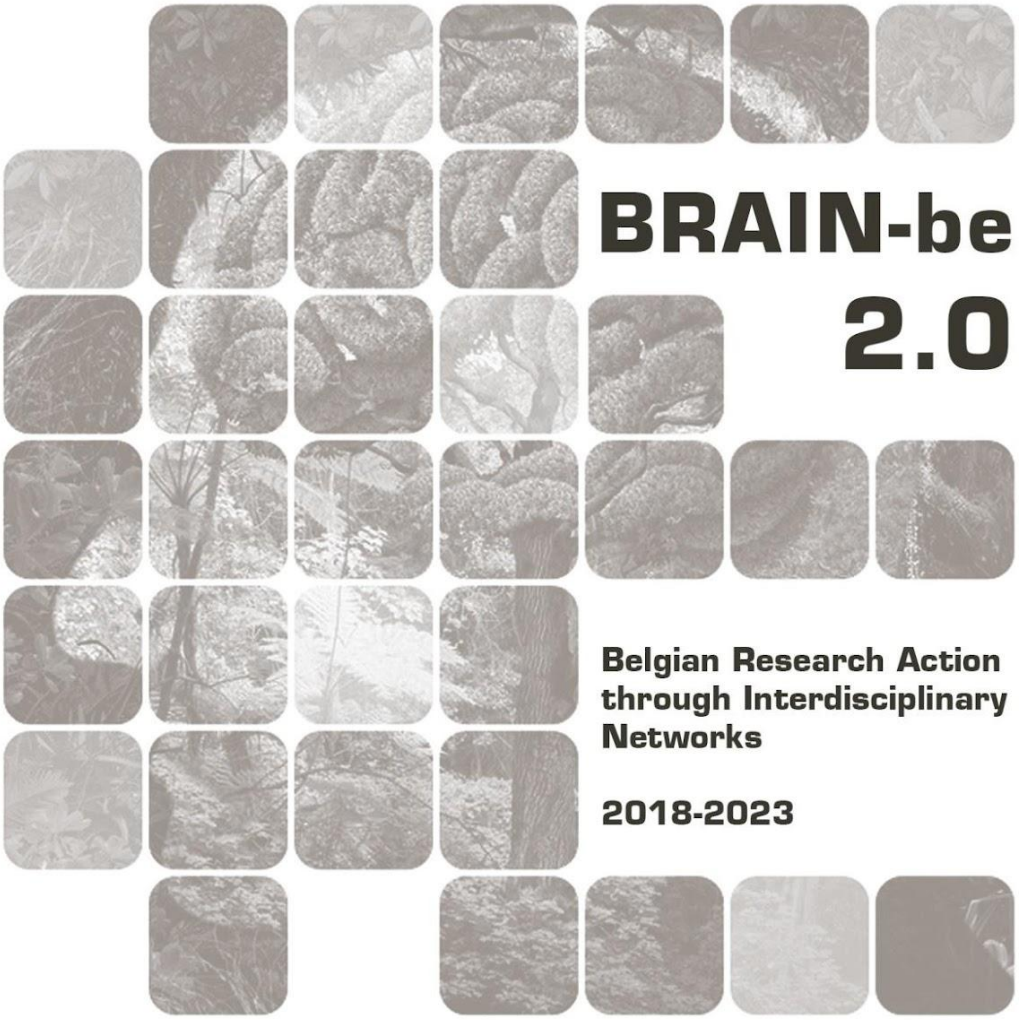

CoffeeBridge

Bridging knowledge to the field: an evaluation of the agronomic and socio-economic potential of Robusta coffee genetic resources as a cash crop in the Congo Basin

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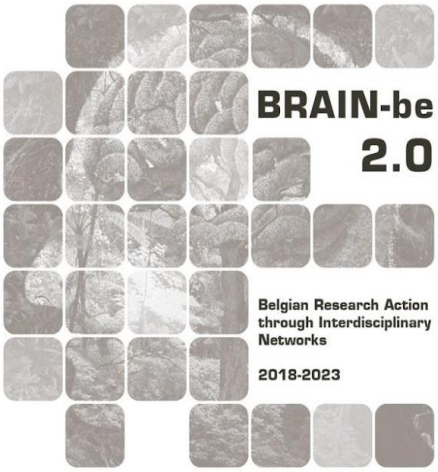

NETWORK PROJECT

COFFEEBRIDGE - Bridging knowledge to the field: an evaluation of the agronomic and socio-economic potential of Robusta coffee genetic resources as a cash crop in the Congo Basin

Contract - B2/191/P1 FINAL REPORT

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ABSTRACT

Context

This report details the findings of the CoffeeBridge project, which investigated the potential of Robusta coffee production in the Tshopo province of the Democratic Republic of the Congo (DRC). Coffee is a critical agricultural commodity globally, with *Coffea arabica* (Arabica) and *Coffea canephora* (Robusta) being the two main commercially significant species. While Arabica is valued for its superior sensory profile, Robusta is often perceived as lower quality, despite its resilience to climate change, pests, and diseases. The project addresses the need to explore and develop the underutilized potential of Congolese Robusta coffee amidst rising global challenges such as climate change, pest pressures, and shifting consumer demands. Historically, the DRC, particularly research stations like Lula and Yangambi, played a vital role in Robusta breeding and global distribution. However, due to political instability, economic challenges, and disease outbreaks, this sector declined significantly. The CoffeeBridge project aims to revitalise the Robusta coffee sector in Tshopo province by integrating research on genetics, cultivation systems, household surveys, socio-economic analysis, and historical insights.

Objectives

The CoffeeBridge project aimed to strengthen the scientific knowledge transfer and socio-economic foundations of Robusta coffee production in the Tshopo province. Key objectives included:

- Assessing the socio-economic dimensions of the local coffee sector, including land tenure, governance, and market access.
- Characterizing and valuing Robusta coffee genetic resources, studying genetic, agronomic, chemical, and sensory diversity.
- Optimizing agronomic practices for sustainable production, including analysing soil fertility and cropping systems.
- Investigating the role of coffee in agroforestry systems, comparing monoculture and agroforestry models.
- Reconstructing the historical trajectory of Robusta coffee in the DRC.
- Strengthening the coffee value chain and policy frameworks, identifying economic constraints and trade barriers.

These objectives were pursued through six interconnected work packages focusing on coordination, socio-economic evaluation, genetic resources screening, agroforestry, historical research, and value chain/policy recommendations.

Conclusions

The report concludes that the DRC, and specifically Tshopo province, holds significant untapped potential for Robusta coffee production. Key findings include:

- Historical research reveals that the DRC played a crucial role in the early development and global dissemination of Robusta coffee, with research stations like Lula and Yangambi being pivotal.

- Genetic screening identified promising Robusta genotypes within the INERA Coffee Collection, exhibiting desirable traits such as large bean size, high cupping scores, and potential adaptation to dry environments.
- Agroforestry systems are preferred over monocultures, offering a balance between yield, biodiversity conservation, carbon sequestration, and farmer needs. Wild forest coffee populations are crucial for genetic diversity and ecosystem services.
- Socio-economic challenges, including lack of buyers, poor transportation infrastructure, low farmgate prices, and unclear land tenure, hinder the sector's growth.
- Value chain analysis shows that producing medium quality roasted coffee for the local market and exporting green coffee are the most promising strategies for growth.
- Policy recommendations emphasize the need for government intervention in improving infrastructure, supporting farmer training, and establishing a national strategy for Robusta revitalization.
- Engaging stakeholders, including farmers, traders, policymakers, and researchers, is critical for the long-term success of the Robusta coffee sector.

Keywords

Robusta coffee, *Coffea canephora*, Tshopo province, Democratic Republic of the Congo (DRC), CoffeeBridge project, genetic resources, agronomy, agroforestry, socio-economic analysis, value chain, policy recommendations, historical research, coffee quality, market access, sustainability, genetic diversity, breeding programs, INERA Coffee Collection, Yangambi.

1. INTRODUCTION

Coffee is one of the world's most popular beverages and a crucial agricultural commodity, particularly for tropical and developing countries. The Coffea genus, belonging to the Rubiaceae family, includes over 130 species (Davis & Rakotonasolo, 2021) of which only two are commercially significant: *Coffea arabica* and *Coffea canephora*, commercially known as 'Arabica' and 'Robusta', respectively (ICO, 2023). They collectively sustain a multibillion-dollar industry that provides livelihoods for millions of smallholder farmers worldwide (OEC, 2024). These two species support the world coffee market, but their market value and segmentation differ significantly. Arabica coffee is valued for its superior sensory profile, with more complex flavor attributes such as fruity and floral notes and a milder acidity, whereas Robusta is characterized by its bitterness, earthy and nutty flavor notes (Seninde & Chambers, 2020; Sunarharum et al., 2014). Traditional perceptions of Robusta as lower-quality coffee have historically limited its value compared to Arabica, which is reflected in consistently lower Robusta green coffee prices (Statista Search Department, 2024) and significant differences in research and development efforts.

