



Prioritizing Policies for Driving Inclusive Agricultural Transformation: Kenya

Value Chain Deep Dive Report: Coffee

October 2021



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This publication is a technical report by the Bureau for Food and Agricultural Policy (BFAP), Tegemeo Institute of Agricultural Policy and Development (Tegemeo) in Kenya, the International Food Policy Research Institute (IFPRI) in the United States of America, and the Alliance for a Green Revolution for Africa (AGRA) in Kenya. It represents the second output under the Policy Prioritisation through Value Chain Analysis (PPVC) project and relates to the Deep Dive analysis into Aquaculture in Kenya.

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DIVING INTO THE REPORT

1. INTRODUCTION

The development and prioritization of appropriate and effective policies and public sector investments to drive inclusive agricultural transformation is high on the agenda in most African countries. In recent years there has been a significant shift in the policy context. Whereas the focus in the past has mainly been on increasing productivity at the farm level, the rapid rate of urbanisation and changing diets is putting greater strain on food systems, and market dynamics and private sector investment are becoming much more important.

In Kenya, the Ministry of Agriculture, Livestock and Fisheries (MoAL&F) is implementing the Agricultural Sector Transformation and Growth Strategy (ASTGS) and supporting the Presidential vision of the Big Four initiative. Both policies seek to accelerate agricultural production and agro-processing, achieve food and nutritional security, improve farmer and local community incomes, lower the cost of food, and increase employment, especially for women and young people. Under the ASTGS Flagship 8 seeks to strengthen research and innovation, with a focus on developing tools for better decision-making and supporting evidence-based policy development, planning, prioritisation and monitoring.

In response to a request for support from the Ministry, the Alliance for a Green Revolution for Africa (AGRA), in collaboration with the Bureau for Food and Agricultural Policy (BFAP), the International Food Policy Research Institute (IFPRI) and the Tegemeo Institute at Egerton University have initiated a project called the Policy Prioritisation through Value Chain Analysis (PPVC). This project uses a set of methodological tools to identify the impact of specific investment and policy interventions in value chains that have been identified under the ASTGS and Big Four Agenda. Through the PPVC approach investments and policy interventions in specific value chains can be determined and ranked according to their impact on agricultural production, employment, farm incomes, dietary and gender transformation and smallholder inclusiveness.

In a first output of the PPVC project (see Box 1), preliminary value chain scan and field investigation data were combined with Partial Equilibrium and Computable General Equilibrium modelling outputs to present a list of 12 prioritised value chains. These were ranked according to the PPVC criteria of Market Led Potential, Inclusivity, Transformation Potential and a Value Chain scan that provides qualitative information and a combined ranking on policy support, investment support, scalability and agro-ecological suitability. From the list of 12 value chains, three were chosen by the Kenyan Government for Deep Dive analysis, namely coffee, aquaculture and beef.



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Coffee is one of the major cash crops in Kenya and is the fourth biggest contributor to Kenya's foreign exchange earnings after tourism, tea and horticultural produce. It is an important economic activity in terms of income generation, employment creation, foreign exchange earnings and tax revenue. However, green bean coffee production has declined from an all-time high of 130 000 tonnes in 1988 to the current 41 375 million tonnes. In the last three decades the sector has faced several challenges. These include the lack of governance and transparency to provide affordable credit to farmers, inadequate transportation and communication (poor infrastructure), old farming and processing infrastructure, ageing varieties, poor banking infrastructure and poorly managed cooperatives, compounded by the various amendments to the International Coffee Agreement (ICA) since the 1980s, which resulted in the removal of the quota system to regulate price through supply and demand controls.

Coffee has been recognized as an important crop that provides income to many smallholder farmers in Kenya. It has been included in the Government's efforts towards the fight against poverty and is central in the agricultural sector's contribution towards the realization of Vision 2030. In 2016, the President emphasised that all necessary support will be provided to achieve the national coffee goals. On this basis, the Ministry of Agriculture and the Office of the President have selected coffee as one of the value chains for achieving the Agricultural Sector Transformation and Growth Strategy (ASTGS) and the Big Four Agenda targets using market-based approaches.

The current study on the coffee value chain aims to identify key areas that require policy and programmatic public and private interventions that will unlock potential for the growth and development of the Coffee Industry.

1.1. Global context

Coffee is the third most consumed beverage in the world, after water and tea. There are roughly seventy coffee producing countries in the world; however, only fifty six (exporting) countries are reported by the International Coffee Organization (ICO). The prime location for coffee growth is called the Bean Belt, an area between latitudes 25° N and 30° S. Coffee grows best in warm locations, therefore extreme areas, in relation to the North and South poles are not ideal for growth. Each variety has specific growing requirements, (i.e. altitude and temperature) which ultimately impacts the quality and flavour of the coffee.

Coffee is an important source of foreign export earnings across the world. According to the Food and Agricultural Organization (FAO) of the United Nations (n.d.), most coffee growing nations are either low-income or middle-income countries. Although coffee is grown and exported by developing countries (more than 50), consumption is dominated by industrialised / developed countries. Brazil is the largest coffee producer in the world, followed by Colombia. Only two of more than 80 coffee varieties are grown commercially around the world, in a range of production systems. These are Arabica and Robusta, which require slightly different agro-climatic



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conditions, with some overlap. In addition, specific varieties are bred in-country to develop cultivars more suitable for production conditions and to achieve improved pest resistance.

Arabica grows best in tropical regions, at cooler, higher altitudes (between 1000 and 2000 metres), while Robusta grows from sea level up to 1000 metres. An annual rainfall of at least 1600mm is required for growth of both varieties. Robusta is cheaper and easier to grow relative to Arabica, and it is generally considered to be lower quality coffee. For this reason, Robustas are normally used for instant coffees or blended with Arabica, resulting in cheaper blends sold in less discerning markets (Marsh, 2007). However, Robusta can yield up to twice as many green beans per hectare than a comparable Arabica production system. Arabica accounts for 70% of total global coffee production. Under best practice production and processing systems, and where marketing requirements are met, Arabica has the potential to achieve higher farm gate and world market prices than Robusta.

The top ten global producers and consumers of coffee are listed in Table 1, while global imports and exports are shown on Figure 1 and Figure 2.

TABLE 1: TEN TOP GLOBAL PRODUCERS AND CONSUMERS OF COFFEE

Country	Production %	Country	Consumption %
Brazil	37	Finland	12.0
Viet Nam	18	Norway	9.9
Colombia	8	Iceland	9.0
Indonesia	6	Denmark	8.7
Ethiopia	5	Netherlands	8.4
Honduras	4	Sweden	8.2
India	3	Switzerland	8.2
Uganda	3	Belgium	6.8
Mexico	3	Luxembourg	6.5
Peru	2	Canada	6.5

Source: ICO, 2020 & World Population Review, 2021



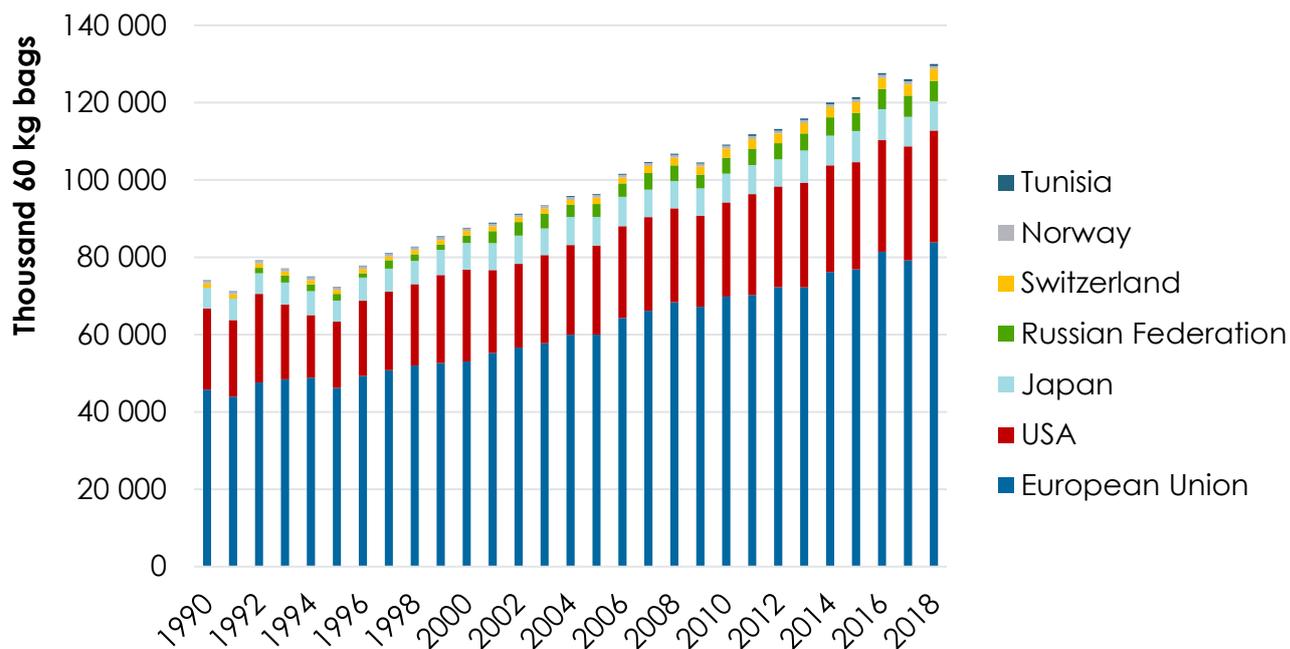


FIGURE 1: GLOBAL COFFEE IMPORTS OVER TIME

Source: ICO, 2020

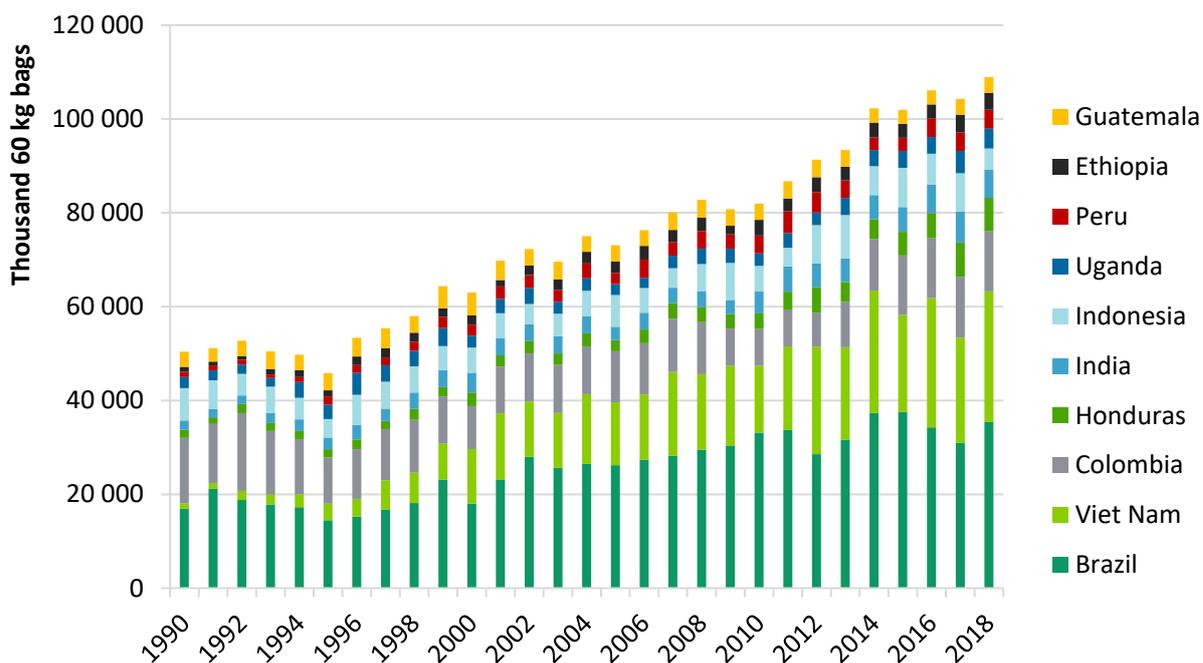


FIGURE 2: TEN TOP GLOBAL COFFEE EXPORTERS

Source: ICO, 2020

¹ EU grouping for global imports are: Australia, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden and the United Kingdom

Individual countries have gained comparative advantages either by implementing unique and specialized production practices or by the countries' geographic location. Brazil, Indonesia and Honduras are excellent examples of specialized systems and favoured geographic location. Brazil has mastered production by way of dry processing - beans are not cleansed using water (wet processing) but through the dehydration of natural heat (air drying). Indonesia produces some of the most expensive coffee beans in the world, an advantage achieved from specialized growing and production. An example of one of the priciest coffee beans in the world is the Kopi Luwak bean produced in Indonesia through specialized growing and roasting methods. Honduras also has a comparative advantage compared to other coffee producing nations. Their success is achieved particularly through highly suitable production regions, which are higher than the minimum altitude necessary for coffee growth.

While the countries in Table 1 are listed as the ten top global producers by total volume, the ICO reports global production by harvesting season. There are three different harvesting seasons, resulting in three different groups, as classified by the ICO: the April group (14 countries), the July group (7 countries) and the October group (36 countries). The ten top producers of each group are listed in Table 2. Both Arabica and Robusta are grown in all three seasons, in combination or exclusively.

TABLE 2: GLOBAL COFFEE PRODUCTION BY CROP SEASON

April Group	July Group	October Group
Brazil	Tanzania	Viet Nam
Indonesia	Dominican Republic	Colombia
Peru	Haiti	Ethiopia
Paupau New Guinea	Philippines	Honduras
Ecuador	Cuba	India
Madagascar	Zambia	Uganda
Rwanda	Congo	Mexico
Burundi		Guatemala
Timor-Leste		Nicaragua
Bolivia		Côte d'Ivoire

Source: ICO, 2020

Global coffee supply and demand patterns largely drive world prices. The ICO established a global indicator price system in 1965. According to the International Trade Centre (ITC) (2020), the system provides a reliable and consistent procedure for reporting prices for different types of coffee and an overall composite price that reflects aggregated daily coffee price movements.

The ICO indicator system is based on four different price groups, namely Colombian mild Arabicas, other mild Arabicas, Brazilian and other natural Arabicas, and Robustas. According to the ITC (2020), the current calculation method for international coffee indicator prices was adopted in October 2000. The price is derived by taking a weighted average of the indicator prices for the four separate groups, weighted according to their relative shares in international trade. In the old method, the composite was a straight average of the other milds and robusta group indicator prices. Global price movements are shown in Figure 3 and Figure 4 below.

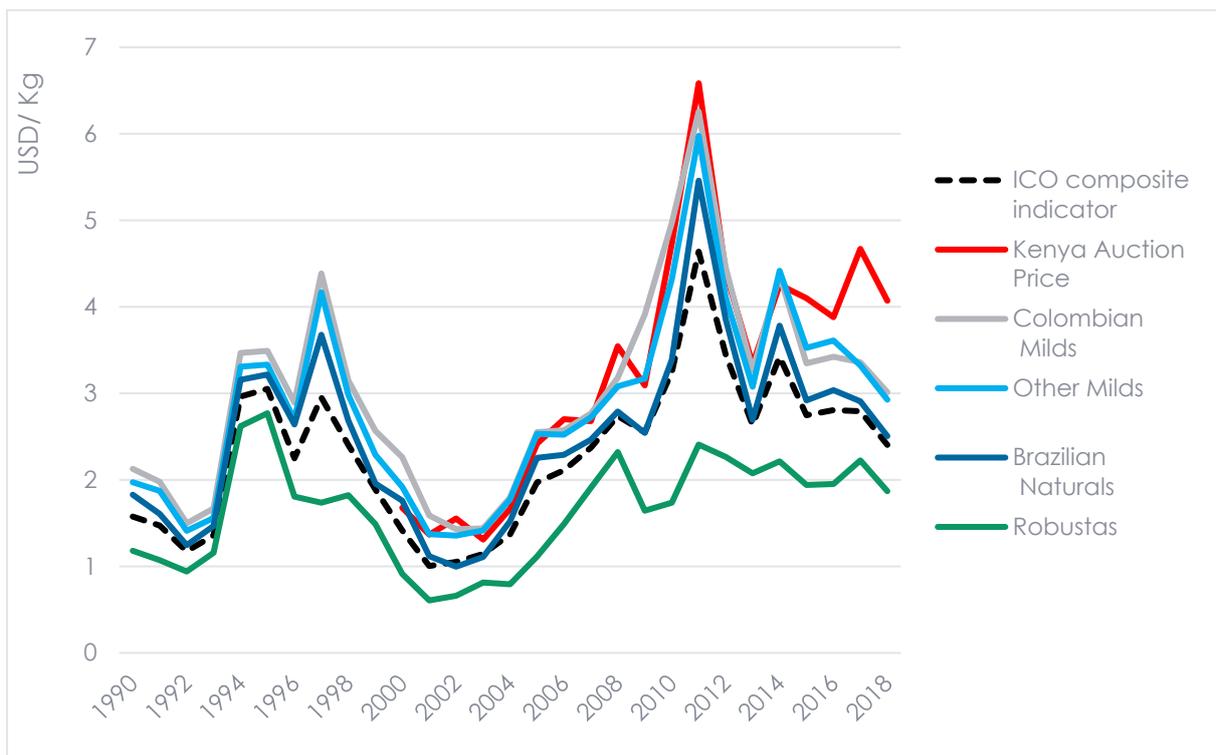


FIGURE 3: INTERNATIONAL COFFEE PRICES ACCORDING TO TYPE

Source: ICO, 2020

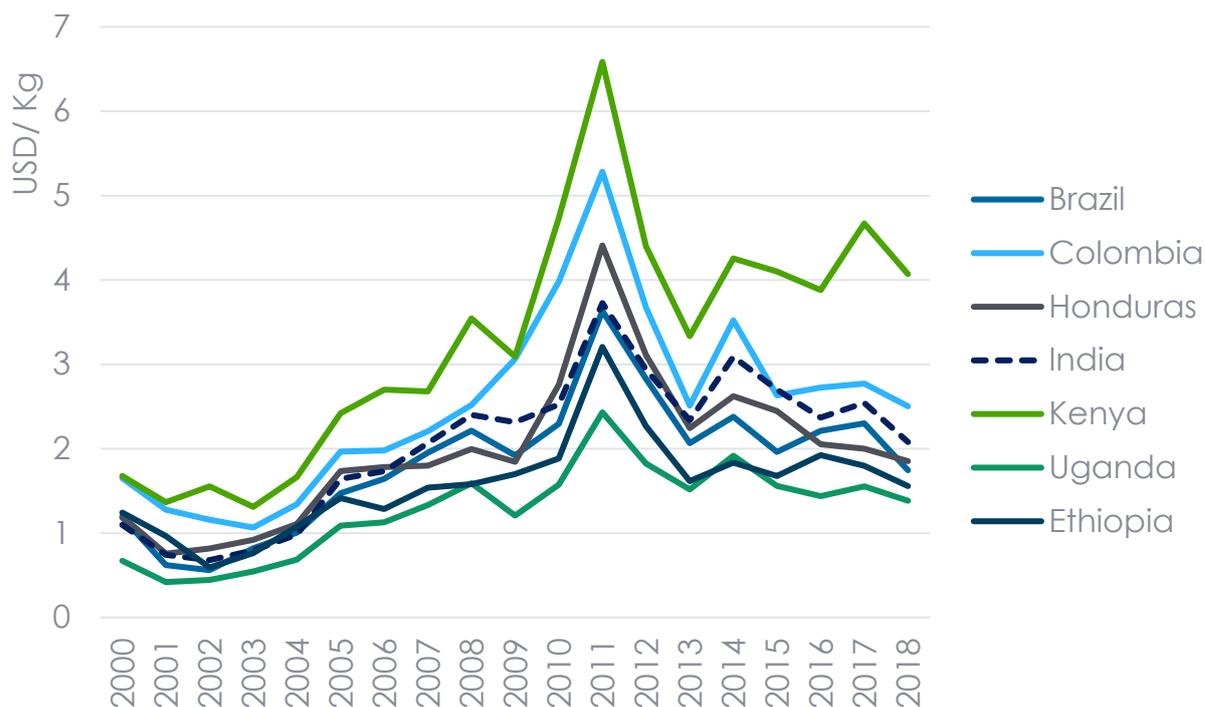


FIGURE 4: AVERAGE GROWER PRICES PER COUNTRY
 Source: ICO, 2020

1.2. Regional context

Ethiopia is the top coffee producing nation on the African continent, followed by Uganda, Cote d'Ivoire, Tanzania and Kenya. In East Africa, Ethiopia and Uganda dominate the region in coffee production, together accounting for 62% of Sub-Saharan African coffee output. Ivory Coast is West Africa's largest producer and the third-largest in Sub-Saharan Africa. Table 3 **Error! Reference source not found.** shows the top producers and consumers of coffee in Africa. The varieties grown in each country, along with the processing methods used, are included in Table 4.

