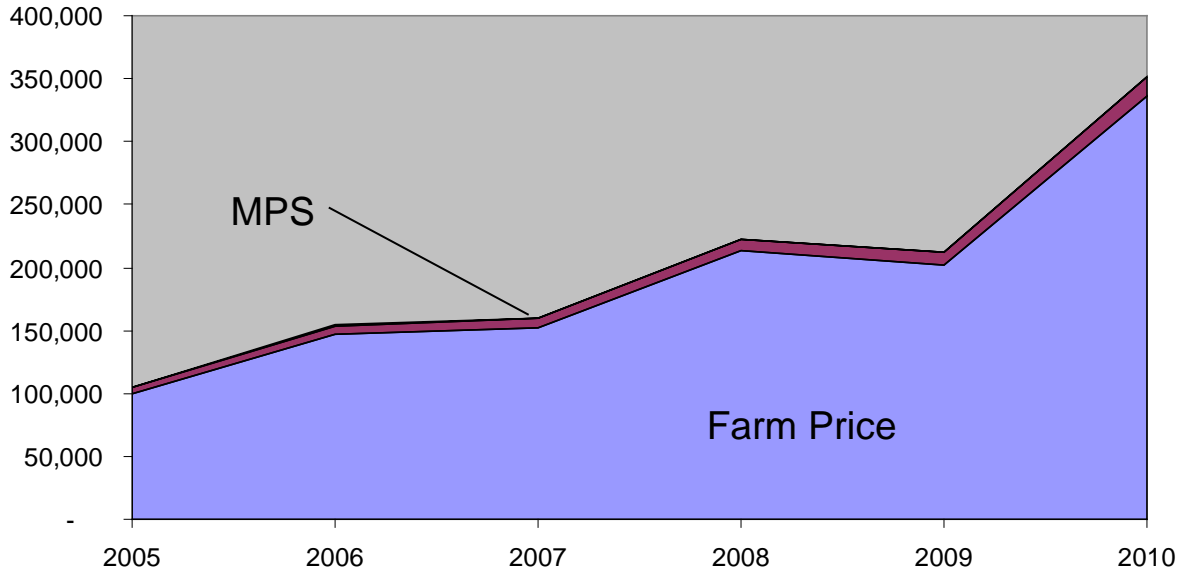
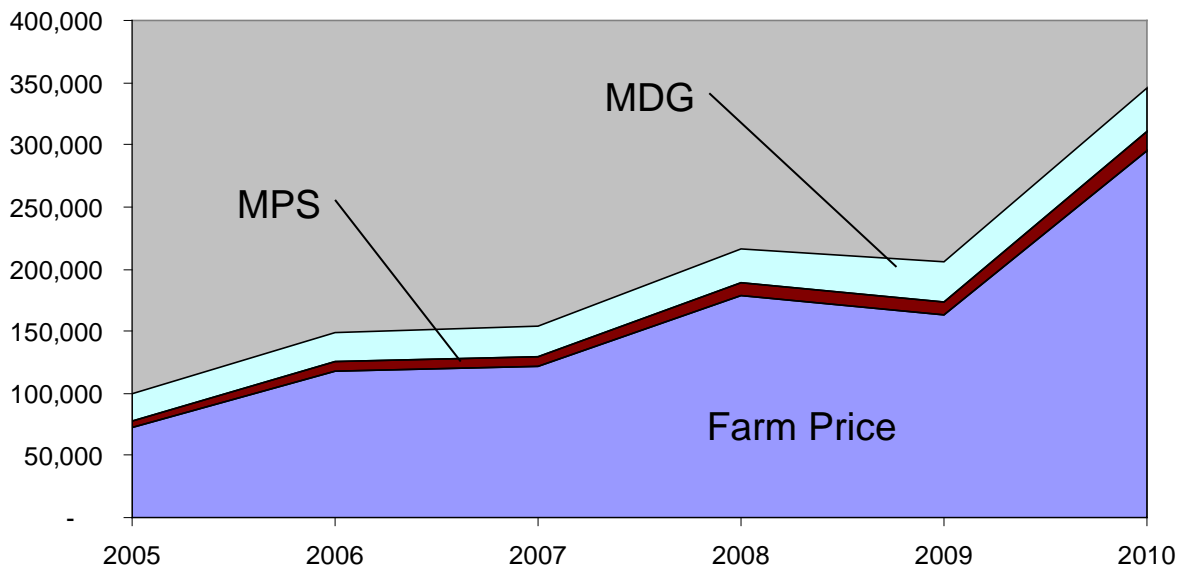


Figure 10

Smallholder coffee farm level prices: observed, reference and adjusted (Ksh/T)





## 5. PRELIMINARY CONCLUSIONS AND RECOMMENDATIONS

### MAIN MESSAGE

There are several features of coffee value chains in Kenya that have significant impacts on outcomes. Perhaps the most striking are:

- the dual structure of production split among cooperatives serving small-scale growers and large-scale coffee estates, with very little production by mid-size growers;
- the highly centralized and regulated marketing system and lack of marketing options or competitive structures;
- the practice of levying fees for research, the marketing board and rural roads;
- the dominant role of cooperatives serving small-scale growers;
- the long delays between the delivery of coffee cherry and payment for small-scale growers.