There are several reasons for this differentiation. First, chemical compounds with a positive impact on the sensory characteristics of coffee have been found in higher concentrations in Arabica coffees. Similarly, compounds that impart negative sensory descriptors have been reported in higher concentrations in Robusta coffee. Secondly, Robusta breeding programs often did not consider the sensory quality of the coffee. When quality traits were considered, they focused on yield, bean size, extractable soluble solids, and compounds such as caffeine (Leroy et al., 2011). Breeding for coffee quality in Arabica has seen consistent investments and development programs, resulting in improved varieties related to the sensory profile of the coffee (Montagnon et al., 2019). Lastly, and most importantly, Robusta's negative reputation and perceived lower quality are attributed to cultivation practices, processing methods, and green bean defects, which affect the final cup quality and price (Bicho et al., 2013; Toledo et al., 2016). There is evidence that Robusta coffees can exhibit good sensory qualities and promising flavor profiles, given proper production practices (Aluka et al., 2016; Augusto De Souza et al., 2018; Dalazen et al., 2020; Lemos et al., 2020; Morais et al., 2021). However, research on the quality potential of the species' genetic diversity remains limited (Lingle & Menon, 2017).

Coffee cultivation faces significant global challenges driven by climate change, pest and disease pressures, and shifting consumer demands (Ferrão et al., 2024; Ngure & Watanabe, 2024). Climate change is projected to reduce the global area suitable for coffee cultivation by approximately 50%, and higher temperatures may reduce yields of Arabica. At the same time, Robusta could suffer from increased variability of intra-seasonal temperatures. Major coffee-producing regions, such as Brazil and Vietnam, could see substantial declines in suitable land (Bunn et al., 2015). Although Robusta will also be affected (Bunn et al., 2015; Venancio et al., 2020), its natural better resistance to diseases and pests, adaptation to warmer climates (N. S. Prakash, 2018) and its higher productivity (Damatta et al., 2018; Ngugi & Aluka, 2019) indicate its significance for the future of coffee production.

The recent surge in Robusta prices, reaching a 47-year high and almost matching Arabica prices, indicates a change in Robusta's market dynamics (ICO, 2024). This situation presents an opportunity for African countries, including the Democratic Republic of the Congo (DRC), to expand their Robusta cultivation and enhance their presence in the global coffee market (WCR, 2024). The potential for Robusta to address market challenges is promising, yet barriers remain, particularly in improving the

flavor profile, increasing farmer profitability, and adapting production systems. Robusta's broad genetic diversity offers opportunities for developing new varieties that can address these barriers (Ferrão et al., 2024). The CoffeeBridge project, although designed before the current coffee crisis triggered by climate change, is responding to this crisis by generating data on the potential of Congolese Robusta coffee in the Tshopo province, both regarding the characteristics of genetic resources and cultivation.

Perhaps the most urgent challenge in safeguarding future coffee cultivation is the slow pace of developing improved varieties to match the effects of climate variability and the increasing demand for high quality coffee (Ngure & Watanabe, 2024). Robusta varieties cultivated include selections from Brazil, India, Indonesia, Uganda, Mexico, and Vietnam (WCR, 2023b). Especially for Robusta, there has been no long-term and sustained effort to improve the species in more than 30 years, and most breeding programs are located in countries outside the geographical origin of the species (N. S. Prakash, 2018). Limited access to sources of agronomic and genetic variability hinders breeding efforts in developing climate-resilient varieties that can also keep up with the growing consumer demand for high-quality coffee (Ngure & Watanabe, 2024). An integrated development of new varieties should aim to characterize and exploit the rich genetic resources, both cultivated and wild, of *Coffea canephora* (N. S. Prakash, 2018). In this context, characterizing genetic collections and identifying accessions with desirable sensory quality traits can provide access to more genetic variation for breeding programs (Anthony et al., 2011). It is now widely recognized that the key to sustaining coffee as an affordable crop lies in the genetic variation found in coffee germplasm collections (Lashermes & Combes, 2018), on farms, and in the wild.

Coffea canephora is a diploid species (2n = 2x = 22) with a self-incompatible, allogamous reproductive system (Berthaud, 1980; Lashermes & Combes, 2018; Nowak et al., 2011). Due to its allogamous nature, it is a highly diverse species, resulting in only outcrosses in the wild, and each plant can be considered a unique genotype (Lashermes & Combes, 2018). It is a woody perennial plant adapted to hot and humid lowland tropical climates (0 – 800 m a.s.l.). Typically growing as shrubs or small trees, it reaches 4 to 10 meters in the wild and is characterized by erect branches and the differentiation of orthotropic (upward-growing) and plagiotropic (lateral-growing) dense branching (Wintgens, 2004). Due to the self-incompatibility of the species, plantations have to be 'polyclonal', and an effective pollination is dependent on the presence of pollinator communities, resulting in genetic diversity within populations. Although the natural habit of the species is often a slender tree, it can easily be pruned to a shrub of ca. 2 m, with many lateral branches.

Advances in molecular genetics increase our knowledge of the genetic diversity within *C. canephora*, revealing distinct genotypes that could hold the key to improving coffee production and quality (Anagbogu et al., 2019; Kiwuka et al., 2021; Loor Solórzano et al., 2017; Ngugi & Aluka, 2019). However, these genetic resources' morphological diversity and agronomic potential are understudied. Morphological screening of its genetic diversity is essential to discovering genetic material with desirable morphological traits (Anthony et al., 2011; Kiwuka et al., 2021; Paredes-Espinosa et al., 2023). Systematic characterization of the morphological traits within *C. canephora*'s extensive genetic diversity can help identify new phenotypes with desirable traits, such as larger green bean size and higher production (Ngugi & Aluka, 2019), climate resilience (Ferrão et al., 2024), or improved sensory quality. Desirable morphological traits related to agronomic performance can range from plant architectural to leaf functional traits. *Coffea canephora* has a wide range of natural distribution,

extending west to east from Guinea to Uganda and north to south from the Central African Republic & South Soudan to Angola (Berthaud & Charrier, 1988). Genetic resources of Robusta coffee are conserved globally in ex-situ collections like those in Cameroon, Uganda, India, Indonesia Brazil, and the Ivory Coast, with the Divo collection in Ivory Coast being the largest (N. S. Prakash, 2018). Within the broad genetic diversity of *C. canephora* we could find genetic material that exhibits traits vital for future breeding programs, including drought tolerance, disease resistance, and adaptability to climate change (Kiwuka et al., 2021; N. S. Prakash, 2018; Vega et al., 2007). The Congo Basin is of particular significance for *C. canephora* genetic resources as the region is home to different genetic groups (Gomez et al., 2009; Merot-L'anthoene et al., 2019). Furthermore, Robusta cultivation originated in the DRC, where *C. canephora* plants introduced from the Lomami River region were first used for cultivar development in Java (1900-1930) and successively in 'Congo Belge' (1911-1960) and Ivory Coast (1960-1980) (Berthaud & Charrier, 1988; Leplae, 1936). Consequently, conserving and exploring local cultivars and wild *C. canephora* from the DRC could lead to promising discoveries (Bramel et al., 2017; Stoffelen et al., 2019). Unfortunately, however, the DRC's genetic resources are poorly represented in studies and in ex-situ collections.

The introduction of Robusta coffee from the Sankuru region in the DRC, formerly the Congo Free State, around 1900 was the starting point of the commercial cultivation of Robusta coffee (Leplae, 1936). The first trial of coffee production in the DRC remained unsuccessful, until the reintroduction of genetic resources selected in Java (principally using genetic resources from the Sankuru region in the DRC), the (repeated) reorganisation of the agricultural policies (e.g. the creation of 'Service de l'Agriculture' in 1910, REPCO in 1926, and INEAC in 1932) and the shift from voluntaristic to science-based approaches (from 'acclimatisation' over 'genetic selection' to 'breeding'). These reforms and approaches were inspired by the success of Java in Indonesia. The foundation of Robusta breeding in the DRC was laid in 1911 by establishing the Lula research station near present-day Kisangani. The research station was dedicated to breeding and cultivating *C. canephora* varieties and expanding the germplasm. These first breeding efforts yielded promising results, and a network of experimental stations was established in 1926 at Yangambi, Gazi, and Barumbu to facilitate comprehensive evaluations of productivity and the adaptability of these accessions under diverse environmental conditions (Coste, 1955). In 1927, the research station in Yangambi focused on enhancing the productivity and quality of Robusta coffee through both generative and vegetative selection. By the 1950s, INEAC Yangambi had become the leading research station for Robusta coffee in the world. In 1944, a breeding program was set up through field trials, resulting in 1951 in the selection of seven lines from superior mother plants with better yield and resistance to pest and disease. These 'elite' lines were distributed throughout the tropics. To date, this 'Lula' and 'INEAC' material remains the basis of Robusta production in several regions, e.g., West Africa (Montagnon et al., 1998), Vietnam (Vi et al., 2023), and DRC (Vanden Abeele et al., 2021). Despite this legacy, other wild Congolese genetic resources have rarely been exploited since. After the independence of the DRC in 1960, INEAC was transformed to L'Institut National pour l'Étude et la Recherche Agronomiques (INERA). However, financial constraints and political instability severely impacted research activities, leading to a gradual reduction in collection size (Berthaud & Charrier, 1988). During the First and Second Congo Wars in the 1990's, a lack of funding, appropriate care, and ultimately outbreaks of Coffee Wilt Disease led to a second decimation of the INERA Yangambi germplasm (Montagnon et al., 1998; Stoffelen et al., 2019).