TABLE 3: AFRICA COFFEE PRODUCTION AND CONSUMPTION

Country	Production (%)	Country	Consumption (%)
Ethiopia	39	Ethiopia	29
Uganda	23	Algeria	18
Cote d'ivoire	13	Egypt	8
Tanzania	6	Sudan	7
Kenya	5	Morocco	6
Madagascar	3	South Africa	6
Cameroon	3	Tunisia	5
Others	14	Madagascar	4
		Cote d'ivoire	4
		Others	14

Source: World Economic Forum, 2015

TABLE 4: AFRICAN COFFEE PRODUCERS, VARIETIES AND PROCESSING METHODS

Country	Variety	Primary Processing
Angola	Robusta	Dry
Benin	Robusta	Dry
Burundi	Arabica	Wet
Central African Republic	Robusta	Dry
Congo	Robusta	Dry
Ethiopia	-	Wet & Dry
Gabon	Robusta	Dry
Ghana	Robusta	Dry
Guinea	Robusta	Dry
Equatorial Guinea	Robusta & Arabica	Dry
Ivory Coast	Robusta	Dry
Kenya	Arabica	Wet
Liberia	Robusta	Dry
Madagascar	Arabica & Robusta	Dry
Malawi	Arabica	Wet
Nigeria	Robusta & Arabica	Dry
Rwanda	Arabica	Wet
Sierra Leone	Robusta	Dry
Tanzania	Arabica & Robusta	Wet
Togo	Robusta	Dry
Uganda	Robusta	Dry
Zaire	Robusta & Arabica	Dry
Zimbabwe	Arabica	Wet

Source: FAO, n.d.



Ethiopia is also the sixth-largest coffee producer in the world. The industry employs approximately 15 million people and accounts for 28% of the country's total annual exports. Its production in 2017/18 reached 415 580 tonnes (green beans) with a steady growth occurring nearly every year since 2002. Uganda ranks eighth in the world with Robusta comprising 82% of the total production. Uganda's production in 2017/18 was 216 000 tonnes (green beans) and it is expected to increase as the country has eradicated wilt disease that wiped out a substantial number of trees. Uganda is also targeting the urban middle class and making the beverage more affordable and widely distributed throughout the country.

Although farmers in these two countries are facing challenges such as climate change, lack of support services like training and advice and high cost of inputs, the governments have initiated programs to help farmers. Jimma Agricultural Research Centre (JARC) in Ethiopia and the National Crops Resources Research Institute (NaCRRI) in Uganda helps to conduct vital research and provide farmers with pertinent growing information such as new coffee varieties which are more resistant to pests, diseases, and changing climate. Some of the challenges faced by African farmers are listed in table 5.

Under the Coffee Initiative programme in Tanzania and Rwanda by Technoserve with funding from the Bill and Melinda Gates Foundation, coffee productivity has increased. This was possible through field based agronomy training, partnerships with the private sector to provide credit to small scale farmers and improving the business viability, governance and quality management system of wet mills. It has been shown in the region that , in order to improve the coffee sector and increase productivity all areas of the value chain need to be addressed, ranging from increasing production at farm level, improved coffee processing methods, creating market linkages, policy reform and private sector investment.

Ethiopia grows Sidano and Harar Arabica varieties, while in Kenya fine Arabica beans are grown at high altitude around Mount Kenya and are in high demand. Key challenges faced by coffee-producing countries in Africa are summarised in Table 5.



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TABLE 5: LIMITATIONS FACED BY AFRICAN COFFEE GROWERS

Challenge	Cause
Agronomic practices	Poor practices Insufficient extension support
Research and development linkages	Poor linkages between farmers, extension workers and research institutions (variety development / improvement?)
Processing methods	Insufficient quality and availability of water for wet processing, which yields better quality coffee
Affordable credit	Credit mostly available from commercial banks, with high interest rates- affordability of inputs
Costly inputs	Costs of imported inputs (i.e. fertiliser) passed on to the farmer
Limited & costly access to market	Lack and quality of infrastructure linking producers to markets inflate costs.
Price laddering	Various middle-men actors & facilitators in the chain including aggregators, millers, cooperatives, marketers and traders etc.; all require compensation as a % of the value of coffee which leads to either inflated coffee prices or a diminished proportion attributable to the farmer.

Source: FAO, n.d.

Per capita coffee consumption of coffee in Africa is very low, with leading consumer Ethiopia at 2.27kg, Madagascar at 1kg followed by Cote d'Ivoire at 0.9kg while EU citizens consume nearly 9 kg per capita (WEF, 2015). Figure 5 illustrates leading coffee import and export countries in Africa.

Nevertheless, the emerging urbanised middle class is driving up local consumption of coffee in Africa, as reflected by the growing presence of local coffee shop chains such as Java café and Dorman's Kenya Art coffee. Dorman's is a local player in Kenya with a presence along the entire coffee value chain from regional bean sourcing to roasting and retail.

In Kenya domestic consumption remains low at less than 7% of the total production. This is attributed to the predominance of the tea drinking culture and relative non-affordability of coffee due to low purchasing power for the majority of the population.

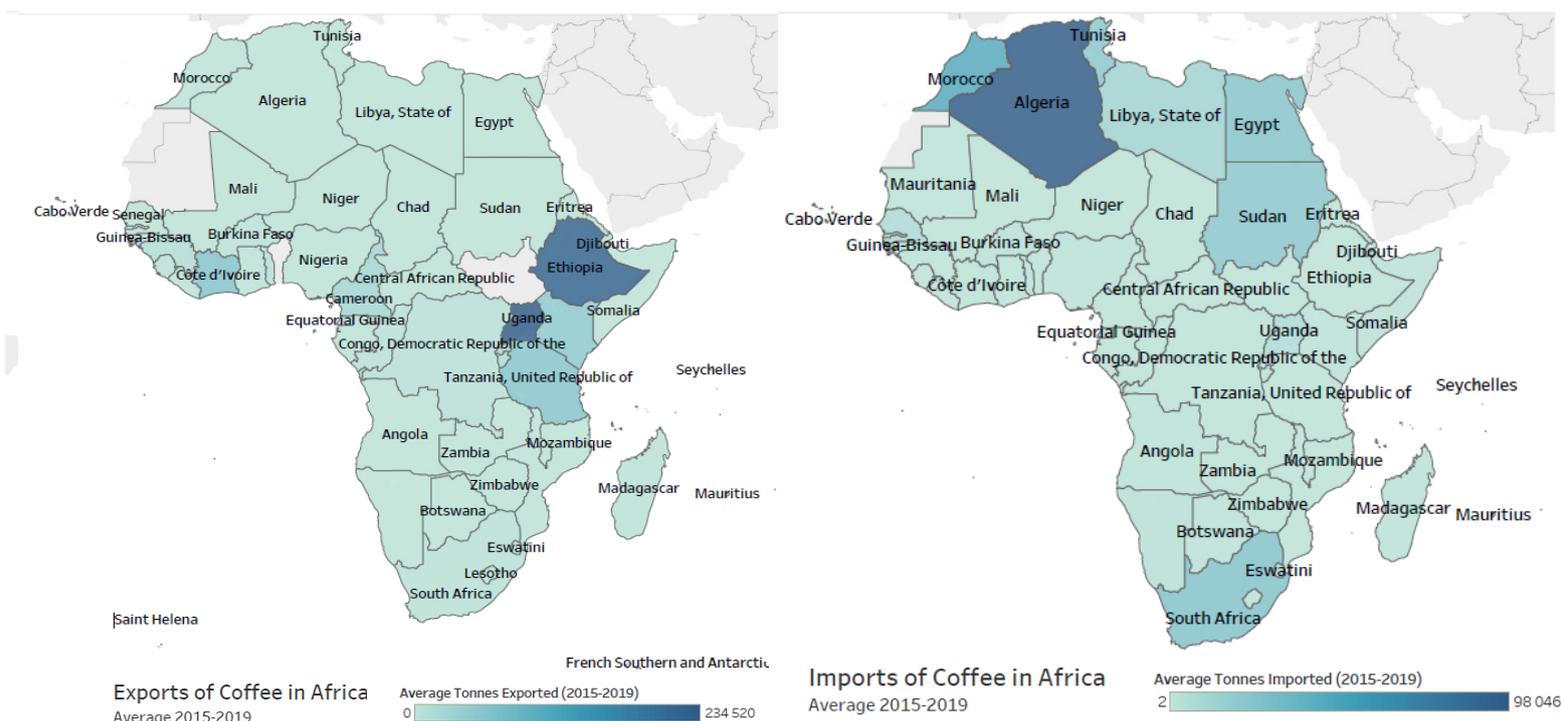


FIGURE 5: COFFEE IMPORTS AND EXPORTS IN AFRICA

Source: Trademap, 2020

1.3 Domestic market

1.3.1 Supply and demand

Coffee was first introduced in Kenya in 1893 by French missionaries, after which the British settlers invested heavily, making it a major Kenyan export. The coffee farmers formed the Planters Union of Kenya in 1917 to collectively lobby the government, and were instrumental in making Kenya move up the value chain and export semi-processed coffee. The Coffee Board of Kenya (CBK) was formed in 1934 to help stabilize the industry after a sharp decline in production during the Great Depression. The CBK was also meant to regulate production and marketing of coffee upon enactment of the Coffee Act (1933). Additionally, the CBK was charged with the responsibility of promoting the coffee industry to give Kenyan Coffee an identity and distinct global market positioning in collaboration with coffee sector stakeholders. However, Kenyans were not allowed to own or manage coffee farms until 1934 when the British Colonial Board allowed Kenyans to manage small-scale coffee farms with limits on farm size, number of trees and farm location.

The Kenya Planters Cooperative Union (KPCU) was formed in 1937 to represent the interests of small farmers. Together with CBK, they continued to play a significant role in the performance of the coffee industry even after Independence. The government in addition established the Coffee Development Authority (CDA) in 1964 to support cooperatives and small farmers, providing farmers with technical assistance to provide loans to coffee cooperatives. The introduction of the World Bank Structural Adjustment Programs in the mid-1980s brought changes in the sector, including the withdrawal of government from cooperative management and ending its financial support to cooperatives, the KPCU and the Coffee Research Foundation (CRF). In 1999, regulation of upstream processes was made more liberal, allowing growers to choose among pulping factories, millers, and marketing agents. In 2001, CBK's role as regulator was reduced and in 2006, the coffee auction was privatized with a portion of coffee allowed to bypass the auction process and be sold directly to exporters.

Production

The coffee industry in Kenya played a key role in the agricultural sector, contributing significantly towards Kenya's economy through foreign exchange earnings, family farm incomes, employment creation and food security. In 2017 the value of coffee as a percentage of all export goods represented 5.5% while its percentage contribution to GDP was 0.21%. The industry contributes an average of KShs 23 billion (US\$ 205.27 million) per year in foreign exchange earnings, ranking fourth after tourism, tea and horticulture. Therefore, the government recognizes the strategic role played by the sector in the economic empowerment of coffee farmers and service providers.

From its introduction in 1893, the area under coffee increased steadily to 170 000ha in 2000 before dropping down to 115 000 hectares in 2018. In the same period the production declined from 60 000 tonnes (green beans) to 41 000 tonnes (green beans) as indicated in Figure 6 below. The export earnings also declined from US\$500 million in the 1990s to less than US\$150 million in 2015. The productivity per tree also declined to an average 2kg/tree/annum against a potential average of 30 kg/tree/annum². During this time many farmers uprooted coffee trees due to low returns, high costs of inputs, limited credit access and poor institutional governance.

² Data from AFA shows that the average yield per tree per year ranges from 0.2 kg to 0.4 kg depending on variety



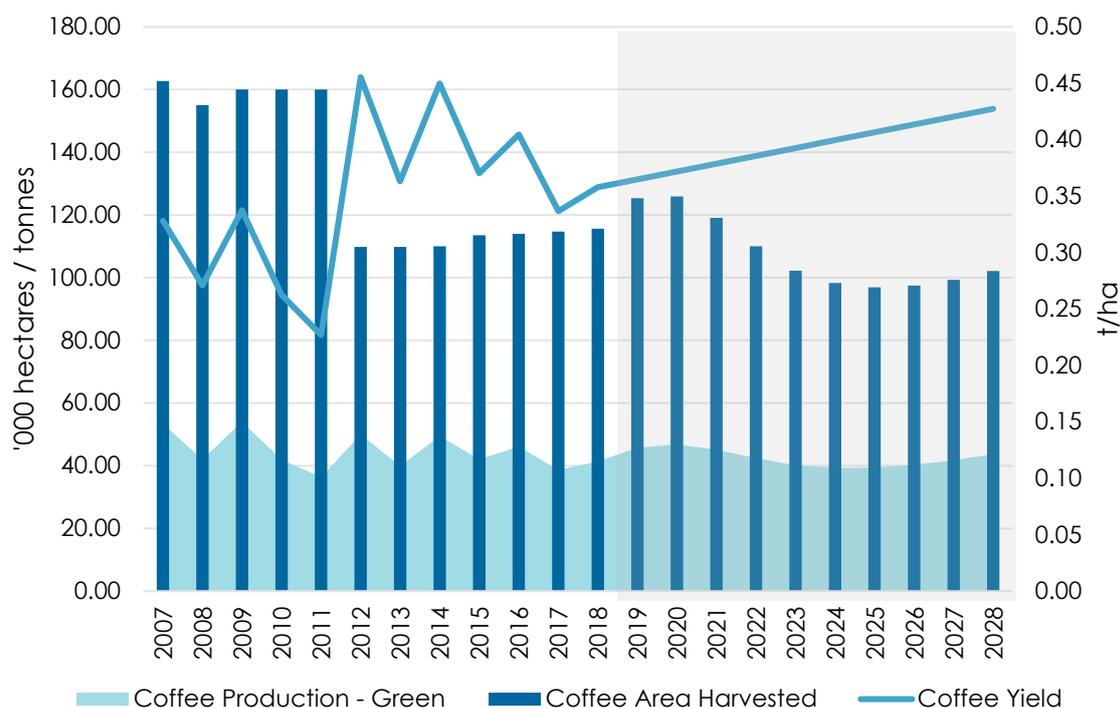


FIGURE 6: COFFEE PRODUCTION IN KENYA

In Kenya, coffee is produced in two main modes of production, namely smallholder production organized into cooperatives and coffee estates, which are individually managed coffee plantations. The coffee sub-sector supports more than 800 000 smallholder farmers in 525 coffee cooperative societies and 3 000 estates (AFA, 2018) which are categorized as small, medium and large as indicated in Figure 7 below. Coffee is grown in the highlands of Kenya, between 1400-2000 meters above sea level. The Central, Eastern, Rift Valley and Coast Regions are the major producing areas. The Mount Kenya region, Aberdare ranges, and Machakos areas account for 70 percent of the Coffee production with close to 45 percent of the population in these counties directly dependent on coffee earnings (Mureithi, 2008). Coffee producing areas contain about 45 percent of Kenya's population, estimated at 46.4 million. Table 6 shows the various distributions of coffee holdings and Figure 7 graphically represents the production and area per grower type.

Coffee is currently grown in 32 counties, with cooperatives accounting for 90 415ha and estates 25 155ha.

Kenya's coffee production continues to be increasingly smallholder dominated as large plantations, especially in the growing areas that border urban centres, are giving way to housing developments. In addition, the sector continues to grapple with other challenges, including increasing cost of labour and inputs; erratic weather conditions; high incidences of pests and diseases; competition from other farm enterprises; and poor governance of marketing cooperatives.

TABLE 6: DISTRIBUTION OF COFFEE HOLDINGS

Sector	Size of acreage	Number of farmers	Share of total farmers
Small holder affiliated	Varies	800,000	99.63%
Estates holdings			
Small estates	5-20 acres	2,400	0.30%
Medium estates	20-50 acres	500	0.06%
Large estates	Over 50 acres	100	0.01%
Total number of coffee farmers		803,000	100%

Source: ICO, 2019

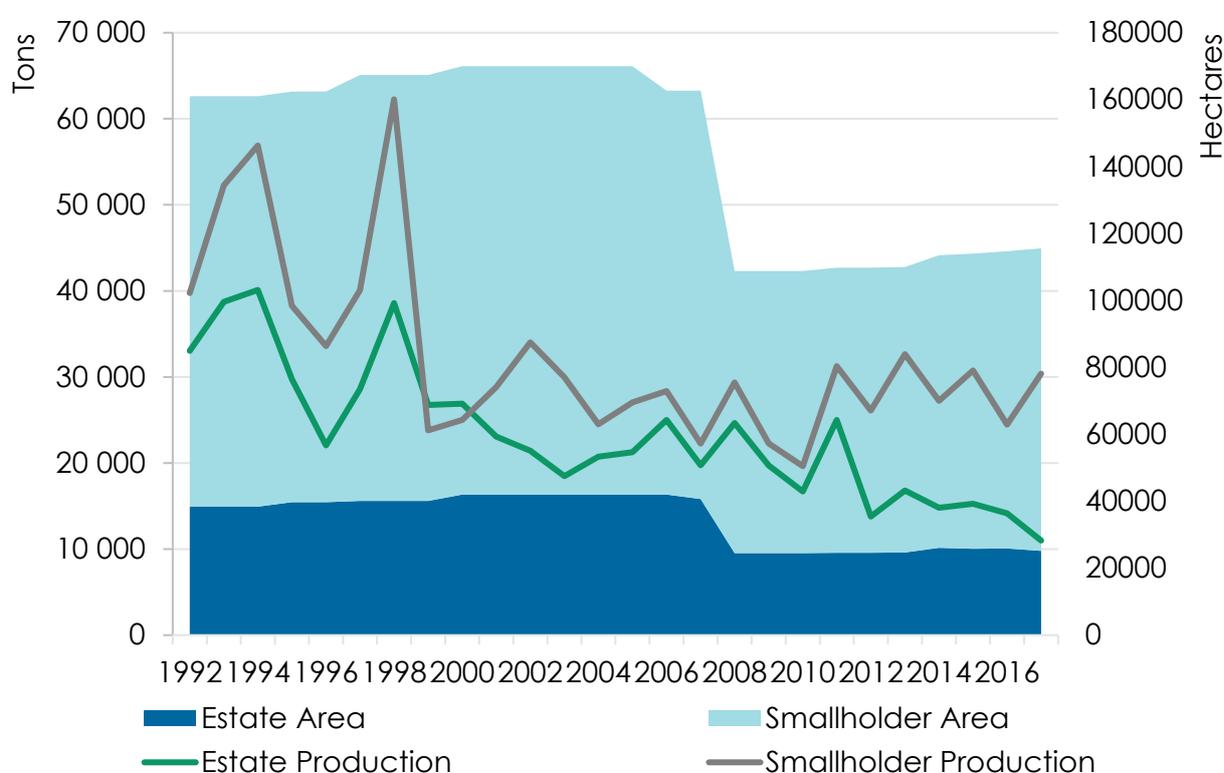


FIGURE 7: COFFEE AREA AND PRODUCTION, BY TYPE OF PRODUCER

Source: Coffee Directorate (AFA), 2018

The decline in productivity has negatively affected farmers' net incomes, a situation that needs to be addressed given that the industry is central in the agricultural sector's contribution towards the realization of Vision 2030. Coffee production is labour intensive and contributes about 30% of the total employment in the agricultural sector.