The Kenya coffee sector has been on a long “roller coaster” ride since independence with respect to coffee production, increasing rapidly to a peak in 1988 at a level 280% above the level in 1961. Coffee was one of the great success stories in Kenyan agriculture in those years. This was followed by a slow decline through the period 1989-2007, with a number of external and internal causes. The external factors include the collapse of the International Coffee Agreement accord on production quotas, which resulted in increased competition and lower prices in international markets. The internal factors include the lack of productivity growth in Kenya, the taxing of industry output for research, poor rural infrastructure, the operation of the coffee board and the high processing costs for cooperatives in the smallholder grower value chain.

The low productivity growth is related in part to the lack of success in developing new, resistant coffee varieties. Research for coffee in Kenya is undertaken by a national agency with little outside support. There are no research organizations like CGIAR to focus on coffee, nor is there a huge research program for developing countries that Kenya researchers can draw upon. Additionally, research in other African countries and the big coffee producers, such as Brazil and Columbia, may not be readily accessible to Kenyan researchers. Kenya estates and small-scale growers use the same varieties, so this is an issue affecting both value chains.

The levies on production are all for functions normally provided by government. The World Trade Organization allows countries to classify research, market promotion and infrastructure as green box support and does not count it in its aggregate measure of support. Similarly, the OECD monitoring and evaluation database would classify these expenditures as part of its General Services Support Estimate and not part of their Producer Support Estimate. Such fees are only rarely charged in developed countries. Eliminating them would eliminate a disincentive affecting both small-scale and estate growers. The size of this levy (4%) is deceptive. At the farm level, it is an effective output tax of 5-7%. For many agricultural commodities, 5-7% could be 25-50% of their profit margin.

The dual production structure results in significantly different on-farm cost structures. The estates have better access to capital and inputs, use more fertilizer, pesticides and irrigation and obtain

much higher yields. The estates also manage their own primary processing and are able to control processing costs.

Small-scale growers, in contrast, rely on one or more local cooperatives for primary processing. The limited choice in processing for small-scale growers means that there is little market pressure on cooperative managers to control costs and improve efficiency. The long time period between delivery of cherry and payment for green coffee beans sold at auction also creates a lack of transparency and a disincentive for smallholder farmers. Individual growers have no way of knowing that their payment reflects the quality of the coffee they delivered.

Undoubtedly, many of these factors are linked together. For instance, the levies for research, the marketing boards and rural infrastructure seem to require a regulatory system to ensure payment. The delays in payment seem to be related to the centralized marketing system in which growers retain ownership until sales of green beans.

There was some limited liberalization introduced in Kenya in 2006 that allows direct grower marketing, but largely within the existing highly regulated framework. However, this liberalization is not reflected in the indicators. The current marketing system was established in the 1960s and may have been appropriate as a means of protecting small-scale growers, but the situation is much different today. Much better information on markets is available to growers through media and cell phones. Transportation and infrastructure is also much improved.

## **PRELIMINARY RECOMMENDATIONS**

First, Kenya could benefit from an even more liberalized system such as that implemented in Uganda. According to Baffes:

“During the late 1980s, the sector [in Uganda] went through a liberalization process, which, coupled with high world prices, led to considerable supply response, with exports exceeding 4 million bags in two consecutive years (1995 and 1996), the only time in the sector’s history. By all accounts, the reforms have been successful. Producers’ share of export prices doubled and growers receive payments promptly<sup>4</sup>.”

At the same time, the Kenya auction system seems to be a component of Kenya’s value chain that does work well. It provides an extremely transparent mechanism to determine price at the wholesale level, with incentives to produce the high quality coffee for which Kenya is known. Kenya policymakers could benefit from an exchange with their counterparts in Uganda and other neighboring countries on the elements of their very different marketing systems that work well and deliver better prices to growers.

Second, with substantially further liberalization, a different system for funding and managing research for coffee in Kenya is needed. An evaluation of alternative models should be carried out to determine options to improve outcomes. The evaluation could consider options such as moving coffee research under the KARI umbrella, expanding means to increase international cooperation

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<sup>4</sup> John Baffes, “Restructuring Uganda’s coffee industry: Why going back to the basics matters”, Development Policy Review, vol. 24, pp. 413-36. Also published as World Bank Policy Paper 4020, October 2006.

and recognition internationally that commercial crops like coffee are income generating activities with possibly high returns that need support, especially in the area of research.