Yangambi became isolated and as a result, these historically significant genetic resources from the INERA Yangambi collection disappeared from the global landscape of Robusta cultivation and breeding. Studies on Robusta's genetic diversity rarely mention this once-important collection, and no active sampling was conducted during the research on Robusta diversity, excluding it from genetic mapping and breeding efforts. This is evident in the current 47 commercial Robusta varieties listed by World Coffee Research, with no reference to INERA or INEAC origins (WCR, 2023b). Nevertheless, these Congolese genetic resources made a highly important contribution to the breeding of Robusta 'elite' cultivars as they have useful traits such as resistance, productivity, and adaptation to poor nutrient deficient soils. In this context, a thorough characterization of these genetic resources is needed to enhance our understanding of the potential of Robusta coffee from the DRC and potentially unveil overlooked genetic material with valuable traits. This could broaden the genetic base for breeding programs and support efforts to improve Robusta quality (Anthony et al., 2011). Since 2017, efforts to rehabilitate and document the Yangambi collection, hereafter referred to as the INERA Coffee Collection, are being undertaken in collaboration with Meise Botanic Garden. Field missions in the Yangambi biosphere and beyond resulted in newly introduced wild accessions and backyard cultivars (Stoffelen et al., 2019).

However, the long-term success of coffee cultivation in the DRC is not solely dependent on genetic resources. Knowledge, human capacity, and economic viability remain major concerns, influenced by socio-economic factors such as land access, financial constraints, weak institutional support, legal frameworks, and fragmented market access (Downie et al., 2018). Historically, these challenges have hindered coffee farmers' ability to secure fair prices and invest in sustainable practices. Addressing these barriers is essential for improving farmer livelihoods and ensuring the profitability of coffee production.

A key aspect of sustainable coffee production is the transition from monoculture systems to agroforestry. Agroforestry has the potential to improve soil fertility, enhance biodiversity, and increase climate resilience, all while maintaining economic productivity (Mayorga et al., 2022). Given the ongoing deforestation and environmental degradation in the DRC, sustainable agricultural strategies such as agroforestry are crucial for balancing economic and ecological objectives. Evaluating the trade-offs between coffee yield, soil health, and carbon sequestration will inform better farming strategies and policy recommendations.

Investment in the Robusta coffee sector must be justified by its profitability and long-term sustainability. Coffee farmers in the DRC face significant financial barriers, including limited access to credit, high costs of capital, and an unstable market. Although recent policy reforms, such as the 2002 investment code and the 2013 agricultural investment plan, aim to strengthen agricultural governance, financial institutions remain reluctant to provide credit to farmers due to perceived risks (Mulume Bonnke et al., 2022). Understanding the financial returns and risks associated with coffee cultivation is essential to attract investment and support stakeholders across the value chain.

The DRC, with its vast agricultural land and rich history of coffee research, has the potential to improve its position as a Robusta coffee producer. The Lula and Yangambi research stations played a critical role in developing and distributing Robusta varieties (Thirion, 1952), yet much of this knowledge has been lost due to political instability and declining research investments. Studying historical developments in Robusta cultivation, focusing on key enablers and barriers that shaped the sector

from 1881 to the present could help to better understand its success and decline. By revisiting archival records and scientific literature, valuable lessons can be extracted that can guide future coffee production strategies.

Beyond genetic and economic considerations, strengthening the coffee value chain is essential for long-term sustainability. The DRC's coffee sector faces persistent challenges such as inadequate infrastructure, restrictive trade policies, high formal and informal taxes, and pre-financing costs. Effective policy reforms, such as reducing trade barriers, supporting farmers (e.g. associations or cooperatives), and encouraging farmer-trader relationships, can significantly enhance market access and financial returns for coffee farmers. By promoting agroforestry, improving available coffee varieties, and mapping the value chain efficiency, an integrated research project could support a more sustainable and resilient coffee sector in the DRC.

The CoffeeBridge project integrates research on genetic resources and on cultivation systems, economic analysis, and historical insights to provide a comprehensive evaluation of the Robusta coffee sector in the Tshopo province, DRC. By addressing key questions on genetic diversity, quality potential, agroforestry systems, and financial viability, we aim to inform policymakers, investors, and financial institutions on the best strategies for revitalizing Robusta coffee production in the Tshopo province. The findings will help ensure that future investments in the sector are both profitable and sustainable, ultimately contributing to economic growth and environmental resilience in the DRC's coffee industry.

2. STATE OF THE ART AND OBJECTIVES

2.1 State of the Art

Before the CoffeeBridge project, the potential of Robusta coffee in Tshopo province remained largely underutilized despite its rich genetic diversity and historic relevance. The sector faced several challenges:

- Weak infrastructure limiting processing and trade.
- Restricted market access and high transaction costs.
- Limited institutional support and lack of farmer training.
- Unoptimized agronomic practices leading to low yields and inconsistent quality.
- Little research on genetic diversity, sensory quality, and environmental sustainability.

Additionally, Robusta coffee's historical significance in the region was poorly documented. During the colonial era, scientific efforts focused on breeding and selection, but much of this knowledge was lost over time. Reconstructing this historical trajectory provides insights in past breeding, conservation, and policy strategies, which are valuable for the relaunch of the coffee sector in the region.

To address these gaps, the CoffeeBridge project adopted a multidisciplinary approach, integrating research on genetics, agronomy, socioeconomics, environmental sustainability, and historical archives.

2.2 Objectives of the CoffeeBridge project

The CoffeeBridge project aimed to strengthen the scientific and socio-economic foundation of Robusta coffee production in Tshopo province. The key objectives were:

- Assessing the socio-economic dimensions of the local coffee sector
    - Conduct surveys on land tenure, governance, and market access.
    - Identify barriers and opportunities for smallholder coffee farmers.
- Characterizing and valuing Robusta coffee genetic resources
    - Study genetic, agronomic, chemical, and sensory diversity.
    - Identify high-quality genotypes for improved cultivation and breeding.
- Optimizing agronomic practices for sustainable production
    - Analyse soil fertility, macro- and micronutrient deficiencies, and cropping systems.
    - Develop recommendations for improved cultivation methods.
- Investigating the role of coffee in agroforestry systems

  - Compare monoculture and agroforestry models to assess biodiversity, carbon sequestration, and soil fertility benefits.

- Reconstructing the historical trajectory of Robusta coffee in the DRC
  - Analyse colonial archives to trace the origins, genetic identity, and past successes/failures of Robusta coffee.
- Strengthening the coffee value chain and policy frameworks
  - Identify economic constraints, market inefficiencies, and trade barriers.
  - Develop policy recommendations and business models for improved farmer income and value chain integration.

To achieve these objectives, the project was structured into six interconnected work packages (WPs):

- WP1: Coordination & Management
  - Ensured effective implementation of research activities.
  - Organized workshops and facilitated collaboration among project partners.
  - Integrated multidisciplinary approaches, connecting research with real-world agricultural and market conditions as well as stakeholders.
- WP2: Socio-Economic Evaluation
  - Examined land tenure, governance structures, and market access barriers in Tshopo province.
  - Conducted socio-economic surveys to understand the challenges facing coffee farmers.
  - Provided insights for policy development to improve farmer livelihoods and create fairer coffee trade structures.
- WP3: Screening of Robusta Genetic Resources
  - Characterized the genetic, sensory, agronomic, and chemical diversity of Robusta coffee in the INERA Yangambi Coffee Collection
  - Identified promising genotypes for future breeding programs.
  - Evaluated the potential for improving coffee quality through post-harvest processing experiments.
- WP4: Agroforestry and Environmental Impact
  - Assessed the ecological benefits and trade-offs of different coffee cultivation systems.
  - Compared monocultures, agroforestry models, and wild coffee production.

  - Provided recommendations for sustainable practices that enhance biodiversity conservation, carbon storage, and soil fertility.

- WP5: Historical Research on Robusta Coffee
  - Investigated the colonial history and global significance of Congolese Robusta coffee.
  - Traced historical breeding efforts and lost genetic resources from the INERA Yangambi collection.
  - Provided insights for the revitalization of local coffee research and conservation efforts.
- WP6: Value Chain & Policy Recommendations
  - Analysed economic constraints limiting coffee farmers' profitability.
  - Studied market inefficiencies, transport barriers, and excessive taxation.
  - Modelled potential business strategies and policy reforms to strengthen the coffee sector.

Although focused on Tshopo Province, the project's findings have broader implications for the coffee industry, both nationally and globally, particularly as climate change disrupts the traditional coffee-growing regions. By advancing knowledge on Robusta's genetic diversity, cultivation system, and market integration, the CoffeeBridge project supports the future sustainability of coffee production worldwide.

3. METHODOLOGY

WP1: Coordination and management

The project was coordinated and managed by Piet Stoffelen, assisted successively by Nele Van der Schueren, Lisa Couck, and Aiden Hendrickx (Meise Botanic Garden).