The decline in production started as a result of the amendments to the International Coffee Agreement (ICA) in the late 1990's that removed the quota system that

regulated production from each producing country thus regulating prices. These amendments resulted in a glut in coffee supply and this meant that coffee prices were left to the forces of supply and demand. At the same time, the new market arrangements did not work well for smallholder farmers. The lack of transparency in pricing across the value chain coupled with conflicts of interests among value chain actors, poor management and underutilised operations for smallholder cooperatives has led to the smallholder farmer absorbing the costs and risks in the coffee industry.

The new Kenyan Constitution of 2010 introduced two levels of government: national and county. The agricultural sector was devolved to the county governments with the intention to ensure efficient and effective service delivery. The collaboration between the national and county governments has given greater focus to the coffee sub-sector in the counties, through increased resource allocation for improved production and productivity.

Due to both national and county governments' concerted efforts to revive the once vibrant sector, both the area and production has started to increase in the last five years. During the period 2013/14 to 2017/18, the area under coffee production increased from 114 700 hectares in 2016/17 to 115 600 hectares in 2017/18, mainly on account of small holder cooperatives. The quantity of green bean coffee produced increased by 7% from 38.7 thousand tonnes in 2016/17 to 41.4 thousand tonnes in 2017/18 (GoK, 2019).

The key national and county governments' interventions driving this improvement have been:

- New plantings, especially in areas West of the Rift,
- Improved productivity in the Central region and in areas east of the Rift, and
- Availability of subsidized fertilizer provided through the National Cereals and Produce Board.

1.3.2 Spatial context

A spatial data analysis was undertaken to contextualise coffee production in Kenya. As seen from Figure 9, Coffee Production is most common around Mount Kenya: 69% of Kenya's total coffee area is around the foot of Mount Kenya. The Spatial Production Allocation Model uses a cross-entropy approach to generate plausible estimates of crop distribution based on national statistical production and production requirement data (see Figure 8). From this, it is clear that the coffee area in Kenya is concentrated in high-altitude regions near Nairobi. As a cash crop, coffee has had to compete with tea, plantains, and most recently, macadamias when it comes to the area under production.



In order to quantify the area availability, a Basic Potential Available Cropland (B_PAC) assessment process was followed for land which is currently uncultivated. This B_PAC selection process drew on a similar approach followed by Chamberlain and Jayne (2015) with their Potential Available Cropland (PAC) estimates for Africa. Within each location (defined as grid cells with dimensions of 5 by 5 arc minutes - roughly 8 000 hectares), total agricultural area was calculated to ascertain how much land potentially remains for crop production expansion.

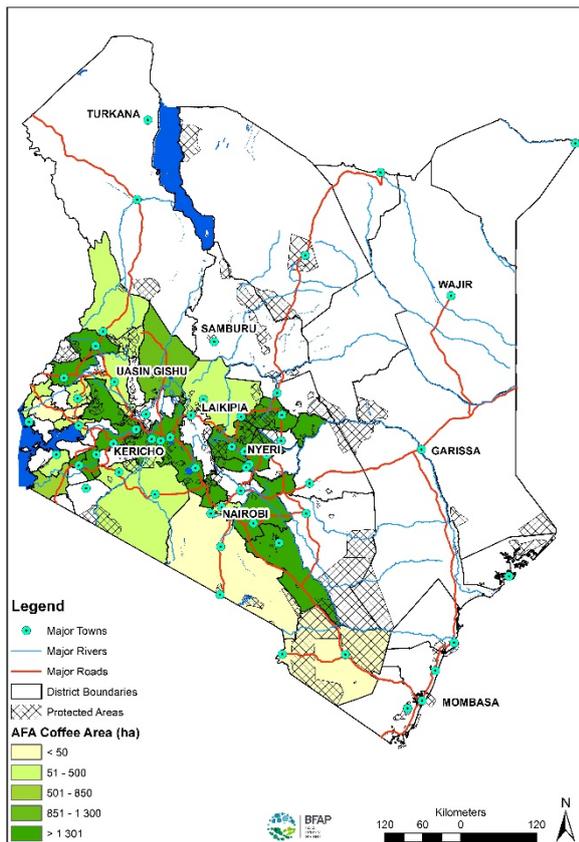


FIGURE 9: COFFEE AREA PER COUNTY
Source: AFA, 2018

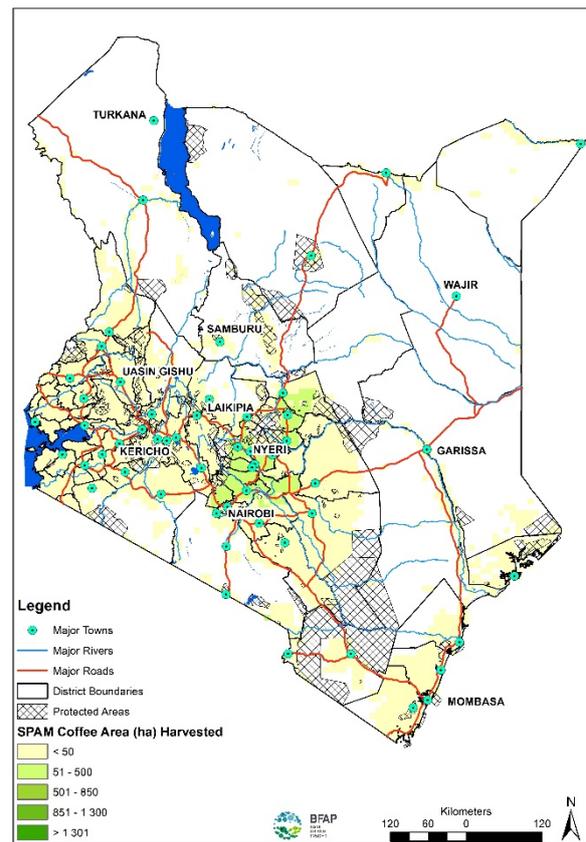


FIGURE 8: COFFEE AREA
IFPRI, 2019 (SPAM 2010)

Within the Agro-Ecological Zones, as sourced from Global Agro-Ecological Zoning 3.0 (GAEZ), possible lower risk rain-fed production areas were identified as a first proxy for production expansion by selecting areas which on average have favourable rainfall and terrain indices for cash crop farming (i.e. excluding all dry and excessively steep areas according to the Agro-Ecological Zone (GAEZ 2018) categorisation). The Basic Potential Agricultural Cropland (B_PAC) process filters through a number of data layers by firstly eliminating protected areas, built-up areas, water bodies and other forests from the total area in the regions. The result is a basic measure of total agricultural cropland (GAEZ 2018). As a final step, only currently uncultivated land was

considered as a proxy for available cropland by removing the share of currently cultivated land at each location (IIASA & FAO 2010).

Figure 10 shows that Basic Potential Available Cropland (B_PAC) in high altitude areas (e.g. around Mount Kenya) is limited (i.e. orange and red shading). Therefore, the revitalisation of the Kenyan coffee sector must primarily be achieved through intensification.

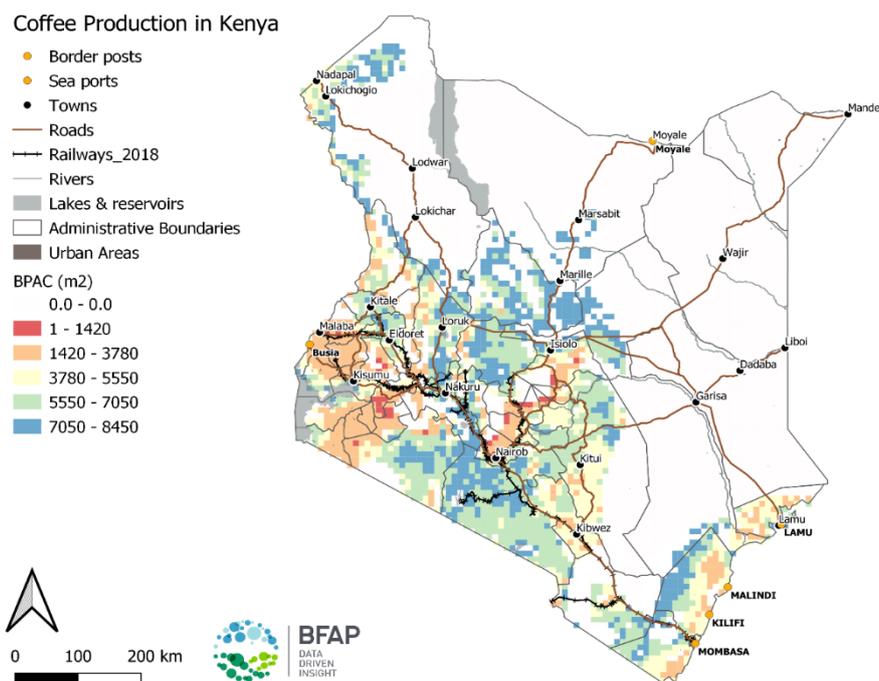


FIGURE 10: BASIC POTENTIAL AVAILABLE CROPLAND

1.3.3 Policy framework

Introduction

The coffee industry has been one of the key pillars of the country's economic development for decades, contributing an annual average of US\$230 million in foreign exchange earnings as Kenya's fourth most important export, after horticulture, tourism and tea. Its key role is recognized in the Government's efforts to fight poverty and is central to the agricultural sector's contribution towards the realization of

Kenya's Vision 2030³, which is the country's blueprint, premised on three pillars and in the Big 4 Government Agenda⁴ (ICO, 2019).

According to Alila & Atieno, 2008, the declining growth performance of the sector has been one of the major concerns facing policymakers since the 1990s. The performance declined dramatically during the post-independence years from an average of 4.7% growth in the first decade to below 2% in the 90s. This decline culminated in a negative growth rate of -2.4% in 2000. This translated to lower levels of employment, incomes and, more importantly, food security for many rural Kenyans.

Policies and programmes introduced to revive the sector

Initially, after independence (1963) the coffee sub-sector was controlled by the government, with the Ministry of Agriculture responsible for policymaking and overseeing the coffee sub-sector in general. The Kenyan coffee sector used to be a public holding, and the Coffee Board of Kenya (CBK) and the Kenya Planters' Cooperative Union (KPCU) operated under the watchful eye of the government, which maintained control over the sector. During this period, the sub-sector operated in a more controlled and functional environment. The smallholder farmers were guaranteed timely payments according to a transparent schedule. Thus, smallholder farmers increasingly relied on coffee for their livelihood and source of regular income. Farmers adhered to strict regulations for coffee growing (effectively enforced by the CBK, and Cooperative Unions supervised by the KPCU), thus producing premium quality coffee.

However, in the 1980s the World Bank (WB) and International Monetary Fund (IMF) introduced liberalization of the economy to stimulate export-led growth in those industries where they enjoyed a competitive advantage. As a result, the various reforms introduced involved the withdrawal of government support with the simultaneous opening up of markets to the world. Many of these industries (including the coffee industry) were unprepared to absorb the risks associated with a liberal/open market system, and with the lack of appropriate safety nets, the primarily smallholder-based agricultural industries began to crumble.

The liberalization of the coffee sector following the introduction of Structural Adjustment Policies (SAP) by the WB and IMF in the late 1980's and early 1990's destroyed the national and cooperative institutions such as the KPCU since there was no longer financial support from the government. The government pulling out its strict and direct role in ensuring proper management in institutions supporting the coffee sub-sector led to mismanagement and decline in production and area under coffee.

³ The Kenya vision 2030 is implemented through three pillars: Economic, Social and Political. Agriculture is a key sector under the economic pillar. The goal is to attain 10% annual economic growth through transforming the sector to be highly commercially oriented.

⁴ Agriculture sector contributes significantly to two agendas of the Big Four Agenda: Attainment of 100% Food Security and Nutrition and Manufacturing. Under Food Security and Nutrition, the government aims at attaining food self-sufficiency and lower the cost of food. Under manufacturing agenda, the government aims to grow the manufacturing industry through agro processing and agro-based SMEs.

The government also reduced research funding to the Coffee Research Institute, which was supposed to develop new coffee varieties to replace the old local varieties.

In 1993 the government introduced policy reforms in the coffee sector when it withdrew its control of the Coffee Board of Kenya (CBK) which served as both the regulating agency and service provider to coffee farmers. This resulted from complaints regarding inefficiency and the conflict of interest as both a regulator and service provider. As regulator, the CBK acted as a government agent in all matters pertaining to the domestic development of the industry and international trade. In its capacity as a service provider, the CBK was responsible for promoting the industry through marketing and processing, licensing and controlling coffee producers and processors, and conducting coffee research. Thus CBK changed to become a farmer-led organization (FAO, 2005).

Before deregulation, the KPCU had the mandate to appoint their own processors, millers, and marketing agents and only required the Board to register these agents. But the planters were prohibited from selling cherry or parchment coffee directly to millers, individual coffee factory owners, or cooperative societies. The selling avenue of coffee remained the central auction through an authorized marketing agent. But due to conflicts between the farmers and millers due to lack of clarity of roles among different stakeholders in the sector the government resumed its management role of the CBK in 1999. It was also an opportunity for the government to facilitate liberalization in the sector as the policy reforms instituted had not given clear roles to different players, and there was also a lack of provision for an accompanying regulatory framework for enforcing industry rules (FAO, 2005).

Thus, a new Coffee Act 2001 was enacted, which introduced wider liberalization in the coffee sector. The Act introduced a second option where about 30 percent of coffee was sold at auction through licensed brokers. The Act:

- Allowed the prices to be determined by those established at the most current auction, with a surcharge of 3 percent
- Encouraged commercial millers or management agents to render extension services either for payment or on credit, as a means to offer indirect financing through cooperative societies and report the corresponding charges to the CBK.
- Established the Coffee Development Fund (CDF) which was meant to provide sustainable and affordable credit to coffee farmers for farm development, inputs, operations and price stabilization. The funding for the CDF was to be sourced from the coffee development levy, funds provided by parliament, interest earned from loans and advances and funds from other approved sources.

The emerging policy and institutional framework initiated by the government had both positive and negative impacts on smallholder farmers' welfare. On the positive side, the reforms reduced government involvement in coffee matters while



encouraging farmers and private sector participation. The reforms also aimed at minimising delays in payments.

On the negative side, the politicisation of cooperatives led to increased fragmentation that continued to erode their economies of scale. There has also been an increase in governance problems that have led to an increase in the mismanagement of coffee cooperatives. Corruption, lack of financial accountability and transparency are some of the mismanagement issues that cut across most institutions in the coffee industry, including cooperatives. The reform period was also accompanied by under-utilisation of coffee processing and milling capacity, factors that do not augur well to farmers returns.

Besides the above reforms, other initiatives undertaken to support and promote the coffee industry in Kenya included the Second Coffee Improvement Project (SCIP II) and Stabilization of Export (STABEX). SCIP II was negotiated and signed in October 1989 between the Government of Kenya (GoK) and the International Development Agency (IDA) of the World Bank.

The project was implemented from 1990 to 1998 with its main objective being to increase the incomes of smallholder farmers and small/ medium coffee estates through increased production and improved coffee quality. It also aimed at increasing foreign exchange earnings, creating employment and strengthening institutional capacity in key participating agencies. These objectives were to be achieved through the provision of credit to finance the Improved Payment System (IPS), the Cherry Advance Payment System (CAPS), the Farm Input Loans Scheme (FILS), the Coffee Factories Development Scheme (CFDS), training, the establishment of the Project Co-Ordination and Management Unit (PCMU), and institutional support to the implementing organisations (Karanja & Nyoro, 2002).

Stabilization of Export (STABEX), a compensatory finance scheme to stabilise export earnings, started operations in 1975 in conjunction with the implementation of the first Lomé Convention between the European Community and the ACP countries. The system was designed to remedy the harmful effects of instability of export earnings by smoothing the negative effects of export earnings shortfalls. The instability of earnings strongly affected farmers and their living conditions. However, most of the funds were not utilised due to the slow response by GoK in coming up with the necessary documentation to enable the EU mission to prepare the framework of mutual obligations (FMO).

Despite these initiatives' contributions to the smallholder coffee sub-sector, they have also had a major negative impact. This is evident in the high level of indebtedness of the co-operative societies.

Further reforms in the coffee industry included the new Kenyan constitution of 2010, which saw the devolution of the agriculture function to counties. This meant that the responsibility for the management of the coffee sector falls entirely with the county governments. The enactment of the Agricultural Food and Fisheries Act no 13 of 2013 led to the consolidation of numerous pieces of legislation within the agriculture sector



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to address the overlap of functions. This resulted in the restructuring of the CBK which has now been merged under the Agricultural Food and Fisheries Authority.

Despite the various policy reforms by the government in the coffee sub-sector, it still faces many hurdles. They include the steady decline of production coupled with weak enforcement of policies and regulations. As a result the National Task Force on Coffee Sub-Sector Reforms was appointed by the President in 2016 to review the entire coffee value chain, identify areas requiring interventions, and make recommendations.

Based on the report of the Task Force, the government has developed a comprehensive coffee revitalization programme meant to revive the once thriving coffee sub-sector and make it a reliable source of livelihoods for millions of Kenyans as well as a foreign currency earner.

The coffee revitalization programme seeks to support coffee production expansion, adoption of improved coffee varieties, increased use of affordable/subsidized farm inputs, and training of farmers on best agricultural practices. The government also plans to enhance the availability of affordable credit to coffee growers, which is expected to increase Kenyan coffee production to over 100 000 tonnes of clean coffee over five years (ICO, 2019).

To revive the country's coffee industry:

- The government is to rehabilitate 500 pulping stations (factories) in 31 coffee-growing counties across the country.
- Coffee farmers are set to benefit from a Cherry Advance Revolving Fund being set by the government which was operational from 1 July 2019. The government will avail Ksh3 billion in credit to be accessed by smallholder coffee farmers (based on farmers' historical production) at a much lower three per cent (3%) interest rate per annum.
- Farmers could start pocketing 80 percent of gross earnings as part of the reforms, while co-operative societies, millers and marketers will share the remaining 20 percent according to new proposed regulations for the sector.

TABLE 7: SUMMARY OF THE HISTORY OF POLICIES IN THE KENYAN COFFEE SECTOR

provides a summary of the policies that historically governed the Kenyan coffee sector.