## LIMITATIONS

All conclusions provided are contingent on the quality of the data. Kenya data at auction and at the border appears to be decent quality, but average border prices are lower than auction prices in 2008 and appear too low throughout 2006-2010. This issue needs further investigation.

The data on value chain costs are nearly ten years old. They have been updated with various price indices, which should be anchored on some more recent direct estimates of cost. One reassuring indication was the cherry price reported by one single small-scale grower for 2009/2010 almost exactly matched our corresponding price for green coffee beans in 2010.

## FURTHER INVESTIGATION AND RESEARCH

There are a number of areas where further work would be useful:

- Auction to border market access costs and the link between export prices and auction prices;
- More recent data on primary and secondary market access costs;
- Evaluation of alternative marketing systems, especially those which may provide more choices to producers, including an immediate payment for cherry.

|  |
|--|
| <p>This preliminary draft was prepared by Cameron Short (FAO). Supplementary data and information were provided by the MAFAP team Nairobi (Kenya). Preliminary comments, inputs and suggestions were provided by Jesús Barreiro-Hurle (FAO).</p> |
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## **ANNEX I: Methodology Used**

A guide to the methodology used by MAFAP can be downloaded from the MAFAP website or by clicking [here](#).

## ANNEX II. DATA AND CALCULATIONS USED IN THE ANALYSIS

|                        |            |
|------------------------|------------|
| Name of product        | SMH Coffee |
| International currency | US\$       |

|                |     |
|----------------|-----|
| Local currency | Ksh |
|----------------|-----|

| DATA   | Unit                                       | Symbol  | Year<br>trade status  | 2005       | 2006       | 2007       | 2008       | 2009       | 2010       |
|--|--|---|-----------------------|------------|------------|------------|------------|------------|------------|
|  |  |   |                       | x          | x          | x          | x          | x          | x          |
| <b>Benchmark Price</b>                               |  |   |                       |            |            |            |            |            |            |
| 1  | Observed                                   | US\$/TON  | P <sub>b(int\$)</sub> | 2,553.58   | 2,770.84   | 2,807.97   | 3,529.68   | 3,299.13   | 4,752.87   |
| 1b   | Adjusted                                   | US\$/TON  | P <sub>ba</sub>       | 2,553.58   | 2,770.84   | 2,807.97   | 3,529.68   | 3,299.13   | 4,752.87   |
| <b>Exchange Rate</b>                                 |  |   |                       |            |            |            |            |            |            |
| 2  | Observed                                   | Ksh/US\$  | ER <sub>o</sub>       | 75.55      | 72.10      | 67.32      | 69.18      | 77.35      | 79.23      |
| 2b   | Adjusted                                   | Ksh/US\$  | ER <sub>a</sub>       | 75.55      | 72.10      | 67.32      | 69.18      | 77.35      | 79.23      |
| <b>Access costs border - point of competition</b>    |  |   |                       |            |            |            |            |            |            |
| 3  | Observed                                   | Ksh/TON   | ACo <sub>wh</sub>     | 27,094.17  | 28,412.79  | 29,700.35  | 34,014.93  | 35,249.80  | 36,785.27  |
| 3b   | Adjusted                                   | Ksh/TON   | ACa <sub>wh</sub>     | 26,943.37  | 28,247.79  | 29,535.01  | 33,816.35  | 35,072.30  | 36,600.52  |
| 4  | Domestic price at point of competition     |   | P <sub>dwh</sub>      | 125,737.15 | 174,484.02 | 181,838.40 | 245,185.00 | 239,234.30 | 375,073.89 |
| <b>Access costs point of competition - farm gate</b> |  |   |                       |            |            |            |            |            |            |
| 5  | Observed                                   | Ksh/TON   | ACo <sub>fg</sub>     | 53,719.89  | 56,131.78  | 60,164.46  | 65,965.56  | 76,224.06  | 79,912.54  |
| 5b   | Adjusted                                   | Ksh/TON   | ACa <sub>fg</sub>     | 31,301.24  | 32,850.38  | 34,923.90  | 38,755.96  | 43,419.27  | 45,478.04  |
| 6  | Farm gate price                            |   | P <sub>dfg</sub>      | 72,017.26  | 118,352.24 | 121,673.94 | 179,219.45 | 163,010.25 | 295,161.36 |
| 7  | Externalities associated with production   |   | E                     | -          | -          | -          | -          | -          | -          |
| 8  | Budget and other product related transfers |   | BOT                   | -          | 3,402.99   | 3,148.87   | 4,321.60   | 3,824.44   | 9,974.13   |
|  |  | Quantity conversion factor (border - point of competition)    | QT <sub>wh</sub>      | 0.82       | 1.05       | 1.16       | 1.18       | 1.12       | 1.14       |
|  |  | Quantity conversion factor (border - point of competition)    | QL <sub>wh</sub>      | 1.00       | 1.00       | 1.00       | 1.00       | 1.00       | 1.00       |
|  |  | Quantity conversion factor (point of competition - farm gate) | QT <sub>fg</sub>      | 1.00       | 1.00       | 1.00       | 1.00       | 1.00       | 1.00       |
|  |  | Quantity conversion factor (point of competition - farm gate) | QL <sub>fg</sub>      | 1.00       | 1.00       | 1.00       | 1.00       | 1.00       | 1.00       |