This work package involved essential project coordination and planning to ensure the effective implementation and integration of research activities across the CoffeeBridge project. Regular meetings were organized among project partners and external stakeholders to align efforts, while an annual steering committee meeting provided a platform to review progress, validate findings, and plan future work. Additionally, smaller thematic meetings facilitated cross-disciplinary collaboration between different work packages, enhancing research integration.

A centralized system was implemented for data management, allowing efficient collection, analysis, and reporting across the project. Research findings were systematically shared among work packages to maintain consistency and foster interdisciplinary collaboration, ensuring a holistic approach to the study.

Stakeholder engagement and communication played a crucial role in maximizing the project's impact. Interaction with policymakers, researchers, and key actors in the coffee sector was actively encouraged. A project website was maintained and progressively updated (CoffeeBridge.be), and workshops and seminars were organized to disseminate research findings, reaching both local and international stakeholders and fostering knowledge exchange (see section 5: Dissemination and Valorisation). To monitor project progress effectively, regular reports were prepared to track task completion and adherence to project timelines. A follow-up committee played an integral role in reviewing research outputs and providing strategic guidance, ensuring that the project remained on course.

Collaboration with external projects further strengthened the research and its practical applications. Complementary funding was granted, such as the ClimCoff project (International climate finance, government of Flanders), and synergies were developed with complementary initiatives such as the FORETS- and YEL-projects (EU funding), in order to continue the activities, to valorise the results and to enhance field implementation. Partnerships with local and international institutions such as CIFOR-ICRAF ensured the sustainability of project outcomes, reinforcing long-term benefits for the coffee sector. As a result, Meise Botanic Garden and its project partners are recognized for their expertise on coffee, locally and internationally.

WP2: Socio-Economic Evaluation of Robusta Coffee in Tshopo Province

Involved researchers: Louis-Pasteur Bamenga Bopoko (ERAIFT), supervised by Théodore Trefon (Royal Museum for Central Africa), Ieben Broeckhoven (KU Leuven) supervised by Bruno Verbist (KU Leuven), Trésor Kasereka (UNIKIS) supervised by Benoit Dhed'a (UNIKIS) and Ebele Aaron Tshimi (INERA).

This work package aimed to assess the socio-economic landscape of Robusta coffee production in the Tshopo Province, evaluating factors such as land tenure, economic viability, and market integration. Data collection was carried out through structured surveys and interviews involving 145 key actors in

the coffee value chain. These included 108 farmers, 6 collectors, 9 green coffee traders, 20 roasted and instant coffee traders, and 2 transformers. The surveys assessed essential socio-economic indicators such as household income, farm organization, and labour distribution, providing a comprehensive understanding of the sector's dynamics. To map the geographic distribution of coffee farms, GPS coordinates were collected using the KoBoCollect tool and analysed with ArcMap 10.3. Spatial analysis identified key coffee-growing regions and highlighted infrastructure limitations that could impact production and trade.

Land tenure and governance analysis focused on understanding ownership structures, land acquisition methods, and governance frameworks. The study examined the hybrid nature of formal and informal land tenure systems, shedding light on the complexities of land management within the coffee sector.

The economic and financial assessment evaluated the profitability of coffee farming through a cost-benefit analysis. Additionally, the financial viability of coffee production was assessed using discounted cash flow analysis, providing insights into long-term sustainability and investment potential.

Gender and social dynamics were also explored, with a focus on the roles of age and gender in coffee farming. The study examined the impact of cooperative membership on economic outcomes, highlighting how social structures influence financial success and resource access.

An institutional analysis was conducted to assess the interactions between coffee farmers and state institutions. This helped identify regulatory and policy constraints that shape the coffee industry's development.

Historical documentation provided essential context for the study. A wide range of archival sources were analysed, including Belgian colonial records, government bulletins, and research reports from INEAC and INERA-Yangambi. These were complemented by data from the International Coffee Organization (ICO) and scientific publications on coffee agronomy, disease management, and agricultural policy. To improve the understanding of both historical and current influences on coffee production, the study also incorporated economic and political analyses related to the sector.

WP3: Screening of Robusta Genetic Resources

Involved researchers: Robrecht Bollen (KU Leuven/Meise Botanic Garden), supervised by Olivier Honnay (KU Leuven), Filip Vandelook (Meise Botanic Garden), and Piet Stoffelen (Meise Botanic Garden), Lauren Verleysen (KU Leuven/ILVO), Tom Ruttink (UGent/ILVO), Olga Rojo-Poveda (ULB), Cédric Delporte (ULB), Caroline Stévigny (ULB), Jean-Léon Kambale (UNIKIS/CSB), Justin Asimonyio Anio (UNIKIS/CSB), Rachel Ndezu (UNIKIS), Hélène Mavar (UNIKIS), Benjamin Ntumba Katshela (UNIKIS), Ebele Aaron Tshimi (INERA).

Supported by: ClimCoff project through rehabilitation and infrastructure of the INERA Yangambi coffee collection / FWO *Coffea canephora* project through partial cofinancing of genetic analyses and logistic support by the European Union (FORETS project)

This work package aimed to provide a detailed characterization of the *Coffea canephora* (Robusta coffee) genetic resources from the INERA Coffee Collection in Yangambi, DRC. The research focuses

on investigating the genetic, sensory, agronomic, and chemical characteristics of underexplored germplasm.

A structured genotyping strategy was implemented to characterize the genetic diversity within the INERA Coffee Collection, led by Meise Botanic Garden and ILVO. The study employed four targeted sampling panels:

- Screening Panel (n = 730): A broad representation of the collection based on field maps and plant labels to assess clonal materials and unique genetic fingerprints.
- Discovery Panel (n = 218): A subset capturing the genetic diversity within the collection, used to identify key genetic loci for distinguishing unique profiles.
- Validation Panel (n = 105): Selected samples with high sequencing coverage to validate genotyping methods.
- Canephora Panel (n = 514): A panel incorporating local wild coffee, reference herbarium samples, and publicly available genome sequences to explore genetic structure.

Leaf tissue samples were collected from all 730 coffee shrubs in the Screening Panel during two field missions with the UNIKIS and INERA researchers. The Discovery Panel samples underwent genotyping-by-sequencing (GBS), and all samples were analysed using the HiPlex assay for targeted DNA sequencing supported by FWO funding from the doctoral research project of Lauren Verleysen.

To evaluate the sensory attributes of the genotypes, we conducted standard coffee cupping following the Fine Robusta Standards and Protocols. Additionally, sensory descriptors from the Coffee Taster's Flavor Wheel were used to characterize the sensory profiles of 70 genotypes, including wild, hybrid, and cultivated accessions. Sensory evaluations were performed across two harvest years (2021; 2022) to assess consistency in sensory profiles. Harvesting and processing of the coffee genotypes was undertaken by the UNIKIS and INERA researchers at the Yangambi coffee collection. Researcher Robrecht Bollen obtained the Robusta Q-grader license from the Coffee Quality Institute in 2021 in order to better understand the coffee quality potential of the studied genetic resources and strengthen the collaboration with CoffeeLab Independent.

Morphological traits were measured by the UNIKIS researchers over two consecutive harvests to evaluate diversity and agronomic potential. This assessment aimed to determine whether morphological traits could predict genetic background and to identify genotypes with promising agronomic characteristics. Measurements included foliar traits, coffee cherry and seed dimensions, floral traits, tree architecture, and yield-related characteristics. Research on floral traits resulted in a master thesis subject for UNIKIS student Jean-Léon Kambale. Research activity on coffee leaves by UNIKIS student Rachel Ndezu at the Yangambi collection laid the groundwork for her ongoing research project 'Les usages du caféier à Yangambi & Yanonge et Villages Turumbu' supported by prof. Hélène Mavar at UNIKIS.

Untargeted metabolomics was employed to analyse metabolite profiles of coffee leaves, green beans, and roasted coffee from 39 genotypes led by the ULB researchers. High-resolution mass spectrometry (LC-HRMS) was used to detect chemical markers associated with sensory quality and genetic

background. Quantification of key metabolites such as caffeine and trigonelline was performed across different plant tissues.

To study the influence of coffee processing methods on sensory and metabolite profiles, experiments were conducted on four Robusta genotypes by the UNIKIS and INERA researchers. Five processing methods were tested: Strip-picked, Overripe, Natural, Pulped Natural, and Washed. Sensory evaluations and metabolomic analyses were performed to assess variations introduced by processing methods. Additionally, germination tests were conducted at Meise Botanic Garden to evaluate the impact of processing on seed viability.

This structured methodological approach ensured a comprehensive evaluation of the Robusta genetic resources from the INERA Coffee Collection, providing a foundation for further breeding and selection efforts.

WP4: Agroforestry and Environmental Impact

Involved researchers: Ieben Broeckhoven (KU Leuven), supervised by Bruno Verbist (KU Leuven) and Roel Merckx (KU Leuven), Trésor Kasereka (UNIKIS) supervised by Bruno Verbist (KU Leuven) and Benoît Dhed'a (UNIKIS), Ebele Aaron Tshimi (INERA).

Supported by: ClimCoff project through co-financing for researcher Ieben Broeckhoven and logistic support by the European Union (FORETS project).