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TABLE 7: SUMMARY OF THE HISTORY OF POLICIES IN THE KENYAN COFFEE SECTOR

Year enforced	Policy (Acts/ regulations/ institutions/ plans/..)	Verification (what does the policy say / intend)	Implication (what was the result of policy; intended / unintended)
1964	Government regulated CBK KPCU and other KPCU	<ul style="list-style-type: none"> • Government maintained control over the sector. • Ensured that the sub-sector operated efficiently and effectively • The smallholder farmers were guaranteed timely payments according to a transparent schedule. 	<ul style="list-style-type: none"> • Increased reliance on coffee for livelihoods of smallholder farmers. • Premium coffee production due to adherence to strict production regulations
1980	World Bank, IMF free market (liberalization of economy)	<ul style="list-style-type: none"> • The government withdrawal financial support to cooperative institutions including KPCU. • The government withdrew its direct control to institutions supporting the coffee industry. 	<ul style="list-style-type: none"> • Resulted in reduced research funding affecting the development of new coffee varieties • Mismanagement of cooperatives leading to decline in production and area under coffee.
1993	The government withdrew its control of the Coffee Board of Kenya which was serving both as a regulating agency and service provider to coffee farmers	<ul style="list-style-type: none"> • KPCU was deregulated and was prohibited from selling cherry or parchment coffee directly to either millers or cooperative societies 	<ul style="list-style-type: none"> • A direct payment was introduced to reduce delays in payments that characterized the old pool system • Three commercial millers were licenced thus breaking the monopoly previously held by Kenya Planters Cooperative Union (KPCU)
1998	New Cooperative Act enacted	<ul style="list-style-type: none"> • The new Act removed the tight control over the way cooperatives operated 	<ul style="list-style-type: none"> • The New Act allowed the government to have minimal regulatory role in the coffee cooperatives. • It encouraged members of various Cooperative societies to run them as economic units

2001	New coffee Act	<ul style="list-style-type: none"> The Act was intended to harmonize the policy reforms already implemented and to complete institutional and legal reforms 	<ul style="list-style-type: none"> The Act separated the roles of regulation and marketing with CBK role confined to regulation only It allowed commercial millers or management agents to provide extension services either for payment or on credit It established Coffee Development Fund (CDF) to offer affordable credit and advisory services to coffee farmers for farm development and inputs The Act intended to limit deductions for CBK expenses to 3% of gross proceeds The new Act banned trading of cherry at the farm gate level and required all coffee sold in Kenya to pass through a central auction
2012	Implementation of the new constitution, 2010	<ul style="list-style-type: none"> The new constitution allowed devolution of the agriculture functions (including the coffee sector) 	<ul style="list-style-type: none"> The devolvement of agriculture function implied that the responsibility for management of the coffee sector falls entirely with the county government
2013	Enactment of the Agricultural Food and Fisheries Act no. 13 of 2013.	<ul style="list-style-type: none"> The Act was meant to consolidate the various pieces of legislations within the agriculture to address overlap of functions 	<ul style="list-style-type: none"> The Act enabled Coffee Board of Kenya (CBK) to be restructured and merged under the AFFA
2015	National Task Force	<ul style="list-style-type: none"> The task was meant to look for issues bedevilling the sector leading to decline in production, decline in area and coffee and recommend ways of reviving the sub-sector 	<ul style="list-style-type: none"> Establishment of Cherry Advance Revolving fund to give farmers credit at 3 % interest per annum Commitment by the government to rehabilitate 500 pulping stations in 31 coffee growing counties across the country

1.3.4 The Nairobi coffee exchange

The Nairobi Coffee Exchange (NCE) is one of the most important institutions in the coffee industry, as over 90% of the total Kenya coffee produced is traded through it in its role as the central coffee auction. The NCE is managed by an Exchange Management Committee as stipulated in the Nairobi Coffee Exchange Trading Rules, 2012.

The first coffee auction was inaugurated in September 1935 when the first coffee was auctioned under Kenya Coffee Auctions (KCA). The coffee marketing function was placed under the Coffee Marketing Board (CMB), established under the Coffee Marketing Ordinance No. 6 of 1946. In 1960 the Coffee Industry Ordinance and the Coffee Marketing Ordinance were merged to form the Coffee Ordinance Cap 333.

After independence in 1963, Kenya organized the coffee industry around a weekly government-run open auction system to create transparency in the pricing hierarchy to ensure that quality with better grades fetched higher premiums. This led to increasing competition for the well-managed, established estates and cooperatives, particularly for the AA grade beans measured based on the bean size and not of defect tolerance.

The coffee marketing function has evolved over the years based on various laws and regulations. Act 13 of 1971 abolished the CMB and consolidated the function of coffee marketing with the regulatory functions of the CBK. CBK controlled the industry up to July 2001 when a new Coffee Act was enacted to amend Cap 333 that specified new roles for CBK as an industry regulator.

Consequently, the Coffee (General) Rules of 2002 provisioned for an organisation/institution to manage the NCE. In 2006, section 62 of the rules were further amended to specify the Kenya Coffee Producers and Traders Association (KCPTA) as managers of the NCE until July 2013. Through Legal Notice no. 79 of 2012, the amendment entrenched NCE in coffee law and the Exchange would be managed by an Exchange Management Committee as provided for by the Nairobi Coffee Exchange Trading Rules, 2012.

Organization

The Nairobi Coffee Exchange is organized by a nine member management committee appointed by the Cabinet Secretary of the Ministry of Agriculture, Livestock, Fisheries and Cooperatives as stipulated in the Nairobi Coffee Exchange Trading Rules, 2012.

The committee consists of 5 producers, 2 traders, 1 representative of the commercial millers, marketing agents and warehousemen, and 1 from the Coffee Directorate.

The Exchange Committee was established to manage the operations of the Exchange for the benefit of the coffee industry in an efficient, prudent, and professional manner. It offers oversight to the overall NCE mandate. In order to



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effectively discharge its mandate, it has constituted two standing sub-committees: Marketing, Standards and Quality and Mediation Committee, and Staff, Finance and Contracts Committee. The main functions of the staff involve the receipt of coffee samples from the marketing agents, distribution of coffee samples to traders and the Directorate and the day-to-day running of the Exchange operations.

Functions

The Exchange is vested in the Regulator (i.e. the Coffee Directorate) in trust for the coffee industry with an overall oversight over its operations. The operations of the NCE are primarily financed by the participants: traders and producers through their respective marketing agents. Additionally, from time to time, an auction levy as determined by the Exchange Committee is charged.

Through Legal Notice 111 Section 44 of the Coffee Act 2001, the Minister for Agriculture in consultation with the Board, made the (Nairobi) Coffee (Exchange Agriculture in consultation Trading) Rules, 2012. These rules stipulate that the Exchange:

- a) Manages all the operations of the Exchange, including the trading floor and the sample room.
- b) Formulates policies and conditions of sale, and sets regulations and any other instruments deemed necessary for the operations of the Exchange in consultation with stakeholders in the coffee industry and with the approval of the Board.
- c) Promotes and participates where necessary in all matters relating to or affecting trading at the Exchange.
- d) Promotes efficient, innovative, and transparent marketing arrangements at the Exchange, including coffee auctions and commodity exchange.
- e) Complies with such rules and directives made or given by the Board pursuant to section 44 (2) (d) of the Act.
- f) Determines coffee volumes for each auction and other price discovery mechanisms in accordance with the Act.
- g) Provides all the necessary facilities for the management, administration, and operations of the Exchange.
- h) Performs all or such other acts as may be necessary for the proper performance and operations of the Exchange.



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2. VALUE CHAIN ANALYSIS: CURRENT STATE

2.1. Value chain map of product flows

Figure 11 illustrates the product flow for the coffee value chain in Kenya, from Cherries produced to green coffee exported. Cherry production by smallholder farmers and estates is estimated at 258.1 thousand tonnes per annum, which is primarily harvested by hand. After harvesting, the cherries are sorted to ensure that only the ripe cherries will go through the primary processing level (FEEM, 2020).

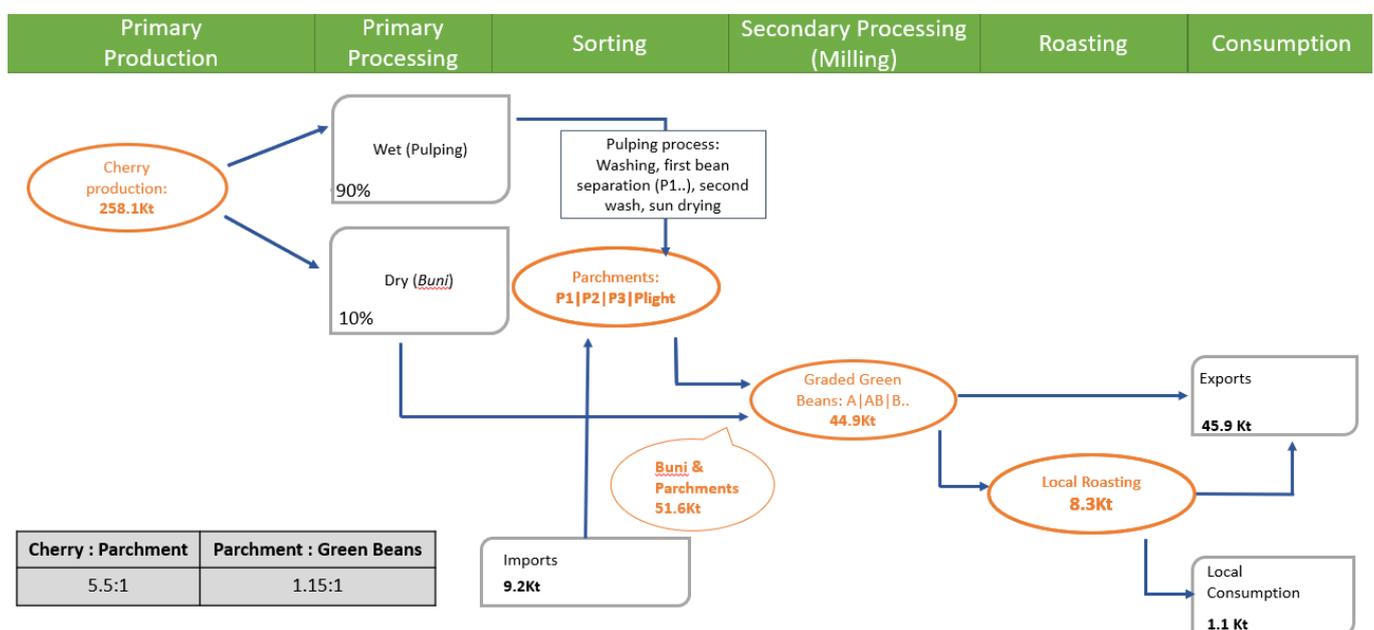


FIGURE 11: PRODUCT FLOW FOR COFFEE IN KENYA

Primary processing entails wet (pulping) and dry milling. About 90% of the total cherry production is processed by wet milling at washing stations owned by cooperatives and estate farmers, while the remaining 10% is dry processed. Smallholder farmers deliver to their respective collection centres or mills where the deliveries are inspected for any unripe, overripe or CBD (Coffee Berry Disease) infected cherries. According to the ICO (2019), the Agriculture and Food Authority Coffee Directorate has registered 1,001 pulping stations under cooperatives and 3,000 estate owned stations. The combined wet milling capacity of Kenya is estimated at 8.5 million tonnes/year. The wet and dry milling processes produce clean coffee in the form of parchments and mbuni⁵. Wet milled cherries are classified according to their density, where Parchment 1 is the heaviest coffee, Parchment 2 is medium density coffee and Parchment 3 or P-

⁵ Low-grade sun-dried coffee.

Lights is the lightest one (FEEM,2020). Kenya imports coffee in the form of parchments, primarily from the African region. Parchment import quantities may be higher than the recorded numbers, given the issue of illicit imports from neighbouring countries.

Secondary processing occurs at the mill where the parchments and mbuni undergo further processing in the form of hulling (removal of the endocarp from wet processed coffee), polishing (optional), grading and sorting. Grading and sorting involve the grouping of beans according to size and weight into commercial lots that meet certain quality standards and for pricing (FEEM,2020).

Grades E, AA, AB and PB are regarded as premium grades. Kenya's AA grade is considered to be one of the world's finest speciality coffees. Grade AB consists of a mix of bean types A and B, it is used to represent other grades being the largest batch in a particular consignment. Other gradings include; SB (sorted beans), UG (ungraded) cherry and HE (hulled ears). 95% of Kenya's coffee is exported green and 5% is exported in roast and ground to African countries (FEEM,2020).

About 60% of Kenyan coffee is exported to the conventional markets that purchase the bulk of Kenyan coffee (see Table), largely to members of the European Union, including Germany, Sweden, Netherlands, United Kingdom, Italy, and Finland. Speciality markets purchase about 20% of Kenyan coffee (premium quality) with the U.S.A leading the pack together with Japan and Canada. There is another category of emerging markets, including Gulf region, China, Korea and Malaysia, which imports about 15% of Kenyan coffee.

TABLE 8: LEADING EXPORT DESTINATIONS FOR KENYA'S COFFEE

Export Destination	2018		2019		2020	
	Quantity (tons)	%	Quantity (tons)	%	Quantity (tons)	%
United States	6 598	14	7 391	15	8 959	20
Germany	7 723	17	8 246	16	8 228	18
Belgium	4 914	11	8 504	17	6 246	15
Korea	4 841	10	4 310	9	4 106	9
Sweden	3 404	7	2 475	5	2 517	6
Switzerland	1 689	4	751	1	1 647	4
Australia	1 705	4	1408	3	1 399	3
Norway	1 135	2	1 532	3	1 317	3
Finland	1 328	3	1 439	3	1 170	3
Somalia	1 189	3	1 022	2	1 032	2

Source: TradeMap Statistics, 2021

2.2. Players at each value chain node

Figure 12 depicts a flow diagram of all coffee value chain players / actors in the Kenyan coffee sector as well as the various combinations of routes- to market. The subsequent sections continue to describe these value chain actors.



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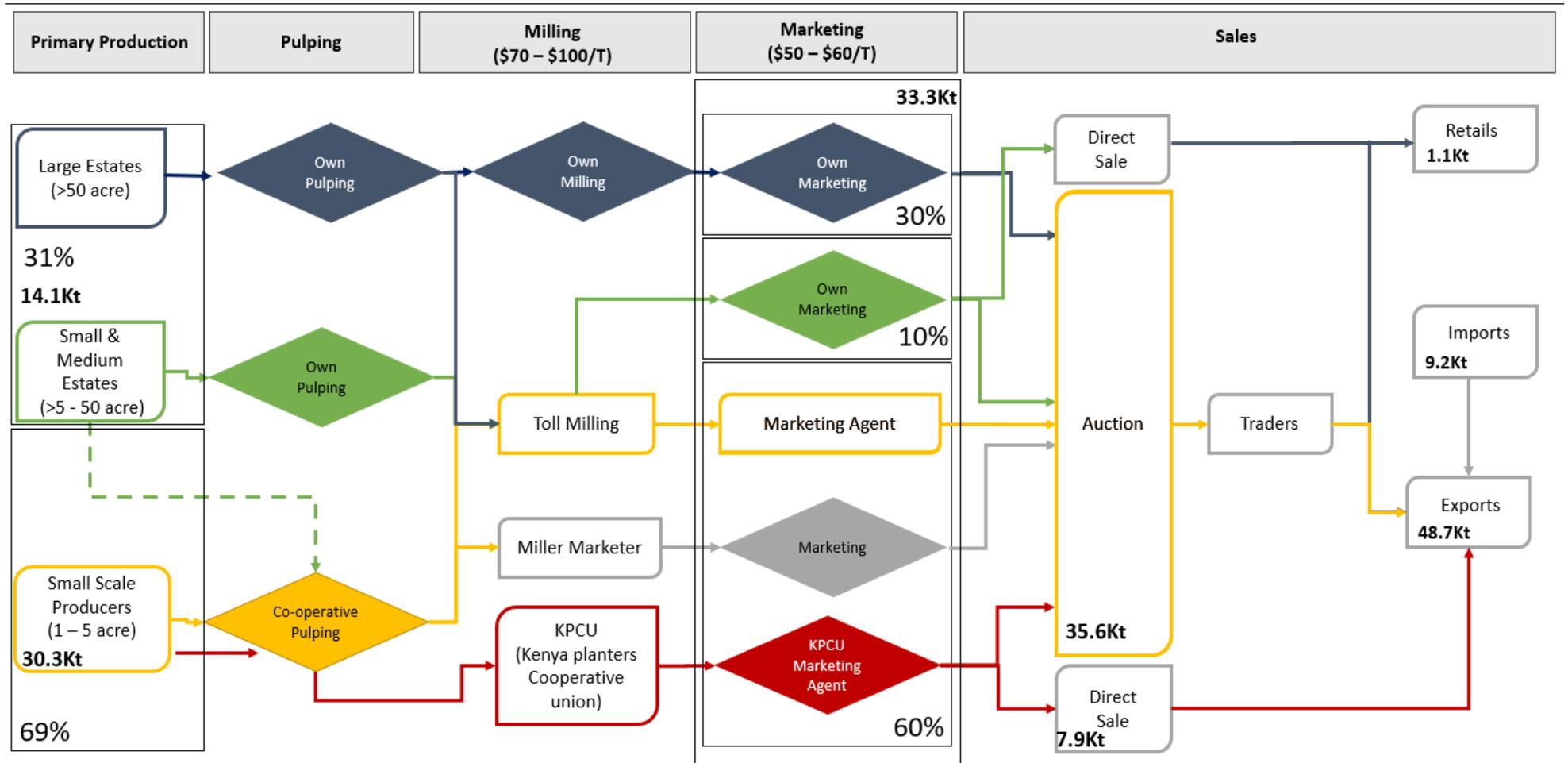
EGERTON UNIVERSITY
TEGEMO INSTITUTE OF AGRICULTURAL
POLICY AND DEVELOPMENT



IFPRI



AGRA
Growing Africa's Agriculture



Producers

Smallholder farmers

The distribution of coffee holdings in Kenya is inclusive of smallholder farms and estates, which consist of small, medium and large estates. Most coffee in Kenya is grown by smallholder farmers, who are clustered under more than 500 cooperative societies. Smallholder coffee farmers produce on farmland of less than 5 acres, primarily rainfed (ICO, 2019). They do farm-level operations, including planting, weeding, fertilizing, pruning, spraying, picking/harvesting red cherry, and transporting the cherries to the pulper/coffee factory. The smallholder farmers have been facing several production constraints, which has resulted in a decline in production as well as quality. These include diseases, low adoption of disease-resistant varieties, lack of access to affordable credit, unreliable weather patterns, high costs of inputs, poor governance of cooperatives and poor infrastructure.

Estate farms

Although estate farms have a smaller share of the total coffee area and annual production, they have a higher level of productivity owing to different farming methods. The farms range in size from 5 to 20 acres for small estates, 21 to 50 acres for medium estates and above 50 acres for the large estates (ICO, 2019). Compared to smallholder farms, yields are much higher given the intensive use of farming inputs, including fertilizers, pesticides, herbicides and fungicides.

Large estates can outsource management where necessary. They practice high maintenance plant treatment and use irrigation systems. As a result, large estates can produce up to three times higher yields than the average smallholder farms (Pederson, 2012). Moreover, the most large estates have their own washing stations and do not rely on service providers for pulping. Small estate farms also own wet mills (FEEM,2020).

Wet millers

Wet processing involves pulping, fermenting, washing and drying to produce parchment coffee, either at a cooperative facility or in a farm-based pulper. Wet processing models differ according to the scale of production; thus small scale farmers and estates (small, medium and large) use different pulping models. Most smallholder farmers rely on cooperatively owned mills for their wet processing; however, independent smallholder farmers have developed their own on-farm milling facilities. The larger estate farmers each have privately owned facilities, with varying capacity.

Smallholder farmers who market through cooperative societies process their coffee at factory level, where the cooperatives generally have a combination of at least 2 wet

mills of half a ton per hour, the 2,900 small and medium estates typically have at least a 1 ton/hour capacity, and the 100 large estates each have a wet mill(s) of about 3 tons/hour capacity (USAID, 2010).

Major key constraints for wet coffee processing include;

- Use of obsolete equipment which produces poor quality and inefficiency leading to high cost of processing in Kenya compared to other regions
- Management for most cooperative societies is not professional leading to inefficiencies and higher costs of operations
- Over capacity – idle capacity which increases the overhead costs
- High cost of energy
- Poor infrastructure, especially the roads in most rural areas, which has led to the proliferation of milling plants because access is difficult in the rural areas

Table 8 provides a wet milling cost comparison for smallholders across various countries in Sub-Saharan Africa. Notable, Kenya's processing costs seem to be three to four times higher than its regional competitors.

TABLE 8: COMPARATIVE WET MILL COSTS FOR COOPERATIVES/SMALLHOLDERS

Country	Cost/Kg Cherry
Kenya	US\$0.108
Ethiopia	US\$0.033
Tanzania	US\$0.025

Source: USAID/COMPETE, 2010

Dry millers

The Dry Milling process involves hulling, cleaning/polishing, sorting, grading and bagging. Kenya Planters' Cooperative Union (KPCU) enjoyed a monopoly over the Dry Milling process until 1995 when more commercial milling plants were established after liberalization. Initially, KPCU had the capacity to handle all the coffee produced in Kenya. The entry of more players such as Socfinaf, Thika Coffee Mill, Sasini and Central Kenya Coffee Mills has resulted in an excess capacity at the milling level. These millers process parchment (and mbuni) into seven official grades based on bean size and bean density, ready for auctioning. The coffee growers select the miller to process their coffee based on the efficiency certificates that each miller has in order to complete the traceability requirements demanded by buyers. Coffee is then stored in a licensed public warehouse before it can be presented at the auction.