|                        |               |
|------------------------|---------------|
| Name of product        | Estate Coffee |
| International currency | US\$          |

|                |     |
|----------------|-----|
| Local currency | Ksh |
|----------------|-----|

| DATA   | Unit  | Symbol   | Year<br>trade status  | 2005             | 2006       | 2007       | 2008       | 2009       | 2010       |            |
|--|---|----------|-----------------------|------------------|------------|------------|------------|------------|------------|------------|
|  |   |          |                       | x                | x          | x          | x          | x          | x          |            |
| <b>Benchmark Price</b>                               |   |          |                       |                  |            |            |            |            |            |            |
| 1  | Observed  | US\$/TON | P <sub>b(int\$)</sub> | 2,553.58         | 2,770.84   | 2,807.97   | 3,529.68   | 3,299.13   | 4,752.87   |            |
| 1b   | Adjusted  | US\$/TON | P <sub>ba</sub>       | 2,553.58         | 2,770.84   | 2,807.97   | 3,529.68   | 3,299.13   | 4,752.87   |            |
| <b>Exchange Rate</b>                                 |   |          |                       |                  |            |            |            |            |            |            |
| 2  | Observed  | Ksh/US\$ | ER <sub>o</sub>       | 75.55            | 72.10      | 67.32      | 69.18      | 77.35      | 79.23      |            |
| 2b   | Adjusted  | Ksh/US\$ | ER <sub>a</sub>       | 75.55            | 72.10      | 67.32      | 69.18      | 77.35      | 79.23      |            |
| <b>Access costs border - point of competition</b>    |   |          |                       |                  |            |            |            |            |            |            |
| 3  | Observed  | Ksh/TON  | ACo <sub>wh</sub>     | 27,094.17        | 28,412.79  | 29,700.35  | 34,014.93  | 35,249.80  | 36,785.27  |            |
| 3b   | Adjusted  | Ksh/TON  | ACa <sub>wh</sub>     | 26,943.37        | 28,247.79  | 29,535.01  | 33,816.35  | 35,072.30  | 36,600.52  |            |
| 4  | Domestic price at point of competition                        |          | Ksh/TON               | P <sub>dwh</sub> | 125,737.15 | 174,484.02 | 181,838.40 | 245,185.00 | 239,234.30 | 375,073.89 |
| <b>Access costs point of competition - farm gate</b> |   |          |                       |                  |            |            |            |            |            |            |
| 5  | Observed  | Ksh/TON  | ACo <sub>fg</sub>     | 26,440.43        | 27,547.46  | 29,586.43  | 32,383.52  | 37,619.72  | 39,438.27  |            |
| 5b   | Adjusted  | Ksh/TON  | ACa <sub>fg</sub>     | 26,376.47        | 27,477.48  | 29,516.30  | 32,299.29  | 37,544.44  | 39,359.91  |            |
| 6  | Farm gate price   |          | Ksh/TON               | P <sub>dfg</sub> | 99,296.72  | 146,936.56 | 152,251.97 | 212,801.48 | 201,614.58 | 335,635.63 |
| 7  | Externalities associated with production                      |          | Ksh/TON               | E                | -          | -          | -          | -          | -          | -          |
| 8  | Budget and other product related transfers                    |          | Ksh/TON               | BOT              | -          | -          | -          | -          | -          | -          |
|  | Quantity conversion factor (border - point of competition)    |          | Fraction              | QT <sub>wh</sub> | 0.82       | 1.05       | 1.16       | 1.18       | 1.12       | 1.14       |
|  | Quality conversion factor (border - point of competition)     |          | Fraction              | QL <sub>wh</sub> | 1.00       | 1.00       | 1.00       | 1.00       | 1.00       | 1.00       |
|  | Quantity conversion factor (point of competition - farm gate) |          | Fraction              | QT <sub>fg</sub> | 1.00       | 1.00       | 1.00       | 1.00       | 1.00       | 1.00       |
|  | Quality conversion factor (point of competition - farm gate)  |          | Fraction              | QL <sub>fg</sub> | 1.00       | 1.00       | 1.00       | 1.00       | 1.00       | 1.00       |



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