The first aim was to study the diversity in shade trees and non-timber forest products (NTFPs) used in coffee systems. A systematic inventory was conducted to assess the shade trees and NTFPs present in different coffee production systems. Three coffee cultivation strata were identified: (i) coffee monocultures, (ii) coffee agroforestry, and (iii) forest coffee. A total of 75 plots (25m x 25m each) were surveyed, with 25 plots per stratum. The fieldwork took place in farmer plots and surrounding forests around Yangambi between October and December 2021. Data collection included coffee yield estimations, carbon stock assessments (above- and belowground), and soil and litter sampling for carbon content analysis. The height, diameter, and species identity of woody species (both living and dead, DBH >5cm) were recorded to compute biodiversity indices for each coffee system. Soil samples were prepared for laboratory analysis, and carbon stock components (living biomass, deadwood, litter, root carbon and soil carbon) were calculated.

The second objective was to evaluate the role of shade trees and NTFPs in coffee farming through household-level biophysical inventories. Interviews were conducted in June-July 2021 across four road axes from Kisangani towards Alibuku, Bafwasende, Opala, and Ubundu (Figure 1). The study included 120 farmers, divided into coffee farmers (n=60) and non-coffee farmers (n=60). Coffee farms were further classified based on size (small gardens: 0.05-0.25 ha, large gardens: 0.25-0.5 ha, and plantations: >0.5 ha) and agroforestry type (fallow-based coffee fields: n=22, home gardens: n=38). Farmers' perceptions of shade tree advantages and disadvantages were recorded in the surveys.

Thirdly, to study the impact of soil fertility on coffee tree health and productivity, a sampling protocol for soil fertility analysis was developed in 2020, and fieldwork was conducted in the fall of the same year. In addition to coffee yield estimations, soil and leaf samples were collected and pre-processed

in 2021. Nutrient analysis of 300 coffee leaf samples was performed using ICP-OES for macro- and micro-nutrient content and dry combustion for carbon and nitrogen content.

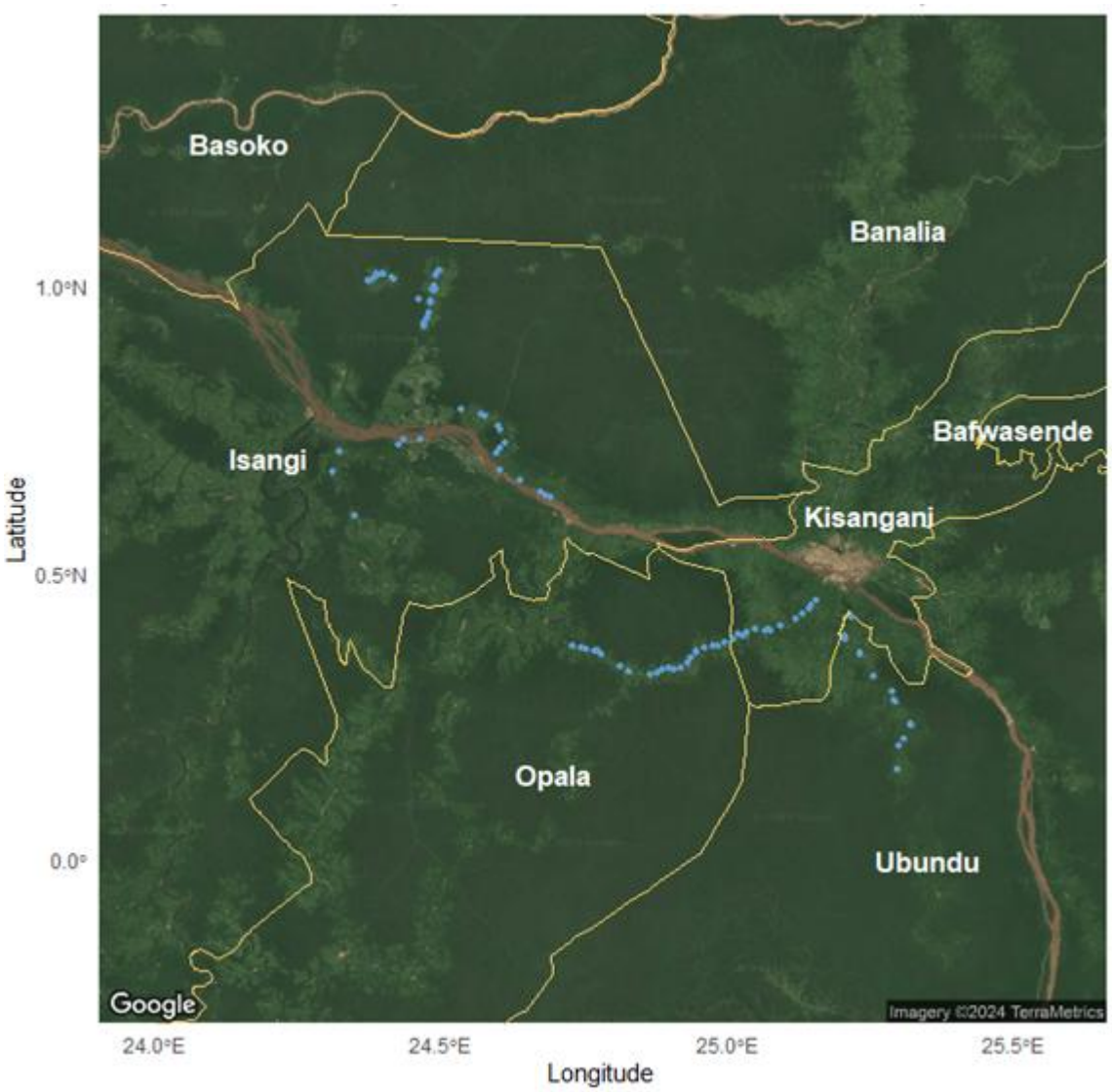

Figure 1. Map of the study area in Tshopo Province, DR Congo, showing the locations of surveyed coffee farms (n = 100) in blue. Basemap: Google Satellite Imagery ©2024 TerraMetrics.

Lastly, a large-scale on-station trial was designed in December 2020, encompassing an 11-ha block trial with three coffee varieties, three shade levels, and four fertilizer levels. Additionally, multiple Nelder designs were set up with funding from the ClimCoff-project to evaluate coffee grown in monoculture and in combination with different tree species (*Pachyelasma tessmannii*, *Pericopsis elata*, and banana). The initial implementation was planned for October 2021 but was delayed to October 2022 due to an insufficient supply of coffee seedlings (the seeds purchased in Uganda and Luki were not germinating as they were stored in inappropriate conditions for several months at the phytosanitary office in Kisangani). During a field mission in October 2021, 30,000 coffee seeds were germinated to ensure mature seedlings for the 2022 planting season. The trial location was identified as PK17 in Yangambi, a 100ha concession managed by CIFOR-ICRAF aiming to host experimental fields and a pilot farm.

WP5: Historical Research on Robusta Coffee

Involved researchers: Sven Van Melkebeke and Guillaume Léonard (Royal Museum for Central Africa) under the supervision of Michael Amara (State Archives of Belgium), Yves Segers (KU Leuven).

This work package aimed to investigate the historical trajectory of Robusta coffee in the DRC, focusing on its introduction, diffusion, and scientific development. Archival research will focus on historical sources from the period 1890–1926 to document the introduction and early spread of Robusta coffee. Key archival materials will include records from INEAC, the Jardin Colonial archives, and government agricultural reports. 22 archive funds were consulted, from which 174 portfolios of documents of various sizes were examined. Of these portfolios, 44 were finally used, providing valuable insights into the early development of Robusta coffee cultivation.

To ensure the preservation and accessibility of historical data, documents will be digitized and systematically organized into a comprehensive guide. This process will facilitate structured analysis and long-term reference for future research.

WP6: Value Chain Analysis and Policy Recommendations

Involved researchers: Rafaël Van den Bruel (CoffeeLab Independent), Ieben Broeckhoven (KU Leuven), Robrecht Bollen (Meise Botanic Garden), Justin Asimonyio Anio (UNIKIS), Bruno Verbist (KU Leuven), Aiden Hendrickx (Meise Botanic Garden), Piet Stoffelen (Meise Botanic Garden).

A value chain analysis was conducted to map key stakeholders, including farmers, processors, and traders. A market study in Kinshasa and Kisangani provided insights into coffee demand, pricing structures, and trade barriers, offering a clearer understanding of the market landscape. Ieben Broeckhoven and Robrecht Bollen participated in the MBA Bootcamp course provided by Flanders Business School (May - July 2022) in order to develop a business case for the Robusta coffee value chain in the DRC.

Economic modelling was used to evaluate potential business scenarios for coffee processing and sales in both local and export markets. The financial model incorporated different taxation and trade policy scenarios to estimate their impact on sector profitability, supporting data-driven decision-making for stakeholders. Stakeholder engagement played a crucial role in shaping the research. Consultations were held with coffee sector actors, including farmer cooperatives, policymakers, and private investors. Based on these discussions, a theoretical business model was developed to explore opportunities for local coffee processing and value addition.