The major challenge currently at this level of processing is lack of enough coffee to process, as all plants are operating below capacity, resulting automatically in high operational costs and inefficiencies due to high unit costs brought about by the overheads.

Marketing agents

There are ten marketing agencies licensed by the coffee Directorate and mandated to facilitate the sale of coffee through the central auction system. The marketing agents sign agreements/contracts with coffee millers (and growers) to prepare catalogues and offer coffee at the Nairobi Stock Exchange (NSE) which takes place every Tuesday of the week. The marketing agents are responsible for ensuring the presentation of coffee in the auction, preparing the auction catalogue, setting reserve prices, and selecting an auctioneer.

The ownership of the coffee still remains with the grower throughout the processing and marketing chain, which means they pay the agents from the proceeds of the auction. The major marketing agents include Tropical Farm Management (K) Ltd, Coffee Management Services, and Aristocrats & Tea who have a total combined market share of 72% for both auction and direct sales (Coffee Year Book, 2019).

The Nairobi coffee exchange stakeholders

The major stakeholders at the NCE include the marketing agents, traders, and warehouse men.

a) Marketing agents

They are contracted by farmers to present their coffee for sale at the Exchange. Their main roles include:

- Preparing sale catalogues
- Drawing and presenting representative samples to the trade sampling room
- Auctioning the coffee on behalf of the farmers
- Preparing invoices for the buyers
- Receiving payments from the respective traders for coffees bought at the auction
- Preparing and remitting coffee warrants to the traders after payments have been made
- Processing payments for the farmers
- Arranging for warehousing of coffee within Nairobi county

b) Traders

- Collect and analyze coffee samples
- Bid/buy coffee from the auction
- Export coffee to overseas roasters and import trade or roast for local consumption

c) Warehousemen

- Store coffee on behalf of the Marketing Agents
- Prepare warrants for coffees on offer at the auction on behalf of the Marketing Agents



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Trading at the NCE is strictly guided by a clear set of rules that dictates each player's responsibilities. In 2017/18, ten (10) commercial marketing agents were licensed by the Directorate to offer coffee for sale on behalf of contracted farmers (Coffee Year Book, 2018). Although there were 12 growers' marketers licensed to undertake direct sales, they were unable to trade due to a lack of contracts. During the period, 41 sales auctions were conducted with top Arabica coffee grades AA, AB and C dominated the auction.

Challenges facing NCE

- The Exchange Automated Auction System was installed in 1998 and due to the evolution of new technologies, the system needs to be modernized to avoid it becoming technologically redundant
- Low volumes traded at the auction because of unfavorable weather conditions due to climate change which has led to unpredictable crop cycles, aging trees and workforce and population
- Legal constraints to deal with malpractices. NSE lacks a legal and regulatory framework
- Volatile global coffee prices
- Lack of capacity building to its members i.e. farmers, traders/brokers
- Lack of market information dissemination to its members

The way forward

The Task Force appointed by the President noted the critical role played by NCE in coffee trading. It also noted the limitations that impede its effectiveness as an independent, reliable, and transparent exchange and therefore recommended the following:

- Establishment of the Nairobi Coffee Exchange as a body corporate and as a public company limited by guarantee
- Procurement of a modern exchange trading system to enable virtual trading
- Establishment of a Central Depository Unit (CDU) for settlement and payment of coffee proceeds in order to transform NCE to a Commodity Exchange. This will eliminate the need for the US\$ 1 million guarantee, which is a requirement to sell coffee in the auction, thus reducing the delay in payments by becoming a platform for digitizing coffee payments. It will also facilitate direct payment to farmers, thereby eliminating third parties from handling farmer payment
- NCE to be upgraded to a fully-fledged Commodities Exchange (CE) under the Capital Markets Authority. This will raise the farmer's and country's earnings by enabling him/her to sell coffee globally at lower transaction costs

Coffee marketing

Coffee is marketed through two systems, auction and direct sales. The auction system has been the traditional method of marketing Kenya coffee and there are over 40 registered coffee exporters who bid for the coffee at the Nairobi Coffee Exchange (NCE) every week. The marketing agents prepare samples of the coffee included in the auction which is then passed on to the auctioneers to facilitate the preparation of the coffee auction catalogue. They also regulate the sale programme and determine the quantities and qualities to offer at every auction. The clean coffee is then purchased at the auction by dealers and exported, either as straight lots or blended into larger quantities of homogeneous quality. A small percentage is roasted locally. In the past 9 years the quantities offered for sale have been consistently below 50 000 tonnes as shown in the table below.

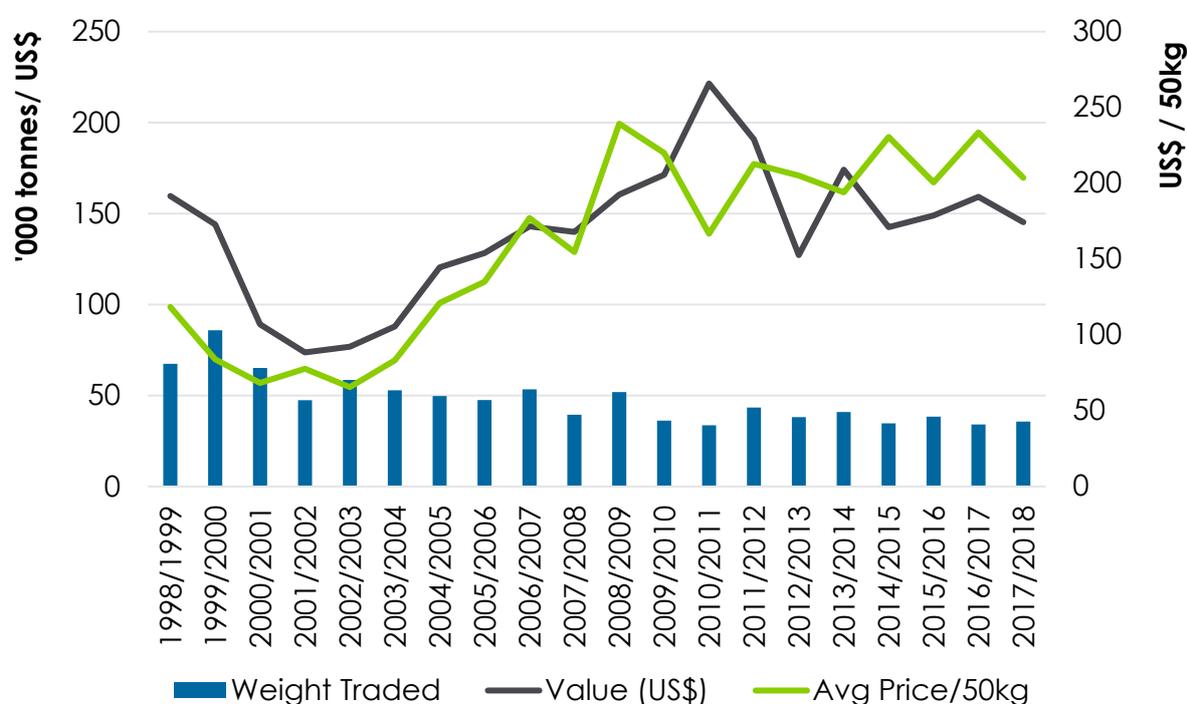


FIGURE 13: AUCTION TRENDS

Source: AFA, 2018

The Finance Act 2005 and Coffee (General) (Amendment) Rules 2006 have allowed direct sales to operate alongside the auction system in Kenya. In 2007/8 and 2008/9, Kenya sold 1 800 & 5 455 tonnes through a direct sales marketing system. This increase has in large been driven by the shift from bigger volumes to purchases of certified and traceable coffee by foreign buyers of Kenyan coffee in response to an increasing demand, specifically in the United States of America and Japan. However, smallholder and estate farmers in the country have not fully embraced the concept of standards. If the strategy can be adhered to, single origin Kenyan coffee could be

promoted more widely with clear traceability and quality checks, which will increase the returns from coffee and help address some of the market access challenges faced by local grower marketers.

Kenyan coffee consumption is low and the domestic consumption market is currently taking up only 1 577 tonnes (AFA, 2018). Although this segment of the market has been growing in Kenya, the country has not fully exploited the benefits accruing from local sales compared to countries like Ethiopia whose domestic market uptake is nearly half of the country's production. Domestic coffee consumption has grown by between 2% and 5% annually over the last five years and the number of coffee houses grew to 399, compared to 206 in 2015. There are 25 local roasters, including 4 of grower marketers and 1 university (ICO, 2019).

In order to promote domestic coffee consumption, the coffee directorate has entered into agreements with several universities including Kenya University, Jomo Kenyatta University of Agriculture and Technology, Multimedia University, Moi University and University of Eldoret. They aim to target the youth in order to promote a coffee drinking culture in Kenya.

Compared to other coffee-growing countries, including Ethiopia, Brazil, Columbia and Guatemala, Kenya only consumes a small share of their local coffee production. Thus the focus on driving coffee consumption in Kenya is largely driven by the goal to reduce reliance on the international market, the spillover being employment creation. This will also help with the stabilization of the volatile global coffee price fluctuations (Xinhua, 2021).

Exports

All Kenyan coffee exports are regulated by the Coffee General Regulations 2002 and the Kenya Coffee Trading Rules 2012. It is mandatory for all coffee dealers (exporters) to be licensed annually by the Coffee Directorate to be eligible to export Kenyan coffee. They must also obtain phytosanitary certification from the Kenya Plant Health Inspectorate Services (KEPHIS) and Certificates of Origin from the Coffee Directorate. Samples for all coffee on offer are submitted to the Central Sample Room which is managed by the Nairobi Coffee Exchange and the Coffee Directorate, for quality checks and distribution to coffee dealers (exporters).

Summary

The coffee sub-sector continues to play a central role in the social-economic development of Kenya as it is still a source of employment, a foreign exchange earner and a source of food security in the country.

However, for the last two decades, the industry has faced a myriad of challenges. These include a decline in production, high cost of inputs, plummeting of the value of

sales, the decline of prices and exports, and the effects of climate change. Many agents collect fees and commissions, and several institutions collect taxes at every node of the coffee value chain, resulting in depressed grower prices. Most of the cooperative societies are not well managed: cost overruns by cooperatives are recovered from members who end up receiving a low net payout.

To revive the coffee sub-sector, the government has developed a coffee revitalization programme anchored on a recent National Task Force on the Coffee Industry, which seeks to support farm expansion, adoption of improved coffee varieties, increased use of affordable/subsidized farm inputs, and training of farmers on best agricultural practices. The government is also keen to provide affordable credit to coffee growers. It is projected that coffee production will increase to over 100,000MT of clean coffee within a span of five years.

2.3. Prices and gross margins

Local coffee prices are determined by type and supply in the international market. Major producing countries (such as Brazil) take the lead in pricing as a result of demand and supply dynamics in these countries. Although certain coffee blends can sell at a premium price, this is sometimes limited by the international market. The quality of Kenyan coffee has fallen over the years, making it harder to realise a premium price in the market.

In the world market, Arabica is considered to be of higher quality and more aromatic, while Robusta is more bitter and is generally used in low-quality blends. Due to the quality difference, Arabica is sold at a higher price compared to Robusta. The coffee market is subject to extreme price volatility. Short-term shocks usually result from supply-demand conditions in major exporting countries. In the long-term price shifts are caused by deregulation in the global space and increases in supply.

For smallholder producers who market through cooperatives, the price received by the farmers is determined by the grading system and, once the product is sold, the cooperative deducts all costs incurred from rendering services and issuing production inputs to the farmer. Smallholder farmers rely greatly on cooperatives for services (extension) and inputs. In addition, they have little choice in selecting a cooperative given little information to compare the performance of these entities. Given little incentive to improve performance and inefficiencies within cooperative systems, the value received by smallholder farmers is limited. Smallholder farmers capture only about 20% of the auction price, compared to the 75% captured by large estates. Cooperative inefficiencies drive up production costs, which are higher in Kenya compared to its competitor countries. Thus growers are susceptible to declines in the global price, making the industry unprofitable (Conliffe, et al., 2008).

Under the current value chain structure (Figure 11), farmer gross margins are significantly subdued due to low primary activity productivity as well as their price-taking position in the value chain. Factors which dampen the gross margin included declining crop yields in an environment of increasing costs. Kenyan yields of Arabica and Robusta are very low compared to those of neighbouring countries (Ethiopia). There has also been a decline in profitability, with falling prices and increasing production costs limiting gross margins for growers. Lower levels of profitability and poor cash flow management result in farmers being unable to invest in good crop production practices, lowering crop quality and yields (Conliffe, et al., 2008).

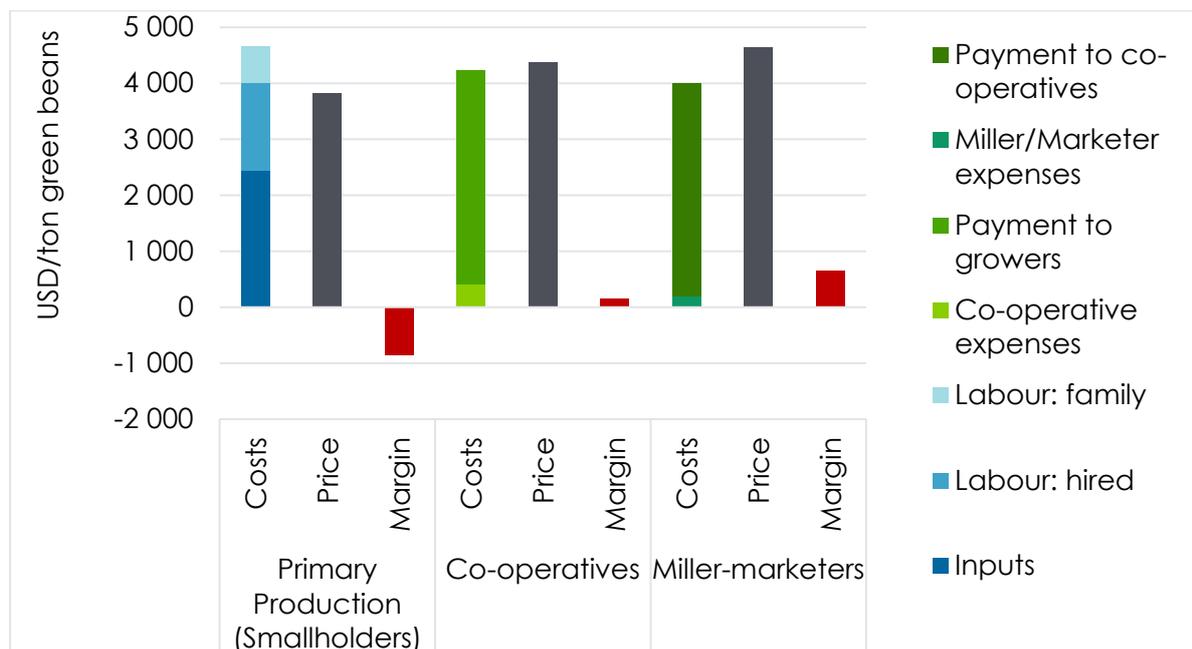


FIGURE 14: HIGH VALUE CHAIN COSTS (INEFFICIENCIES) ACROSS THE INDUSTRY

3. VALUE CHAIN ANALYSIS: DESIRED OR IDEAL STATE

3.1. Challenges and opportunities

In the following sections, a synthesis of the challenges and opportunities faced by the coffee industry is presented after which the suggested market-led interventions and resulting ideal state for the Kenyan coffee value chain are presented.

3.1.1. Table of challenges

Value Chain Node	Challenge	Cause
Pricing Structure	Traditional smallholder producers who process, market and sell their coffee through traditional co-operative structures suffer the full effect of value chain inefficiencies as all related costs are deducted from the price they receive for their coffee.	The pricing structure / principle is based on the smallholder producer retaining ownership of their beans until they are sold at auction. This results in significant time delays in producers receiving payment for their coffee and an unequitable share of costs and risks placed on the producers.
Primary Production	Poor agricultural practices resulting in low yields and poor product-quality	Insufficient funds to afford inputs Limited access to affordable finance Inadequate extension services Limited R&D into improved cultivars, limited funds for replanting
	Limited quality differentiation and incentive	Inadequate quality controls and measurement at cherry in-take to pulping facility.
Pulping	Expensive and inefficient processing	Overcapacity of traditional cooperatives facilities coupled with poor / outdated infrastructure, machinery and management result in high costs being subtracted from producer's price.
	Poor governance and financial controls	Insufficient governance and financial controls result in poor investment decisions by

		cooperatives with all costs and risks allocated to producers.
Milling	High processing fee	Reduction in coffee production has resulted in over capacity of milling, contributing to the high processing fee deduction from producers' price.
Marketing Agents	Regulatory environment supports a single channel to market with limited registered agents	Industry structure and licencing requirements enables inflated pricing and limited opportunities to realise direct/alternative market value
Auction / Market	Price Determination	Various concerns around transparency and market related price determination at Auction.

3.1.2. Table of opportunities

Value Chain Node	Opportunity	Impact
Primary Production	Structural reform around transparent & fair pricing mechanism	Increased returns to small-scale producers enabling investment into coffee production to drive quality and yields (supported by access to affordable finance, extension & improved R&D)
	Fair and equitable quality incentive across the value chain	Quality premiums realised at producer level – incentivising improved agronomical practices to further improve quality.
Pulping	Implementation of institutional Governance and Financial Controls	Improved financial management and risk / cost allocation (linked to pricing reform and transparency of costs)
Pulping & Milling	Managed Industry Consolidation and Processing Upgrade	Improved utilisation of capacity and efficiency of operation to reduce costs and improve quality
Industry Wide	<p>Prioritised and targeted implementation of National Task Force on Coffee Sub-Sector Reforms regarding:</p> <ul style="list-style-type: none"> - access to affordable finance - access to extension services - R&D into improved cultivars, limited funds for replanting 	<p>Keystone interventions required to support the sustained improvement in agronomical practices to further improve quality and yields.</p> <p>(NB: impact only realised if pricing reform implemented cross the value chain)</p>

Marketing Agents	Diversification of route to market	Enables producers to secure the best possible price through effective quality management and access to a variety of marketing channels.
Auction / Market		

3.2. Levers of intervention: Defining the ideal-state

Coffee used to be the primary livelihood source for most of Kenya's small-scale producers. However, following the collapse of the International Coffee Agreement in 1989, production of coffee went into a steady decline and, coupled with other key challenges such as delayed coffee payments, mismanagement and inefficiencies in cooperative societies and the high cost of production, the sector has declined to 40 000 tonnes in 2019 from 130 000 tonnes in 1988. As a result, there has been a series of reforms aimed at reviving the coffee sub-sector.

The most recent initiative is described in the Coffee Bill of 23 October 2020 and is currently being considered by Government for implementation. Some of the aspects of this bill are summarised below:

- The coffee factories are to be transformed to autonomous entities (instead of falling under / belonging to a cooperative).
- Coffee factories are to appoint millers themselves (previously decided by the cooperative).
- A revision of the Nairobi Coffee Exchange operations to a commodity-based system.
- Millers and factories are to be prohibited to lend to farmers, farmers are to borrow from the Cherry Advance Fund.
- Additional levies on the sale of coffee are to be introduced (nowhere does the bill state which existing levies are to be replaced, and stakeholders will continue to pay other licences as required). These include:
 - 2% ad valorem levy for the Coffee Research Institute
 - 4% import duty on imported coffee to the Coffee Board of Kenya
 - 2% auction levy (paid by buyers) - half to the Coffee Board of Kenya and half to County Governments.

The bill introduces various forms of additional government controls on the coffee value chain, the transformational effect of which can be speculated and debated – research and evidence shows that markets need to be well regulated but with fair practices. While a number of these changes might take time to implement, the

additional levies are straightforward to implement and this analysis considered this change as part of the near-future reality. While the Coffee Research Institute and Coffee Board of Kenya are not directly involved in handling coffee volumes, the auction is a significant stakeholder in the coffee value chain from a market perspective. Therefore, the 2% additional auction levy is introduced to the current state of the coffee value chain as the first “intervention” and part of the near-future state; before the PPVC market-led intervention recommendations are systematically introduced and the impact modelled.

Additional levies essentially impose additional taxes on a declining industry, rendering the value realised at farm-level lower and resulting in a worse-off position. However, if these funds can be put to use to support farm-level productivity and address downstream inefficiencies, significant additional value can be unlocked, particularly at farm level, supporting the overall sustainability and profitability of the coffee value chain.

The key take-out from the Deep Dive analysis of the Coffee value chain in Kenya, is that **market interventions without supporting farm-level productivity reform will not transform the industry.**

A combination of market-led interventions at various nodes in the smallholder coffee value chain are suggested to reverse the declining coffee area, especially in the smallholder value chain. These interventions are designed to build on and support each other and are described in the subsections below.

3.2.1 Optimised inputs

Figure 15 highlights the differences of input costs and margins per kg of coffee produced between smallholder and estate producers in Kenya. On average, coffee margins are negative, which is not sustainable and a key driver for smallholders choosing to exit coffee production and opt for higher-return perennial crops. During the deep dive analysis the following illustrates the evidence found: framers were applying 0.5kg/tree nitrogenous fertilizers together with 25kg/tree manure while the CRI recommended 0.125kg/tree nitrogenous fertilizer together with 5kg/tree manure. Clearly the application was higher than recommended, and a resulting yield-response might've justified higher application rates. However, the yield gain was low, leading to relative cost-inflation. Furthermore, some stakeholders report that smallholders don't apply fertilizers which is the reason behind the low yield response. Irrespective of whether the fertilizers are physically applied, the fertilizer costs are being deducted from the growers' income prior to them being paid for their coffee and hence negatively affecting grower returns. A re-alignment and reduction of inputs in smallholder production is recommended from the Deep Dive analysis. In particular:

- **Reduced fertilizer and manure application.** Both fertilizer and manure are applied, while likely only one of the two or at least lower quantities of each is often necessary.

- **Reduced disease management, weeding and vegetative management costs.** If excessive fertilizer and manure application is addressed, the cost of excessive disease management, weeding and vegetative management can likely be addressed in turn.
- **Reduced labour expenditure.** From Figure 15 it is clear that total labour costs (hired and family labour) is much more costly per coffee output for the smallholder than for the estate; this might be linked to economies of scale benefits at estate-level, as well as lower yields achieved by smallholder producers.

For the ideal state, a 25% total input cost saving was simulated in the three areas outlined above.

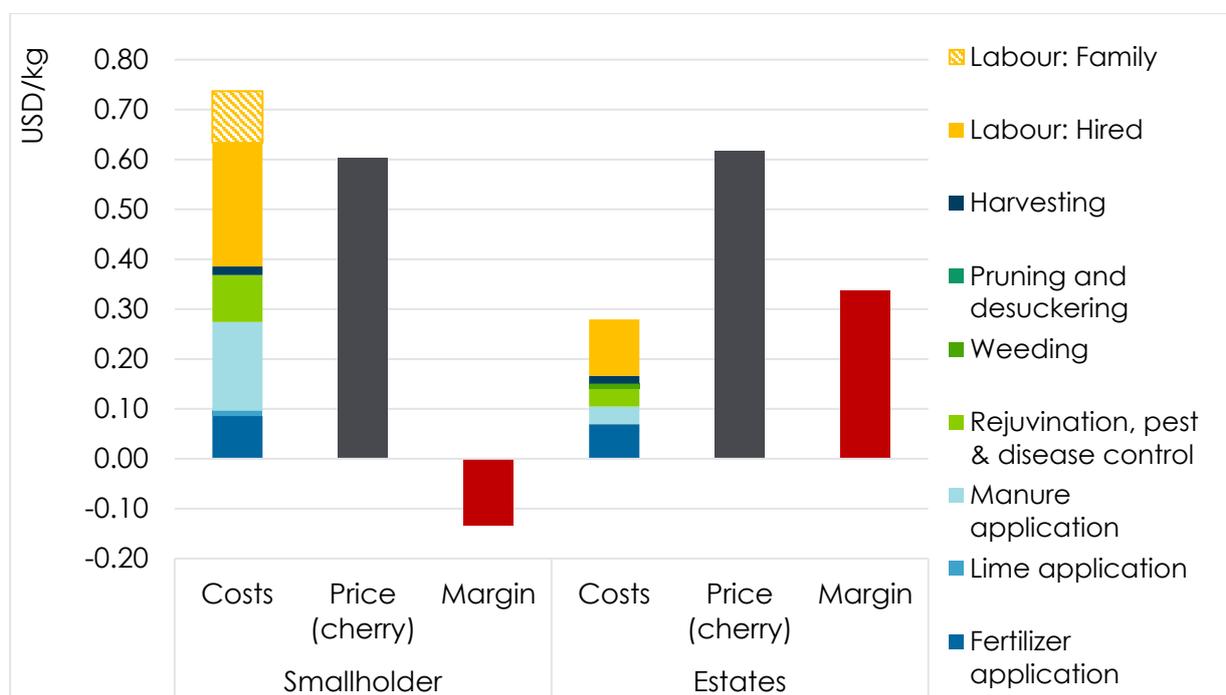


FIGURE 15: HIGH INPUT COST & LOW YIELDS DRIVING NEGATIVE MARGINS FOR SMALLHOLDERS

3.2.2 Improved agricultural practices and yields

Smallholder farmers have borne the brunt of the collapse of extension and advisory services. At present, they have to incur costs to access these services. Cooperative societies could potentially minimise these costs, but they are unable to overcome management challenges to hire private service providers. Smallholder farmers cannot comb through the messages they receive on improving productivity, resulting in suboptimal utilisation of inputs and incorrect application of agronomic practices.

The Deep Dive analysis found that inconsistent information and advice is supplied to smallholder farmers and that the time it takes to action advice ultimately leads to sub-

optimal management of the coffee crop. Improved crop management (performing the right activities at the right time) can lead to higher achieved yields. If management is improved, it is estimated that average smallholder yields can improve by 18%, from 2151kg/ha to 2538kg/ha.

The following recommendations are made to improve agronomic practices and yields,:

- **Strengthen linkages between research and extension:** the linkages between the Coffee Research Institute and extension service providers were severed due to the reforms in the sector and underfunding. Improved funding for coffee research and improved linkages ensures better use of research to improve yields. Improved varieties can be optimised for the agroecological zones where coffee will be produced.
- **Strengthen extension delivery systems for smallholders:** County governments have the mandate to provide extension and advisory services. Enhanced support by county governments in providing extension and advisory services will have a critical role in the adoption of appropriate agronomic practices as well as improved varieties.
- **Develop GAPs and enhance their adoption:** defining the good agricultural practices (GAPs) for coffee production will standardise production. Further, ensuring that farmers adhere to these standards is essential to guarantee the quality of coffee being produced. Standards for primary and secondary processing should also be developed and enforced.

3.2.3 Value chain efficiencies

As pointed out in the table of challenges faced by the coffee industry, the pulping and milling processing nodes are running old and outdated machinery in many factories, while the system itself has underutilized capacity. Inefficiencies to address at co-op level include:

- High operating costs, which is the result of old equipment, underutilization of capacity and low conversion rates.
- Delays in payout for coffee delivered, as producers own the coffee up to the point of sale.
- Governance related inefficiencies.
- Inputs and extension services.

It is estimated that by addressing the abovementioned inefficiencies, cooperatives (pulping) and millers can save up to an estimated 10% of processing costs. This will allow more value of the sold coffee to be payable to smallholder farmers to ultimately improve producer margins.

3.2.4 Commercial sustainability

While the optimisation of inputs, improved agricultural practices and resulting yield improvements and higher value chain efficiencies improve the position of the smallholder farmer, continued improvements in all areas are needed in order to establish smallholders as commercially sustainable in the ideal state. Over the longer term, additional input-cost saving and simultaneous yield improvements through targeted and best-practices crop management will further improve the competitiveness and profitability of smallholder coffee farming and will ultimately improve the livelihoods of the large number of smallholders in Kenya.

Progress in eliminating the abovementioned value chain inefficiencies is also assumed to continue as a result of economies of scale due to increased coffee volumes that pass through the value chain.

The ideal state for smallholder farmers is not achieved by the end of the 2030 due to the long-term nature of coffee production. Improvements continue towards becoming a sustainable commercial smallholder unit with efficiency gains in downstream activities:

- Additional input cost savings
- Additional yield improvements due to improved crop management and improved or area-specific cultivar availability
- Higher volumes through the value chain lead to further efficiency in downstream activities

3.2.5 Combination of interventions and cumulative impact

Figure 16 illustrates the principle of layered market-led interventions: the Deep Dive analysis found that a combination of improvements at smallholder farm-level productivity and value chain efficiencies would all contribute to an improved gross margin position at farm level and ultimately, to commercially sustainable coffee farming. Planned market interventions, such as the additional auction levy which is part of the current Coffee Bill, will not transform the industry in isolation. Targeted spending on improved extension services, input supply mechanisms and affordable finance aimed at re-aligning (and reducing) input costs at farm-level and improving crop management in order to improve achieved yields will go a long way to improve smallholder farmers' overall sustainability. In addition, value chain efficiencies and value chain growth (higher coffee volumes passing through the value chain) will ensure that equitable value of the final product is realised on-farm.

Market interventions without supporting Farm-level productivity reform will not transform the industry

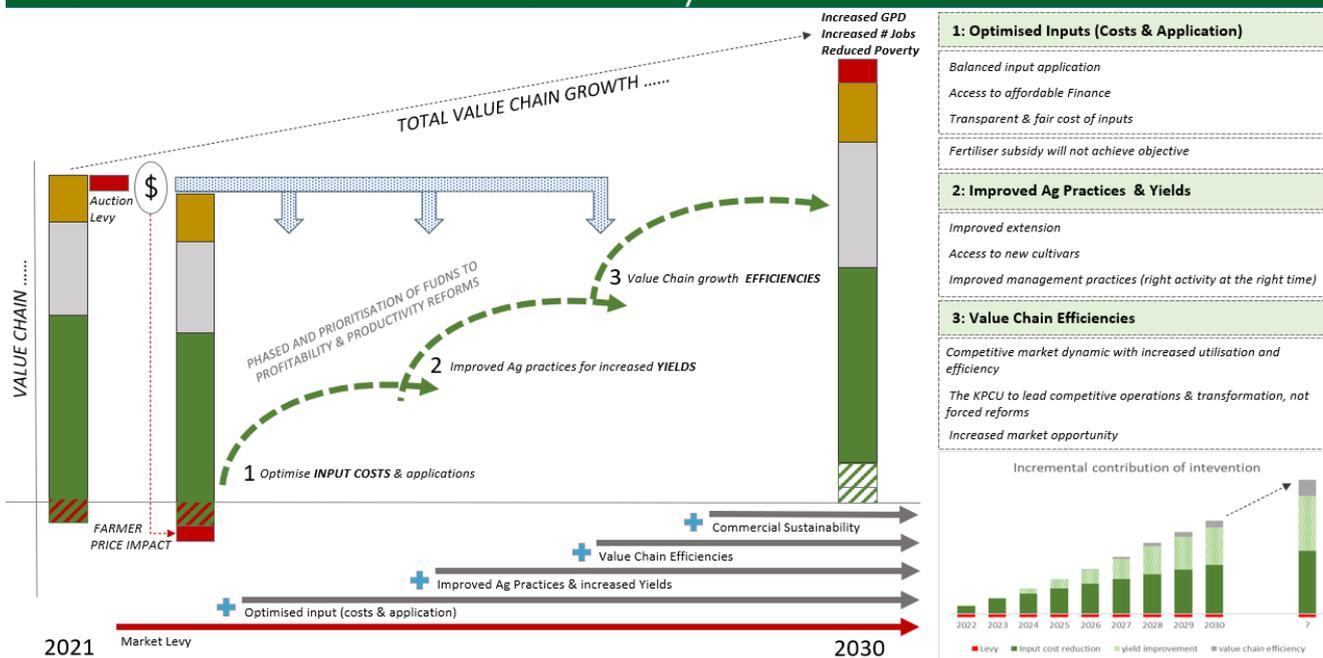


FIGURE 16: LAYERED INTERVENTIONS TOWARDS COMMERCIALY SUSTAINABLE SMALLHOLDER COFFEE PRODUCTION

The interventions discussed can be organised in value chain and policy specific levels of change, as shown in Table 9.

TABLE 9: SUMMARY OF LEVERS OF CHANGE

	Value Chain Levers	Public Policy Levers
Primary production	Affordable access to finance	Affordable access to finance
	Transparent and equitable input cost finance through cooperatives.	Improved extension services regarding agricultural practices (when to do what), input application in-line with yield expectations and appropriate soil condition / corrections.
Processing (pulping and milling)	Improved processing equipment efficiency and capacity utilization	Incentivise transparency regarding costs and financial management of cooperatives and mills.
Marketing / Auction		Additional auction levy (2%, as specified in the new Coffee Bill).

The impact assessment has three aspects: It starts with a gross margin analysis, which illustrates the impact of specified actions and interventions on margins for smallholder producers. Secondly, simulations were conducted using BFAP's multi-market partial equilibrium simulation model, which is described in Box 1. This enables quantification of the impact in terms of prices, revenue and returns, as well as the dynamic supply response that results from improved margins. Thirdly, this supply response, along with the gross margin impacts, is introduced into IFPRI's general equilibrium RIIAPA model, detailed in Box 2, which simulates the economywide and development impacts.

Box 2: BFAP Africa multi market partial equilibrium model

The multi-market Partial Equilibrium (PE) model utilised in this analysis has been developed by the Bureau for Food and Agricultural Policy over a number of years. After initially starting with an ad hoc combination of country and commodity coverage that emanated from specific research requests for forward looking analysis in the region, the first comprehensive structure for grains and oilseeds in 8 countries was established in 2012. Over the period 2012-2015, BFAP also introduced the PE modelling methodology to the ReNAPRI network and researchers from in-country think-tanks received training in the application of these analytical tools. Over time, the model has been utilised in various research projects and expanded to the point where it now covers 12 countries, with commodity coverage in each country ranging from 1 to 15. The Kenyan module currently covers fifteen commodities, with relevant sectors linked through both competition for resources and input output relationships. For instance, livestock is linked to grains through animal feed and so scenarios that impact the livestock sector spill into grains and vice versa.

The multi market model is a dynamic, recursive partial equilibrium framework, based on balance sheet principles to establish equilibrium, where total supply (production, imports and stocks) must equal total demand (consumption, export and ending stock) for any given product. This approach, together with the analyses of market prices, provides the backbone for detailed market analysis that forms that foundation for the market-led approach of this project. The strengths of the partial equilibrium framework lie in the ability to capture intricate market and policy details, that closely mimic the situation for specific commodities. This also enables detailed scenario analysis when changes occur in any of the existing variables or relationships.

Model specification is generally based on well accepted structures and specifications of supply and demand, with prices based on a combination of import or export parity, and domestic supply and demand dynamics, depending on the market situation for each commodity. In commodities such as maize, where regional trade dynamics are important, the model also captures trade and pricing relationships within the region in an innovative trade specification detailed in Davids, Meyer and Westhoff (2018). The modelling framework ensures consistency in supply and demand



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relationships and is able to provide price impacts of alternative scenarios, as well as a dynamic supply and demand response over time.

Parameterisation is based on a combination of econometric estimation and elasticity assumptions based on literature review, theoretical consistency and specialist judgement. The model is calibrated based on historic data, with the period dependant on data availability and consistency. For the bulk of the commodities, the calibration period ranges from 2005 to 2019, but data limitations resulted in a calibration period of 2012 to 2019 for others.

The dependence on historic data, both for estimation and calibration purposes, implies that significant emphasis must be placed on the quality of the historic data feeding into the model. Initial commodity balance sheets were compiled based on a range of secondary data sources. While the official national data provided the starting point for balance sheet compilation, complementary data from the other listed sources provided opportunities for validation and alternatives where required.



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BOX 3: IFPRI's economywide RIAPA model

IFPRI's Rural Investment and Policy Analysis (RIAPA) model is a dynamic economy-wide (or CGE) model that captures the interactions between all producers (sectors) and consumers (households) in the economy. RIAPA separates the Kenyan economy into 86 sectors (half within the agri-food system) and the Kenyan population into 15 household groups (i.e., urban, rural nonfarm, and rural farm, each further divided by per capita expenditure quintile). Producers in each sector combine intermediate inputs (e.g., fertilizers, seeds, fuels) with factor inputs (i.e., land, labour and capital) to produce a level of output, which they either consume within the household or supply to markets where they are combined with imports. Marketed products are either purchased by domestic agents (producers, households, government, investors) or exported to foreign markets. The decision to purchase domestic or imported goods and supply domestic or foreign markets depends on changes in relative prices in these different markets. Producers seek to maximize profits and consumers seek to maximize utility (e.g., consumption). RIAPA, therefore, provides a comprehensive picture of the workings of the Kenyan economy, while also ensuring that macroeconomic consistency and resource constraints are respected.

Finally, the economy-wide model is linked to a survey-based microsimulation module that tracks changes in household incomes, consumption and poverty. The 2015/16 Kenya Integrated Household Budget Survey is used to build the CGE model's social accounting matrix (SAM) as well as the microsimulation module. The SAM captures the structure of the economy in 2017 using data compiled from the national statistical agency (e.g., national accounts) as well as other international sources, including the IMF (i.e., balance of payments and government financial statistics).

The RIAPA model is used to simulate the effects of expanding farm production within existing agricultural value-chains. Total factor productivity (TFP) growth in the farm component of each value-chain is accelerated beyond baseline growth rates, such that, in each value-chain scenario, total agricultural GDP is one percent higher in 2028 than it is in the "business-as-usual" baseline scenario. Expanding farm production increases the supply of raw agricultural products to downstream processing activities and generates demand for trade and transport services.



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The cumulative impact of interventions on the gross margins of smallholder farmers is illustrated in Figure 17. Initially, the market levy negatively affects the gross margin at producer level since less value is available to move down the value chain. However, if the funds from this levy are applied to achieve the market-led interventions detailed in the above sections, the returns and gross margins at smallholder production level can be significantly improved.

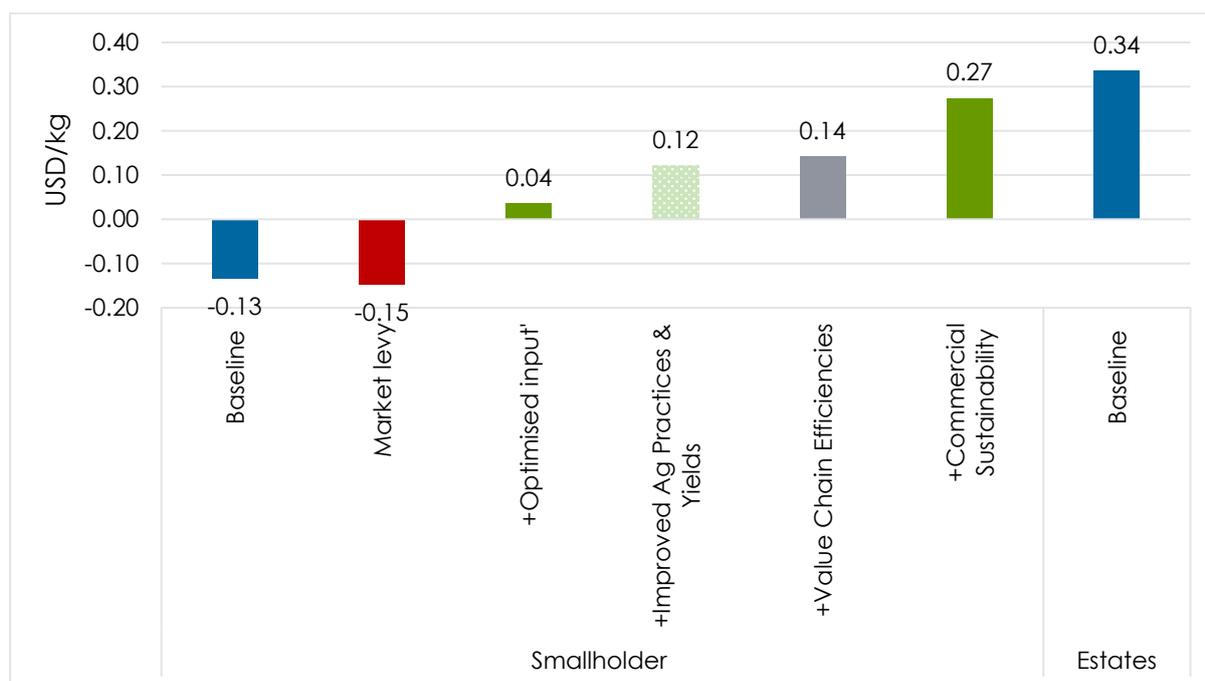


FIGURE 17: CUMULATIVE IMPACT ON GROSS MARGINS

The cumulative impact of the market-led interventions on the total production of coffee is illustrated in Figure 18. Under the baseline, total coffee production is projected to decline to 43.05 thousand tonnes (-6%) in 2030 from current levels. The planned additional market levy of 2% is seen as part of the near-term reality for the sector, and essentially taxes an already declining industry. The effect is a decrease in price realised at production level, and therefore a further decline in total production to 42.33 thousand tonnes in 2030 (-7.6% from the Baseline). The primary production input cost savings (optimised inputs) and improved agricultural practices and yields already achieve a turn-around in the declining coffee production by 2030 enabling it to reach 52.87 thousand tonnes. Although the smallholder farmers' position is improved, in order for these improvements to be sustainable, value chain efficiencies need to be improved and continuous input cost savings and yield improvements need to be achieved. The total impact of these interventions is only realised beyond the 2030 outlook period due to the long-term nature of coffee production however, by 2030 under the "towards commercial sustainability" combination of interventions,

55.71 thousand tonnes of coffee is produced in Kenya, 29.4% more than projected under the baseline status quo.