Scenario planning further enhanced the study by modelling various "what-if" scenarios to assess potential policy interventions and their effects on the coffee sector’s growth. This structured methodological approach will provide a comprehensive evaluation of the socio-economic, environmental, historical, and market-related factors influencing Robusta coffee production in the Tshopo Province.

4. SCIENTIFIC RESULTS AND RECOMMENDATIONS

WP1: Coordination and management

The project was coordinated by Meise Botanic Garden. Beside the annual meetings with the steering committee and with all the project partners, we organised two workshops: one workshop at the beginning of the project which aimed networking between researchers and a second, final workshop aiming to present the results to stakeholders and valorising the results of the project (see below under WP6).

The coordination was also successfully applying for complimentary funding:

- The FORETS project (EU funding via CIFOR-ICRAF) was facilitating our field activities by providing logistic and administrative support within the DRC.
- The ClimCoff project (Climate adaptation, carbon fixation and sustainable development through Robusta coffee agroforestry in and around Yangambi, DR Congo) was granted by the Government of Flanders in the context of international climate finance. The ClimCoff project provided funding for the rehabilitation of post-harvest infrastructure and equipment, supported data collecting, initiated valorisation activities and installed experimental agroforestry fields.
- The Yangambi Engagement Landscape (YEL) project (EU funding via CIFOR-ICRAF) is continuing the activities in the Yangambi landscape.

WP2: Socio-Economic Findings

By examining long-term trends and contextual factors, the historical research study provides a comprehensive understanding of how Robusta coffee production has evolved over time and the key drivers behind its successes and setbacks. It examined the evolution of Robusta coffee (*Coffea canephora*) farming in Tshopo province from 1881 to the present. Robusta coffee production in the DRC has undergone significant fluctuations, experiencing periods of prosperity followed by decline. These boom-and-bust cycles are attributed to political, economic, and infrastructural factors, including global coffee price fluctuations, investment in research and infrastructure, and political instability.

Tshopo province played a pioneering role in coffee cultivation, with major research stations such as Lula (°1911) and Yangambi (°1923) contributing to breeding and global distribution. However, political and economic instability, poor infrastructure, and coffee diseases, such as Coffee Wilt Disease, have negatively impacted production.

Several factors have influenced Robusta production over time. During the colonial period, the Belgian administration encouraged coffee farming through research, quality control, and export facilitation. However, post-independence instability, the Mobutu dictatorship, and civil wars disrupted production. Market fluctuations also played a role, with the global coffee price crash of 1989 and the collapse of the International Coffee Agreement (ICA) leading to significant decline, while events like the Brazilian coffee frost of 1975 temporarily increased global prices, benefiting Congolese production.

Scientific research has played a crucial role in Robusta coffee cultivation. The Yangambi research station led the development of elite Robusta varieties and introduced wilt-resistant strains to mitigate

disease impact. However, infrastructure and policy failures, including poor road networks, lack of agronomic extension services, and inadequate policy interventions, have further weakened the sector.

Robusta coffee production in the DRC fell from 110.000 tons in 1985, over 40,000 tons in 1997 to 15,530 tons in 2023 due to conflict, economic instability, and disease outbreaks. The Office National des Produits Agricoles du Congo (ONAPAC), which replaced previous coffee regulatory bodies, has been unable to revitalize the sector.

Five political periods were identified:

1. **Pre-Congo Free State (1881-1885)** – Sporadic coffee cultivation in regions in contact with 'arabica' traders, coffee cherry pulp was consumed locally, and leaves and seeds were used as a febrifuge.

2. **Congo Free State (1885-1908)** – King Leopold II promoted coffee cultivation but forced labour and competition from rubber reduced its success.

3. **Belgian Congo (1908-1960)** – Research stations were established, infrastructure improved, breeding and agronomic advances led to increased production.

4. **Post-Independence to Mobutu's Fall (1960-1997)** – Growth continued until the 1980's, but with political instability, the Congo Wars, and lack of management, coffee production declined significantly.

5. **Post-Mobutu to Present (1997-2023)** – Political instability, Coffee Wilt Disease outbreaks, and weak infrastructure and institutional support further crippled the sector.

The study underscores the fragility of the coffee sector, which is highly dependent on international prices, political stability, economic policy, and research investments. The collapse of research institutions and the lack of agronomic extension services have hindered the breeding of improved locally adapted coffee varieties. Additionally, external shocks such as wars, global price fluctuations, and climate change exacerbate the challenges faced by farmers.

In present day DRC, coffee farmers face significant challenges, including a lack of buyers (32%), long pre-harvest cycles (22%), and low farmgate prices (16%). To mitigate these issues, many farmers prioritize agroforestry, integrating coffee cultivation with fruit trees and Non-Timber Forest Products (NTFPs) to diversify their income sources. However, governance issues, weak institutional support, and unclear land tenure remain major obstacles to investment in coffee farming.

Access to land varies depending on the categories of actors involved, which can be classified as either informal or formal. Coffee growers without registration certificates are legally vulnerable to land disputes. These conflicts arise from competition for land among local community members (minor conflicts) or from alienation or dispossession by third parties (major conflicts). Minor conflicts are typically resolved by social actors, such as family heads, customary chiefs, and ecclesiastical authorities, while major conflicts require intervention from legal actors, including judicial police officers. The primary issue in land tenure is ambiguity, as official legal frameworks from the state often conflict with socio-cultural land practices.

From a legal perspective, farmers' perceptions of land ownership do not guarantee security. Their rights are acquired through socially legitimate but legally unrecognized actors. The lack of land registration certificates suggests that neither statutory nor customary laws are strictly followed. Indigenous farmers have some legal recognition to use land for agriculture, but this recognition remains precarious due to contradictions between land and agricultural laws. Non-indigenous farmers must follow formal legal procedures, but high costs and long delays hinder their land security. Although few farmers are involved in disputes, conflict resolution is primarily handled by socially recognized but legally unvalidated actors.

Our household surveys highlight that informal actor, such as rightful claimants ('ayants droits') and local chiefs, dominate rural land access, whereas formal state actors, including land registry officials and provincial governors, play a greater role in urban areas. To improve land security and coffee production, three interventions are proposed: (1) establishing land registration certificates for customary lands after rural land planning, (2) defining the roles of local governance actors and structuring land dispute resolution bodies, and (3) balancing customary land values with universal legal principles from international policies.

Political and economic stability must be restored through stable governance, infrastructure investment, and improved security. Reducing bureaucratic inefficiencies and corruption in agricultural institutions is also crucial. Revitalizing coffee research and agricultural extension services requires reinvestment in breeding programs to develop coffee varieties resistant to pests, diseases, and climate change. Improved infrastructure and market access are necessary, including road rehabilitation in coffee-producing regions to lower transportation costs and increased access to financing for smallholder farmers through microfinance and cooperatives. Value chain development and international market integration should be encouraged through direct trade partnerships between Congolese farmers and international buyers, as well as certification schemes such as Fair Trade and Organic to add value and secure premium prices.

Finally, addressing Coffee Wilt Disease (CWD) incidence requires the breeding of locally adapted wilt-resistant varieties, large-scale distribution and planting of these varieties, and the development of an integrated pest and disease management strategy. The historical trajectory of Robusta coffee in Tshopo reflects broader socio-political and economic trends in the DRC. The coffee production in the Tshopo province was affected even more strongly by the Congo Wars, landlock, and CWD than other coffee production regions in the DRC, which had access to alternative export routes abroad. While coffee farming flourished under stable policies, it suffered under political instability, market deregulation, and infrastructure collapse. A holistic approach combining research, policy reform, and private sector engagement is necessary to revitalize the sector.

WP3: Screening of the Robusta Genetic Resources

During the first field mission of Robrecht Bollen to the Yangambi Coffee Collection, unknown genetic material was found in the collection, as well as a substantial number of inaccuracies and errors in the coffee collection inventory and plant labelling. Given these inaccuracies and the newly introduced genetic material, it became clear that the first objective was to perform a detailed genetic screening of the INERA Coffee Collection Robusta germplasm. The following section is adapted from Verleysen

et al. (2023) and summarizes the structured approach to sampling and genotyping of the INERA Coffee Collection.

Bayesian clustering was performed on the Canephora Panel, revealing three genetic clusters. Firstly, wild coffee shrubs collected from the local rainforest in the Yangambi region, hereafter referred to as Wild samples. Secondly, the 'Lula' cultivars. Thirdly, the Congolese subgroup A material (Figure 2). All three genetic clusters were present in the INERA Coffee Collection. The majority of the sampled germplasm belonged to the 'Lula' cluster. Nine samples with Wild ancestry, and four with Congolese subgroup A ancestry were found. Twenty-nine samples from the field genebank showed an admixed ancestry with partial 'Lula' and Wild ancestry. Thirty-two samples showed an admixed ancestry proportion of 'Lula' and Congolese subgroup A ancestry. All 14 samples collected from the INERA field genebank in Luki were assigned to the Congolese subgroup A. The Structure analysis revealed that around one-quarter of the unique genetic fingerprints had a hybrid identity (29 'Lula'– Wild hybrid and 32 'Lula' – subgroup A hybrid). These hybrid identities could be a result of dedicated crosses or open pollination. The 'Lula' – Wild hybrid genotypes indicate that local wild genotypes are already used for crossing activities.