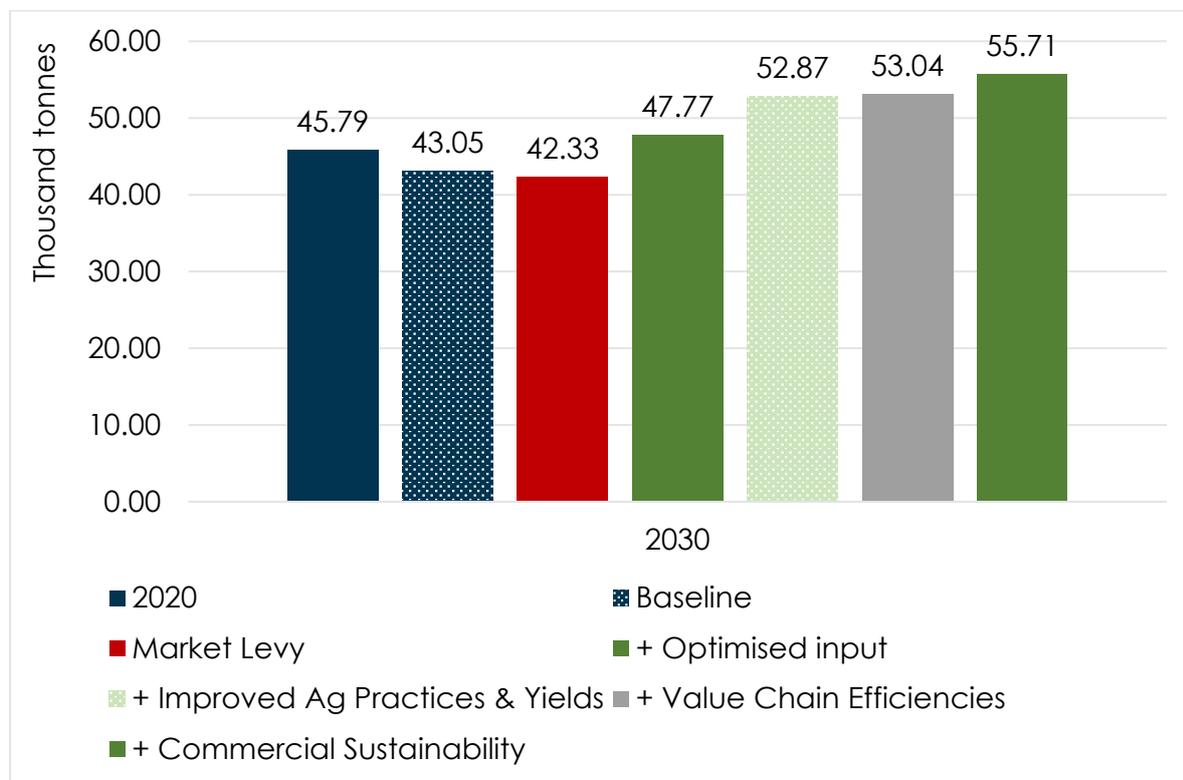


FIGURE 18: CUMULATIVE IMPACT ON COFFEE PRODUCTION

Source: BFAP Multi-market partial equilibrium model simulations

The total production increase is driven by both intensification (yield improvements) and expansion (area increases). Under baseline assumptions, the smallholder coffee area is projected to decline by 12% by 2030, from 89.7 thousand hectares down to 78.9 thousand hectares. The combination of interventions improve gross margins and therefore returns from coffee realised at smallholder production level relative to other perennial crops like macadamia nut production. The area under smallholder coffee production increases to just over 100 000 hectares by 2030 (27% increase from the baseline 2030) as smallholders re-enter the coffee value chain (Figure 19).

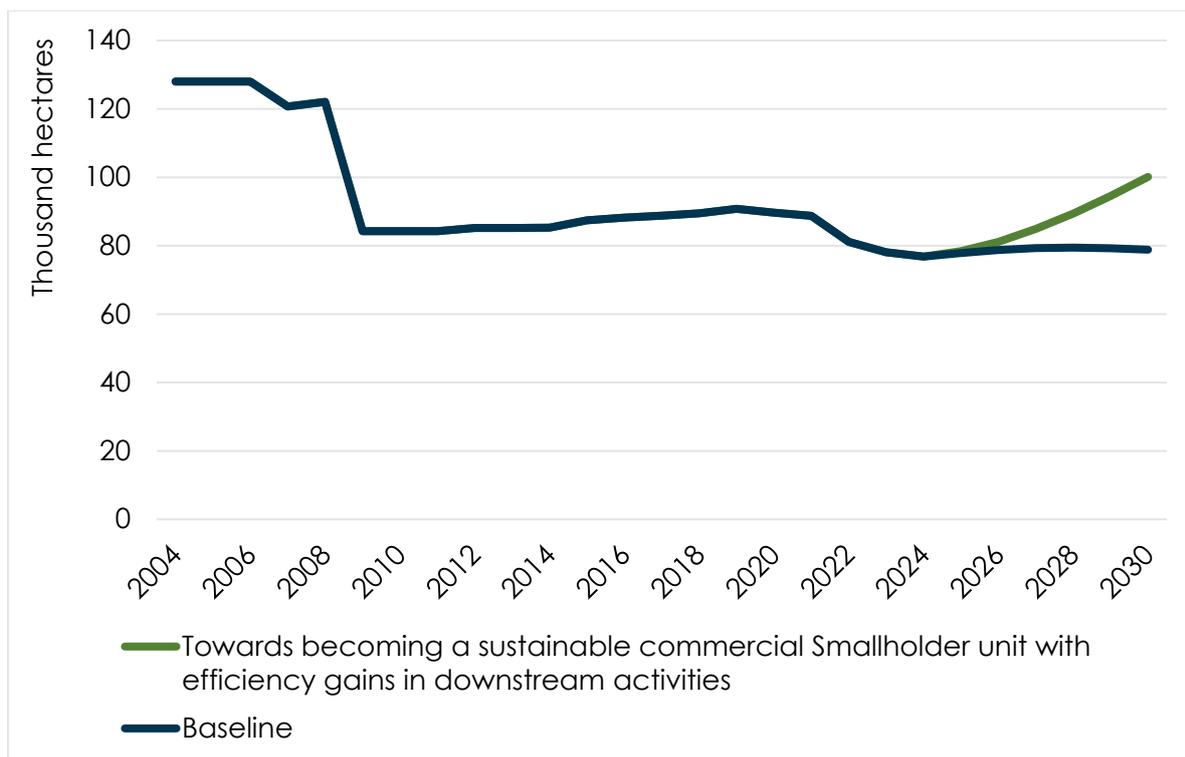


FIGURE 19: IMPACT ON SMALLHOLDER AREA UNDER COFFEE

Source: BFAP Multi-market partial equilibrium model simulations

3.3. Redesigning the value chain

While the value chain structure is not inherently changed by the suggested market-led interventions, some changes that potentially flow from the interventions include:

- Processing facility consolidation (pulping and milling) in order to optimise capacity utilisation.
- Increased and targeted farmer support and readily available input-cost-finance.
- Diversification of market channels which might lead to an increasing proportion of coffee being sold via direct marketing (by farmer associations) rather than through cooperatives and the auction.

3.4. Economy-wide impact

Upgrading the coffee value chain either releases or demands more resources (to or from other sectors) and the net impact depends not only on the coffee value chain's own profitability but also its profitability relative to other value chains.

Figure 20 shows that coffee's GDP per hectare is significantly smaller compared to that of all agricultural crops and while the reforms lead to an almost doubling in GDP per hectare from coffee (USD710/ha under the baseline to USD1 230/ha by 2030 after cumulative interventions were applied) the GDP per hectare remains low compared to agriculture at large.

On the other hand, if GDP is expressed per worker, coffee out-performs the rest of the agricultural sector: coffee yields USD2 510/worker, compared to the USD1 250/worker for all crops. Under the coffee reforms, the GDP per worker from coffee is projected to significantly increase to USD5 440/worker in 2030.

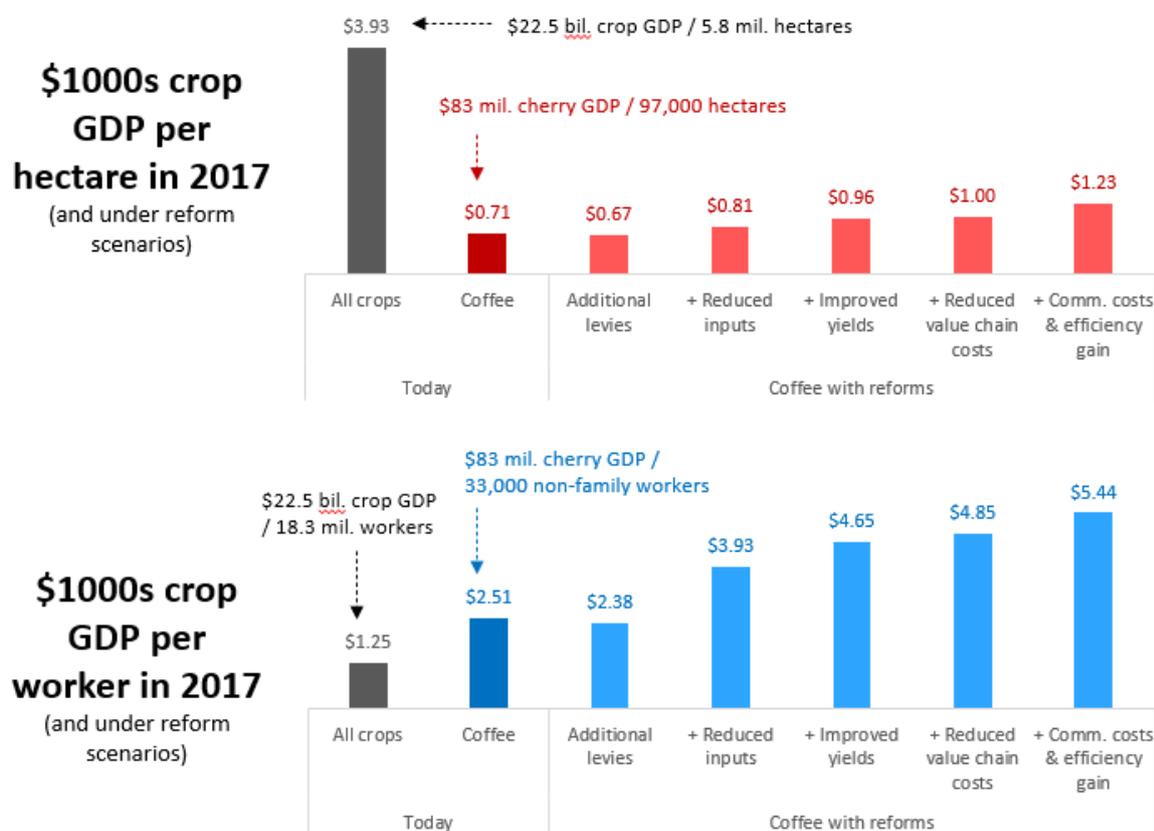


FIGURE 20: COFFEE RELATIVE TO OTHER AGRICULTURAL SECTORS

Source: IFPRI RIAPA Kenya economy wide model

It is estimated that the coffee reforms lead to an increase in the annual agri-food system GDP of USD 161.5 million. This increase is not only limited to the coffee sector, but reforms allow farmers to diversify into other crops and generates value-added downstream in the agri-food system.

Furthermore, the coffee reforms lead to a reduction in the estimated number of poor people of 58 500. The reforms lead to higher incomes per worker on/off the farm as poverty in both rural and urban areas is reduced (Figure 20).

Agricultural subsectors differ in size. To achieve the same absolute increase in total agricultural value-added (i.e. GDP), it is necessary for smaller value-chains to expand more rapidly than larger ones. Smaller subsectors need larger productivity gains to match the effects of bigger subsectors. While such rapid growth for these smaller subsectors may be difficult to achieve, targeting the same absolute increase in agricultural GDP permits comparisons across value chain growth scenarios.

Annual increase in agri-food system GDP & reduction in number of poor people by 2030 under different reform packages

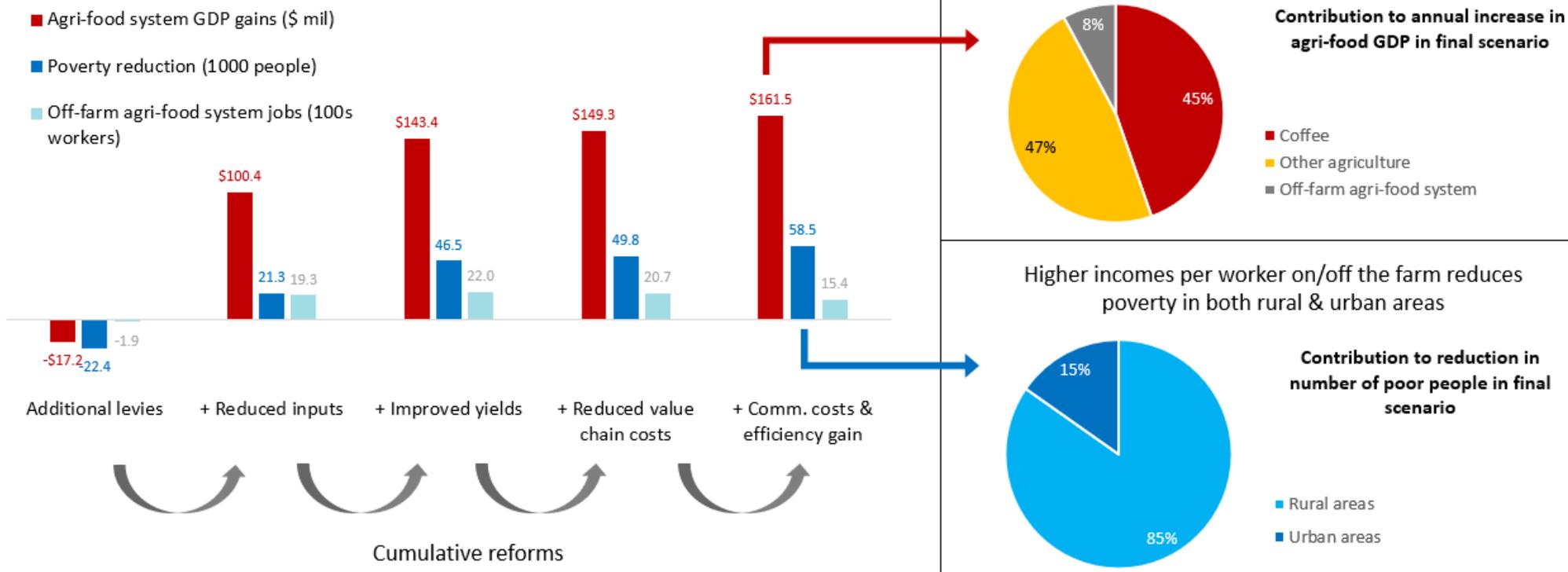


FIGURE 21: ECONOMY-WIDE IMPACTS

Source: IFPRI, 2020

4. MARKET AND POLICY CONSISTENCY ASSESSMENT

As detailed in section 1.3.3, Kenya Vision 2030 was launched in 2008 as Kenya's development blueprint covering the period 2008 to 2030. It is aimed at making Kenya a newly industrializing, middle income country providing high quality life for all its citizens by the year 2030. The first two decades of Vision 2030 have focused on developing higher and more sustainable growth of the economy in a more equitable environment (Medium Term 1) and delivering an increase in the scale and pace of economic transformation through infrastructure development with strategic emphasis on the economic and social pillars of Vision 2030 (Medium Term 2). The next phase of Vision 2030 (Medium Term 3) is centered around the Big Four Agenda namely **food security, affordable housing, manufacturing and affordable healthcare for all**.

Although the Big Four Agenda is the current overarching framework for the delivery of Vision 2030 the implementation structures and accountabilities for specific sectoral reforms remain fragmented, with different parties driving various agendas within the same value chain. The range of policy reforms within the coffee sector are un-coordinated, often politically motivated and without clear accountability for implementation. Although the latest coffee bill (Republic of Kenya, 2020) references the key issues around poor farmer productivity and profitability, the need for improved access to inputs and affordable finance, the value chain inefficiencies and mismanagement, most of the interventions focus on the market structures and price which are focused on the short term, and in-practice worsen the position of the grower as all costs and levies are deducted before the grower gets paid.



IN CLOSING

5. CONCLUDING REMARKS

Coffee has played an important role in Kenya's economy for over a century. It was first introduced in 1893 and experienced rapid growth becoming one of Kenya's major exports by the mid 1920's. Coffee became known as the "black gold" of Kenya. The rapid expansion in the sector resulted in various political institutions being introduced to structure and manage the different stakeholders and role players across the value chain. Coffee continued to grow in both economic value and political importance for decades but Kenyans were not allowed to own or manage coffee farms until 1934 when the British Colonial Board allowed Kenyans to manage small-scale coffee farms but with limits on farm size, number of trees and farm location. By the time Kenya declared independence from Britain in December 1963 the coffee sector had reached 100 000 tonnes green beans and had become a major source of income for small holder farmers. In the period following independence the coffee sub-sector was controlled by the government, with the Ministry of Agriculture responsible for policymaking and overseeing the coffee sub-sector in general. During this period, the sub-sector operated in a more controlled and functional environment reaching 130 000 tonnes of green coffee in the mid 1980's.

However, following the liberalisation of the coffee sector in the 1980s and the subsequent changes in the value chain structures and controls (with the industry being subject to the free market forces of supply and demand) the primarily smallholder-based agricultural industry began to crumble. The past 4 decades have seen the Kenya coffee industry decline from the 130 000 ton production in the mid 1980's to 41 000t in 2018.

Despite the significant decline coffee is recognized as an important crop that provides income to many smallholder farmers in Kenya. It has been included in the Government's efforts towards the fight against poverty and is central in the agricultural sector's contribution towards the realization of Vision 2030. Vision 2030 provides the overarching goal for Kenya's further growth and direction but the implementation structures and accountabilities for specific sectoral reforms remain fragmented, with different parties driving various agendas within the same value chain.