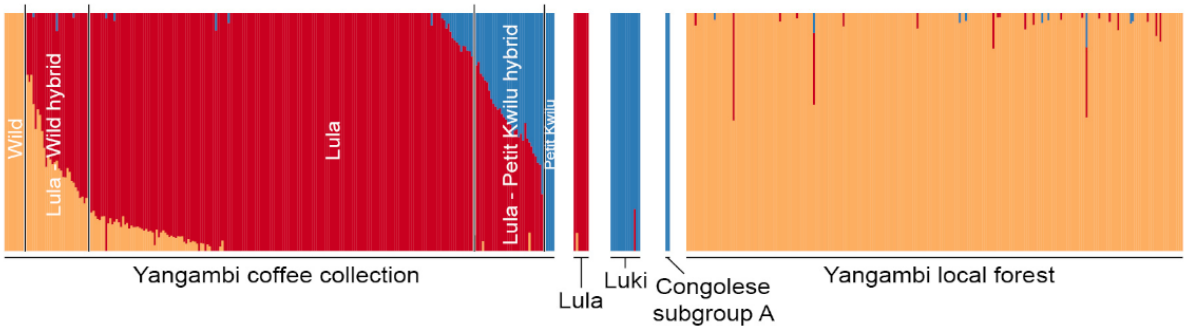

Figure 2. Population genetic structure within the INERA Coffee Collection, Yangambi local forest and reference material (Canephora Panel). FastSTRUCTURE bar plot representing three clusters (K = 3). Colours define subpopulations: orange (Wild), blue (Congolese subgroup A), and red ('Lula' cultivars). Figure adapted from Verleysen et al. (2023).

In Merot-L'anthoene et al. (2019), wild coffee plants collected from the Yangambi rainforest prior to Depecker et al. (2023) were classified within the Congolese subgroup BE, a hybrid group between subgroups B and E. This suggests that the wild coffee shrubs collected by Depecker et al. (2023) likely belong to the same Congolese subgroup BE. As a result, we currently have two distinct origin groups in the collection: Congolese subgroups A and BE. However, our data indicate that the 'Lula' cultivars do not align with either group. According to INERA archives, the 'Lula' cultivars are thought to be hybrids of *Coffea robusta* L. and *Coffea sankuriensis*, both originating from the Sankuru region in the DRC. To clarify the genetic origins of the 'Lula' cultivars, they must be compared with each of the eight genetic groups defined by Merot-L'anthoene et al. (2019). Unlike the 'Lula' cultivars, the cultivars from Luki were successfully assigned to Congolese subgroup A, as they showed strong genetic similarity to the reference material for this subgroup (Merot-L'anthoene et al., 2019).

In WP3, we evaluated the sensory quality potential of the Robusta cultivars from the INERA Coffee Collection in Yangambi, the local wild diversity, and their hybrids (Bollen et al., 2024). We evaluated the sensory attributes of 70 genotypes, representing the genetic structure of the coffee collection. Of those 70 genotypes, 22 were evaluated for two consecutive years to assess the consistency of the sensory quality. Standard coffee cupping with the Fine Robusta Standards and Protocols was

enhanced through sensory descriptors from the Coffee Taster's Flavor Wheel. Each genotype's sensory profile was constructed based on the total cupping score and the frequency of reported sensory descriptors. The total cupping score ranged from 75.75 to 84.75, with a substantial variation in sensory profiles, even within a genetic cluster (Figure 3). Nutty/Cocoa was the most frequently reported descriptor class. The sensory profile ideotype exhibits a high frequency of Fruity, Sweet, and Sour/fermented descriptors and a low frequency of Green/Vegetative, Other, and Roasted descriptors. Evidence suggests that the sensory profile of a genotype is consistent over two harvest years. Genotypes with promising and unique sensory profiles were discovered within the cultivars and the wild – cultivar hybrids. The genetic diversity of wild and cultivated Robusta in the Democratic Republic of the Congo could play an essential role in understanding and improving its sensory quality.

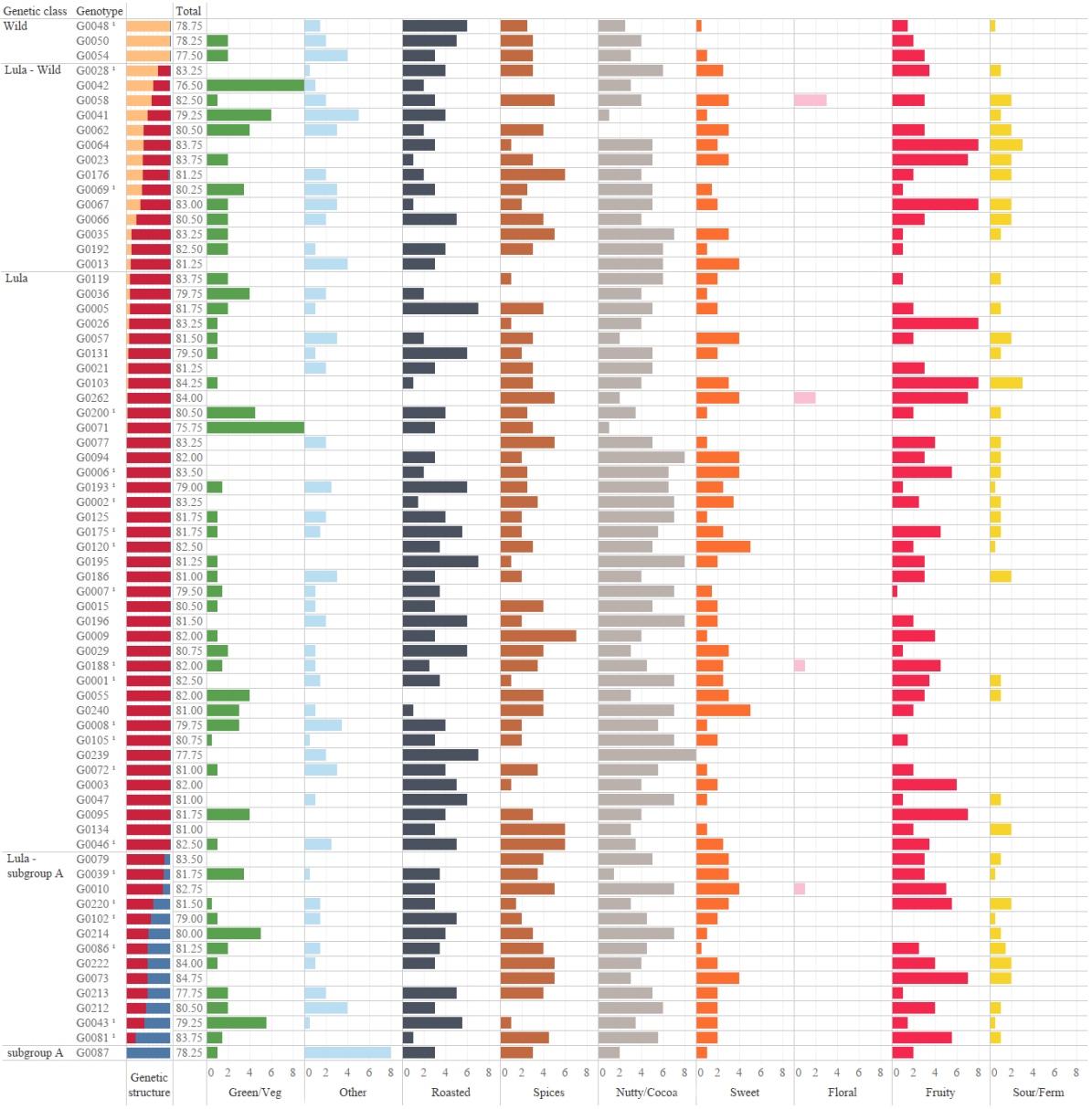

Figure 3. Sensory profiles of the 70 genotypes representing the INERA Coffee Collection in Yangambi. Genetic structure based on the fastSTRUCTURE bar plot representing three genetic clusters (K = 3). Colours define subpopulations: orange (Wild), blue (Congolese subgroup A), and red ("Lula" cultivars) (Verleysen et al., 2023). Wild, Lula - Wild, Lula, Lula - subgroup A hybrid, and Congolese subgroup A classes. (1) Sensory profile created from the mean Total score and mean frequency of descriptors over the two harvest years.

Meeting rising quality standards while at the same time addressing climate challenges will make the commercial cultivation of Robusta coffee increasingly difficult. Whereas breeding new varieties may be an important part of the solution, such efforts for Robusta lag behind, with much of its genetic diversity still unexplored. By screening existing field gene banks to identify accessions with desirable traits, breeding programs can be significantly facilitated. Furthermore, our research from work package 3 also quantifies the morphological diversity and agronomic potential of 70 genotypes from the INERA Coffee Collection in Yangambi, Democratic Republic of the Congo. We measured 29 traits, comprising vegetative, reproductive, tree architecture, and yield traits. Classification models were applied to establish whether these traits could accurately classify genotypes based on their background. Furthermore, the agronomic potential and green bean quality of the genotypes were studied. While significant variation in morphological traits was observed, no combination of traits could reliably predict the genetic background of different genotypes. Genotypes with promising traits for green beans were identified in both 'Lula' and 'Lula' – Wild hybrids, while promising yield traits were found in 'Lula' – Congolese subgroup A hybrids. Additionally, certain 'Lula' – Wild hybrids showed low Specific Leaf Area (SLA) and stomatal density, indicating potential fitness advantages in dry environments, warranting further study. Our findings highlight the agronomic potential of underexplored Robusta coffee genotypes from the Democratic Republic of the Congo and indicate the need for further screening to maximize their value (Figure 4).