This market led, evidence based evaluation of the Kenya Coffee Value Chain was commissioned to support the Government's efforts and provide recommendation regarding policy prioritisation and investment opportunities that deliver long term sustainable transformational growth in the Kenya coffee sector. One of the key principles highlighted within the deep dive analysis is that **market interventions without supporting farm-level productivity reform will not transform the industry.**

To sustainably turn the Kenya coffee sector around a combination of market-led interventions at various nodes, primarily in the smallholder coffee value chain, are recommended to address smallholders' productivity, value chain inefficiencies and poor governance structures:

Optimised inputs (costs & application)	Improved Practices & Yields	Ag	Value Efficiencies	Chain	Towards Commercial Sustainability
Balanced input application, transparent and fair cost of inputs, access to affordable finance.	Improved management practices, access to new cultivars		Competitive market dynamic with increased capacity utilisation and quality processing. Increased market opportunity		Interventions 1 – 3 are seen to yield incremental improvements over time. Continuously achieving incremental improvements over time, will reduce the gap between smallholder and estate coffee profitability.

The systematic and sequential implementation of these interventions across the coffee value chain leads to a combination of input cost savings, producer price increases, and overall increased competitiveness in coffee production. The economy wide effect of successfully implementing the recommended interventions across the value chain results \$161million increase in total Agri-food system GDP and sustainability lifts over 58 000 people out of poverty.

The key next steps and opportunities are to align and integrate both the deep dive modelling framework and the recommended interventions with key value chain stakeholders and policy frameworks to support the refinement of the Coffee Bill to provide additional evidence based analysis to influence the policy prioritisation and investment decisions that deliver long term sustainable transformational growth.

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ANNEXURE A: OVERVIEW OF PPVC METHODOLOGY

In most developing countries, the formulation of sound economic policies that establish a framework and enabling environment for agricultural transformation and inclusive economic growth is high on the agenda. However, appropriate and effective public policies and investments require strategies that are targeted and recognise budgetary constraints. To this end, many governments develop national agricultural investment plans (NAIPs) or strategic reforms that outline the Ministry of Agriculture's policy and investment priorities. While these initiatives are a positive step towards formalising the process of priority-setting and budgeting, they can often lead to long lists of policy ambitions and substantial increases in proposed levels of public agricultural expenditure.

Against this backdrop, the Bill and Melinda Gates Foundation (BMGF) is supporting a replicable, market-led, evidence-driven Policy Prioritisation through Value Chain Analysis (PPVC) project. The project is implemented by the Bureau for Food and Agricultural Policy (BFAP) in partnership with the Alliance for a Green Revolution in Africa (AGRA), the International Policy Research Institute (IFPRI), and in-country think tanks. The PPVC approach was developed by BFAP and IFPRI during a pilot project in Tanzania in 2017 and 2018 that was executed in collaboration with Sokoine University of Agriculture, Morogoro, Tanzania. The approach was developed to (1) identify value chains that can increase incomes, ensure food and nutrition security, attain higher agricultural GDP growth, create jobs and employment and other outcomes related to inclusive agricultural transformation (IAT); and (2) prioritise and implement policies and public investments for upgrading the identified value chains. The initiative is set up to follow a demand driven approach in relation to the identification and prioritisation of policy options, and upon the explicit request from national governments and other relevant stakeholders, and focuses on capacity building of in-country think-tanks. The project has been implemented in Tanzania, Kenya, and the first set of outputs have been developed for Ethiopia and Nigeria.

This project does not replace the national plans or any ongoing value chain and policy prioritisation activities, but rather augments the process by providing a unique combination of empirical tools within a market-led approach. The broad activities or interventions to be delivered by the Project include:

- **Market-led analysis to identify value chain priorities.** On-the-ground value chain mapping, and partial and computable general equilibrium modeling to generate a market outlook and identify and assess priority value chains that align to national strategies and that have the potential to drive IAT.
- **Policy and public investment reform identification, prioritisation and design.** Articulation and sequencing of policy and public investment reforms for upgrading each prioritised value chain.
- **Technical assistance on implementation of reforms.** Provision of ongoing technical assistance to governments on the implementation of policy and public investment recommendations, as follow-up support for ensuring that recommendations are implemented after technical findings are presented.



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Broadly, the PPVC approach covers two key aspects, which can run concurrently, each with multiple phases. The first aspect relates to **cross-cutting sectoral priorities** and the second is focussed on **value chain specific priorities**. Under the various phases, the approach combines a number of qualitative and quantitative assessments. Figure 1 presents the overall framework where a combination of market-led and economy-wide outcomes inform the selection and analysis of priority value chains and cross-cutting policies and investments that are most effective at driving sustainable inclusive agricultural transformation.

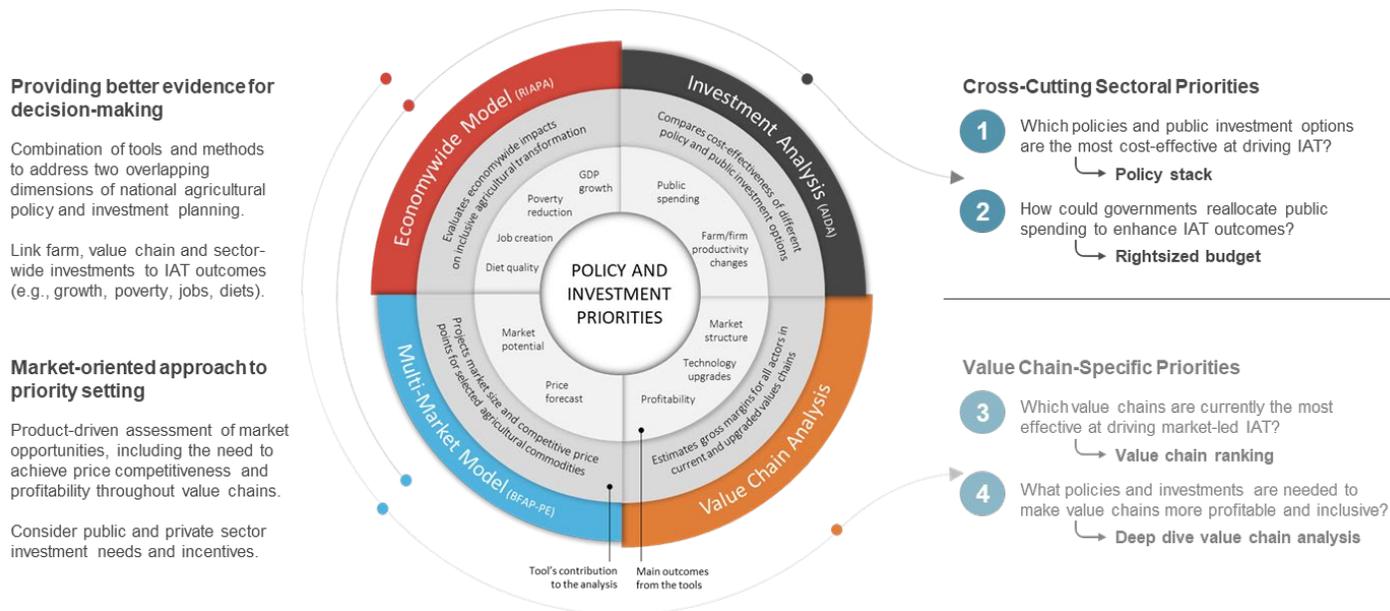


Figure A1: Overview of the tools utilised in the PPVC approach.

1. Cross Cutting Sectoral Priorities

The cross cutting sectoral priorities is an investment analysis conducted by IFPRI using the RIAPA-AIDA framework. It comprises two phases designed to compare the cost effectiveness of various relevant policy and public investment options. It considers the quantum of government expenditure, as well as the farm and firm level productivity gains that the expenditure is expected to unlock. The first phase develops a policy stack, based on the cost effectiveness of various options in driving inclusive agricultural transformation (IAT). The second phase develops a rightsized budget, which considers expenditure constraints and therefore reallocates public expenditure in order to optimise and enhance IAT outcomes.

AIDA requires information on investment impacts, unit costs and public spending. Econometric analysis of farm and household survey data is first conducted to analyze household-level investment impacts. This is combined with information from secondary sources, including monitoring and impact evaluation (M&E) studies of past investments and programs, and/or from spatial crop and infrastructure modeling. AIDA then decomposes and analyzes government budgets using public

expenditure data, and projects future changes in spending allocations and investment impacts. This information is fed into RIAPA, which analyzes the economywide impacts of AIDA's investment spending forecast, alongside changes in market and macroeconomic policies. Finally, RIAPA's microsimulation module estimates household-level poverty and dietary impacts differentiated by gender.

The estimates of the returns to different investments is then used to prioritize the allocation of public spending given resource constraints (i.e., budget rightsizing). This is an iterative process in which investment impacts and returns are re-estimated over time, allowing the prioritized budget to evolve over the planning period in response to changes in investment outcomes and costs.

2. Value Chain Specific Priorities

Value Chain Specific Priorities involve research undertaken by BFAP, IFPRI and in-country think tanks with AGRA facilitating discussions with key in-country stakeholders. The analytical work also comprises two phases, designed to prioritise specific value chains to maximise impact on IAT outcomes, as well as specific actions within these value chains to ignite inclusive growth.

2.1 Value Chain Ranking

The first phase of the value chain specific priorities is the development of a ranking report. The ranking exercise considers current policy initiatives and therefore typically, but not exclusively, starts with a shortlist of value chains identified in existing policy documents such as the National Agricultural Investment Plans. The value chains included in this short list is then ranked based on a selection of quantitative indicators, informed by historic data and the modelling framework, related to market led potential, inclusiveness, transformation and a qualitative scan of the value chains that considers four key elements for each chain: (1) The current and potential investment level of each value chain; (2) the scalability of a value chain taking account of potential in regional markets and in downstream or complementary value chains; (3) the existing level of policy support; and 4) Agro-ecological resource potential related to the specific chain. Table 1 provides a summary list of indicators.

Table A1: Summary of Value Chain Ranking Indicators

Indicator Category	Indicator Sub-Category	Indicator Name / Description	Analytical Framework
Market-led potential	Market Potential	Potential for intensification	BFAP Africa PE Model
		Domestic consumption growth	BFAP Africa PE Model
		Regional Export Potential	Historic Data
	Competitiveness	Relative Trade Advantage (RTA)	Historic Data
		Input cost to use ratio	Historic Data
Inclusiveness		Poverty Reduction	RIAPA CGE Model

		Agri-food System Employment	RIAPA CGE Model
Transformation		Agri-food system growth	RIAPA CGE Model
		Diet Quality	RIAPA CGE Model
Value Chain Scan	Qualitative Feedback in country	Level of Policy Support	Qualitative Ranking through Stakeholder Engagement
		Private sector investment levels	
		Scalability and interlinkages with additional value chains	
		Agro-ecological Resource Base	

The various indicators are combined using a Garrett Ranking technique. The indicators inform a ranking outcome for each category. These can be regarded as orders of merit assigned to value chains through the indicators. Orders of merit are transformed into units of scores by converting orders of merit to percentage positions and converting percentage positions to scores using the Garrett table (Garrett & Woodworth, 1985). Finally, scores are added for each factor (value chains in our case) and divided by the total number of indices used. The final ranking of value chains is assigned according mean scores: highest mean score ranking first and lowest mean score ranking last.

Value chain selection is informed by the ranking, but occurs in collaboration with stakeholders and policy makers in country. In the various countries where the approach has been rolled out to date, the ranking was a key consideration in choosing relevant value chains, but the choice was also informed by urgency and need for actions from policy makers. Consequently, while higher ranking value chains have been chosen, it has not simply come down to choosing the highest ranking value chains for deep dive analysis.

2.2 Value Chain Deep Dive

The deep dives provide an in depth analysis of specific value chains and follows the initial selection process. Essentially, it aims to inform which policies and investments are needed to unlock improved profitability, inclusivity, efficiency and therefore growth from these value chains. The value chain deep dive process proceeds sequentially as follows:

- Firstly, it aims to establish the current state, as well as the baseline, or “business as usual” outlook for the specific subsector. This provides an overview of historic and expected supply and demand trends (including trade flow and prices), identifies critical stakeholders throughout the value chain, and establishes associated market shares, operational costs, capacities and constraints. This all informs a summary of major challenges and constraints faced by the various value chain actors.
- Secondly, it defines an “ideal or improved state” for the value chain, in which key bottlenecks and constraints are addressed using specific levers of change, including but not limited to value chain investments (public and private) and policy levers. In order to reach the ideal state, a combination of investments and policies are formulated at specific nodes of the

value chain aimed at unlocking more value out of the market system and to boost the level of participation/inclusiveness.

- Thirdly, the impacts of the changes are quantified in three ways.
 - Changes are translated to gross margin impacts at the various nodes of the value chain.
 - The impact of interventions is modelled over a medium-term horizon (10 years), using BFAP's multi-market partial equilibrium model, which informs the projected product flow through the value chain.
 - The broader economic and socioeconomic impacts of improved margins and expanded production is simulated using the economy-wide RIAPA general equilibrium model.
 -

2.3 Quantitative tools utilised in the analysis

The value chain specific analysis relies on a package of empirically-grounded tools designed to answer key questions at different stages of the policy process. These tools include four main components, namely a multi-market model (BFAP); an Integrated Value Information System (IVIS); an economy-wide model (RIAPA-AIDA); and value chain mapping and gross margin analysis. The Integrated Value Information System provides a platform that integrates global spatial datasets with the empirical output of the other tools. The Value Chain Analysis identifies key actors and products flows and provides gross margins at various points of the chain to inform investment needs and feasibility. The BFAP multi-market partial equilibrium model projects market space and competitive price points for the specific commodities, whereas the RIAPA economywide model evaluates broader economic and socioeconomic impacts on inclusive agricultural transformation. The specific tools are detailed below. While each tool has its own merits, the strength of the PPVC approach rests in the combination, which is ultimately used to assess impact and prioritise actions. The combination of the multi-market PE model, IVIS and value chain analysis enables the identification and costing of public and private investments in agriculture and downstream agro-processing. The value chain analyses adopts a product-driven or market-led approach which extends from local farmers to final consumers or export markets, and the farm component of each value chain is situated within the broader agricultural sector (but not the economy as a whole). IVIS highlights where value chains could potentially be located in a country and the PE model assesses impacts on agricultural production and prices. In turn, RIAPA captures the whole economy, including both agricultural and downstream subsectors, and how these combine to form a country's agri-food system (AFS).

Integrated Value Information System (IVIS)

IVIS was developed to integrate economic, statistical and spatial modelling approaches into a single system designed to answer the kinds of policy and business questions needed to design a feasible public-private investment plan. IVIS is hosted in a secure web-based geographical information system that facilitates better project governance, including real-time monitoring and evaluation using BFAP's economic models and databases.

BFAP Multi Market Partial Equilibrium Model

The multi-market Partial Equilibrium (PE) model utilised in this analysis has been developed by the Bureau for Food and Agricultural Policy over a number of years. After initially starting with an ad hoc combination of country and commodity coverage that emanated from specific research requests for forward looking analysis in the region, the first comprehensive structure for grains and oilseeds in 8 African countries was established in 2012. Over the period 2012-2015, BFAP also introduced the PE modelling methodology to the Regional Network of Agricultural Policy Research Institutes (ReNAPRI) and researchers from in-country think-tanks received training in the application of these analytical tools. This training is repeated and strengthened in countries where the PPVC project is implemented, for example Tanzania and Kenya. Over time, the model has been utilised in various research projects and expanded to the point where it now covers 12 countries, with commodity coverage in each country ranging from 1 to 15. The model typically covers ten to fifteen main commodities, with relevant sectors linked through both competition for resources and input output relationships. For instance, livestock is linked to grains through animal feed and so scenarios that impact the livestock sector spill into grains and vice versa.

The multi market model is a dynamic, recursive partial equilibrium framework, based on balance sheet principles to establish equilibrium, where total supply (production, imports and stocks) must equal total demand (consumption, export and ending stock) for any given product. This approach, together with the analyses of market prices, provides the backbone for detailed market analysis that forms that foundation for the market-led approach of this project. The strengths of the partial equilibrium framework lie in the ability to capture intricate market and policy details, that closely mimic the situation for specific commodities. This also enables detailed scenario analysis when changes occur in any of the existing variables or relationships.

Model specification is generally based on well accepted structures and specifications of supply and demand, with prices based on a combination of import or export parity, and domestic supply and demand dynamics, depending on the market situation for each commodity. In commodities such as maize, where regional trade dynamics are important, the model also captures trade and pricing relationships within the region in an innovative trade specification detailed in Davids, Meyer and Westhoff (2018). The modelling framework ensures consistency in supply and demand relationships and is able to provide price impacts of alternative scenarios, as well as a dynamic supply and demand response over time.

Parameterisation is based on a combination of econometric estimation and elasticity assumptions based on literature review, theoretical consistency and specialist judgement. The model is calibrated based on historic data, with the period dependant on data availability and consistency. For the bulk of the commodities, the calibration period ranges from 2005 to 2019, but data limitations resulted in a calibration period of 2012 to 2019 for others.

The dependence on historic data, both for estimation and calibration purposes, implies that significant emphasis must be placed on the quality of the historic data feeding into the model. Initial commodity balance sheets were compiled based on a range of secondary data sources. While the official national data provided the starting point for balance sheet compilation,

complementary data from the other listed sources provided opportunities for validation and alternatives where required.

IFPRI Economywide RIAPA Model

IFPRI's Rural Investment and Policy Analysis (RIAPA) model is a dynamic economy-wide (or CGE) model that captures the interactions between all producers (sectors) and consumers (households) in the economy. RIAPA separates the Kenyan economy into 86 sectors (half within the agri-food system) and the Kenyan population into 15 household groups (i.e., urban, rural nonfarm, and rural farm, each further divided by per capita expenditure quintile). Producers in each sector combine intermediate inputs (e.g., fertilizers, seeds, fuels) with factor inputs (i.e., land, labour and capital) to produce a level of output, which they either consume within the household or supply to markets where they are combined with imports. Marketed products are either purchased by domestic agents (producers, households, government, investors) or exported to foreign markets. The decision to purchase domestic or imported goods and supply domestic or foreign markets depends on changes in relative prices in these different markets. Producers seek to maximize profits and consumers seek to maximize utility (e.g., consumption). RIAPA, therefore, provides a comprehensive picture of the workings of the Kenyan economy, while also ensuring that macroeconomic consistency and resource constraints are respected.

Finally, the economy-wide model is linked to a survey-based microsimulation module that tracks changes in household incomes, consumption and poverty. Integrated Household Budget Surveys are used to build the CGE model's social accounting matrix (SAM) as well as the microsimulation module. The SAM captures the structure of the economy using data compiled from the most recent national statistical agency (e.g., national accounts) as well as other international sources, including the IMF (i.e., balance of payments and government financial statistics).

The RIAPA model is used to simulate the effects of expanding farm production within existing agricultural value-chains. Total factor productivity (TFP) growth in the farm component of each value-chain is accelerated beyond baseline growth rates, such that, in each value-chain scenario, total agricultural GDP is one percent higher in 2028 than it is in the "business-as-usual" baseline scenario. Expanding farm production increases the supply of raw agricultural products to downstream processing activities and generates demand for trade and transport services. Agricultural subsectors differ in size. To achieve the same absolute increase in total agricultural value-added (i.e. GDP), it is necessary for smaller value-chains to expand more rapidly than larger ones. Smaller subsectors need larger productivity gains to match the effects of bigger subsectors. While such rapid growth for these smaller subsectors may be difficult to achieve, targeting the same absolute increase in agricultural GDP permits comparisons across value chain growth scenarios.

Value Chain Analysis

The value chain analysis encompasses the entire deep dive process, combining gross margin assessments, product flow, processing and handling capacity, trading volumes and platforms, partial and general equilibrium modelling frameworks and spatial dimensions. The final outcomes



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provide a granular view of all products and actors, as well as the economics of the value chain, including operating margins derived from input costs and output and import/export parity prices. A key feature is the development of the potential state, which considers how the value chain could be restructured and optimised to enhance competitiveness, profitability and transformational outcomes. Identifying the potential state of the value chain is made possible by engaging industry specialists and private sector actors with local and international knowledge and expertise.



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