Genetic class	Genotype	Genetic structure	Total	Screen 15+	Screen 17+	100 BW	Peaberry	Tree height	Tree width	Fruct. branches	Fruct. nodes	Cherry per node	Max. node	Total cherries
Wild	G0048		78.75	0.75	0.29	17.30	44	264	181	26	27	6	32	179
	G0050		78.25	0.74	0.14	12.71	36	195	181	22	32	8	34	237
	G0054		77.50	0.08	0.00	8.70	114	234	129	19	30	7	22	199
Lula - Wild	G0028		83.25	0.58	0.20	11.80	45	178	129	26	34	9	32	303
	G0042		76.50	0.89	0.40	14.24	48	248	142	27	30	5	21	141
	G0058		82.50	0.68	0.08	12.00	92	224	159	28	64	8	29	542
	G0041		79.25	0.80	0.29	13.85	19	318	224	33	26	14	45	392
	G0062		80.50	0.79	0.25	12.66	72	298	162	29	35	12	27	413
	G0064		83.75	0.58	0.12	13.26	33	334	207	46	62	9	21	542
	G0023		83.75	0.59	0.07	10.80	23	300	130	17	17	11	19	185
	G0176		81.25	0.86	0.59	15.10	18	234	141	24	23	7	23	186
	G0069		80.25	0.94	0.71	17.20	23	275	193	46	42	9	28	395
	G0067		83.00	0.93	0.56	14.53	27	301	182	32	39	6	17	240
	G0066		80.50	0.82	0.40	15.00	32	291	214	39	48	11	31	516
	G0035		83.25	0.93	0.52	16.17	39	325	209	34	42	6	22	275
	G0192		82.50	0.83	0.35	16.21	28	236	182	23	43	8	24	334
	G0013		81.25	0.54	0.09	12.93	16	268	163	27	35	7	29	257
Lula	G0119		83.75	0.83	0.33	12.77	28	280	179	36	42	9	35	395
	G0036		79.75	0.84	0.46	18.95	37	227	138	25	37	6	18	225
	G0005		81.75	0.85	0.42	16.16	24	271	164	27	36	10	40	362
	G0026		83.25	0.72	0.11	11.90	33	274	146	34	38	8	22	278
	G0057		81.50	0.89	0.34	13.47	20	312	179	18	45	12	42	557
	G0131		79.50	0.65	0.08	11.81	33	364	219	31	40	10	32	402
	G0021		81.25	0.68	0.11	12.40	19	425	192	17	19	8	32	159
	G0103		84.25	0.89	0.32	9.90	25	257	141	29	42	9	28	323
	G0262		84.00	0.81	0.25	17.74	54	244	167	28	34	7	20	229
	G0200		80.50	0.30	0.04	14.32	46	207	173	26	32	11	31	391
	G0071		75.75	0.74	0.23	13.35	20	273	178	19	26	7	21	182
	G0077		83.25	0.94	0.60	17.08	75	360	160	16	29	7	22	192
	G0094		82.00	0.61	0.20	16.20	10	280	184	35	42	12	41	494
	G0006		83.50	0.90	0.43	14.99	52	267	177	25	32	7	30	233
	G0193		79.00	0.85	0.32	13.87	40	267	149	29	34	8	27	249
	G0002		83.25	0.87	0.38	12.94	16	412	149	32	32	8	24	241
	G0125		81.75	0.86	0.32	13.88	58	271	179	35	29	8	30	206
	G0175		81.75	0.66	0.15	15.98	30	179	111	19	34	6	32	214
	G0120		82.50	0.92	0.63	16.55	37	288	146	21	43	10	47	440
	G0195		81.25	0.96	0.77	11.60	16	245	181	15	31	7	36	318
	G0186		81.00	0.23	0.00	9.35	48	301	148	26	27	9	26	244
	G0007		79.50	0.80	0.37	11.08	20	263	166	31	39	11	35	425
	G0015		80.50	0.68	0.30	13.70	10	421	152	15	29	8	25	238
	G0196		81.50	0.78	0.26	13.67	46	210	115	25	32	4	30	291
	G0009		82.00	0.78	0.33	13.25	23	267	198	31	40	6	27	241
	G0029		80.75	0.75	0.32	13.85	29	209	163	16	14	5	16	70
	G0188		82.00	0.86	0.33	14.54	27	277	139	21	35	5	17	190
	G0001		82.50	0.94	0.69	17.33	29	275	110	20	32	7	30	241
	G0055		82.00	0.68	0.28	13.99	53	366	162	16	43	11	37	484
	G0240		81.00	0.99	0.92	13.77	12	265	255	35	53	7	26	675
	G0008		79.75	0.68	0.24	12.53	23	310	159	23	41	8	23	296
	G0105		80.75	0.87	0.59	16.92	22	186	154	22	38	8	25	297
	G0239		77.75	0.98	0.71	18.82	9	223	146	11	25	8	29	196
	G0072		81.00	0.90	0.59	19.33	15	274	231	27	42	7	23	301
	G0003		82.00	0.80	0.48	19.77	75	270	180	39	45	11	36	497
	G0047		81.00	0.96	0.63	15.97	26	286	153	25	29	7	28	187
	G0095		81.75	0.91	0.66	14.80	36	229	141	16	45	5	13	219
	G0134		81.00	0.66	0.15	12.80	18	282	165	28	41	13	51	528
	G0046		82.50	0.78	0.55	15.10	65	245	174	38	53	14	40	736
Lula - subgroup A	G0079		83.50	0.91	0.49	12.04	128	297	154	25	33	8	32	271
	G0039		81.75	0.65	0.11	12.88	25	333	171	22	37	11	42	404
	G0010		82.75	0.77	0.35	15.80	21	329	193	30	42	17	52	738
	G0220		81.50	0.46	0.32	16.33	16	278	169	35	49	8	37	411
	G0102		79.00	0.57	0.06	14.91	24	293	237	46	70	9	29	647
	G0214		80.00	0.70	0.19	16.58	24	264	165	38	42	10	22	438
	G0086		81.25	0.84	0.23	14.40	71	229	227	54	64	13	32	816
	G0222		84.00	0.78	0.37	14.11	37	358	253	46	56	7	22	409
	G0073		84.75	0.24	0.04	10.40	135	210	164	45	45	12	34	530
	G0213		77.75	0.77	0.18	19.10	97	286	135	20	25	4	17	191
	G0212		80.50	0.68	0.19	12.52	100	277	223	63	53	14	29	734
	G0043		79.25	0.53	0.04	13.20	61	276	172	35	43	12	47	539
	G0081		83.75	0.34	0.10	15.30	20	222	175	37	45	12	28	537
subgroup A	G0087		78.25	0.57	0.08	13.73	109	201	189	23	47	9	24	404

Figure 4. Agronomic and quality-relevant traits of 70 genotypes from the INERA Coffee Collection, DRC: Total cupping score, fraction of 50 g green beans retained by screen 15 and 17, 100 green beans weight (BW), number of peaberries in 50 g of green beans, coffee tree height and width (cm), number of fructifying branches on the main stem and the number of fructifying nodes, average cherries per node, maximum cherries per node and total cherries from six measured branches. Genetic structure based on the fastSTRUCTURE bar plot representing three genetic clusters (K = 3). Colours define subpopulations: orange (Wild), blue (Congolese subgroup A), and red ('Lula' cultivars) (Verleysen et al., 2023). Total sensory quality score of the genotype based on Bollen, Verleysen, et al. (2024).

The metabolomic research in WP3 investigated the metabolite profiles of roasted coffee, green beans, and coffee leaves from 39 *C. canephora* genotypes through LC-HRMS with an untargeted metabolomics approach. Our results showed that metabolite profiles of roasted coffee, green beans, and coffee leaves can be discriminated based on the coffee's sensory quality. The highest predictive power of coffee sensory quality was achieved with the metabolite profiles of the coffee leaves (Figure 5). Genotypes with varying genetic backgrounds could only be discriminated by the metabolite profiles of the coffee leaves. Metabolite marker compounds predictive of sensory quality were a putative quercetin derivate in green beans and likely physagulin E and argophyllin in coffee leaves. Estimated levels of caffeoylquinic acids, dicaffeoylquinic acids, and caffeoylquinic acid lactones were higher in roasted coffee with a lower sensory quality. These differences were not apparent in their respective green beans and coffee leaves. Overall, our study revealed the promising potential of the metabolite profile of coffee leaves as a predictive tool for coffee sensory quality and the genetic background of *C. canephora*.

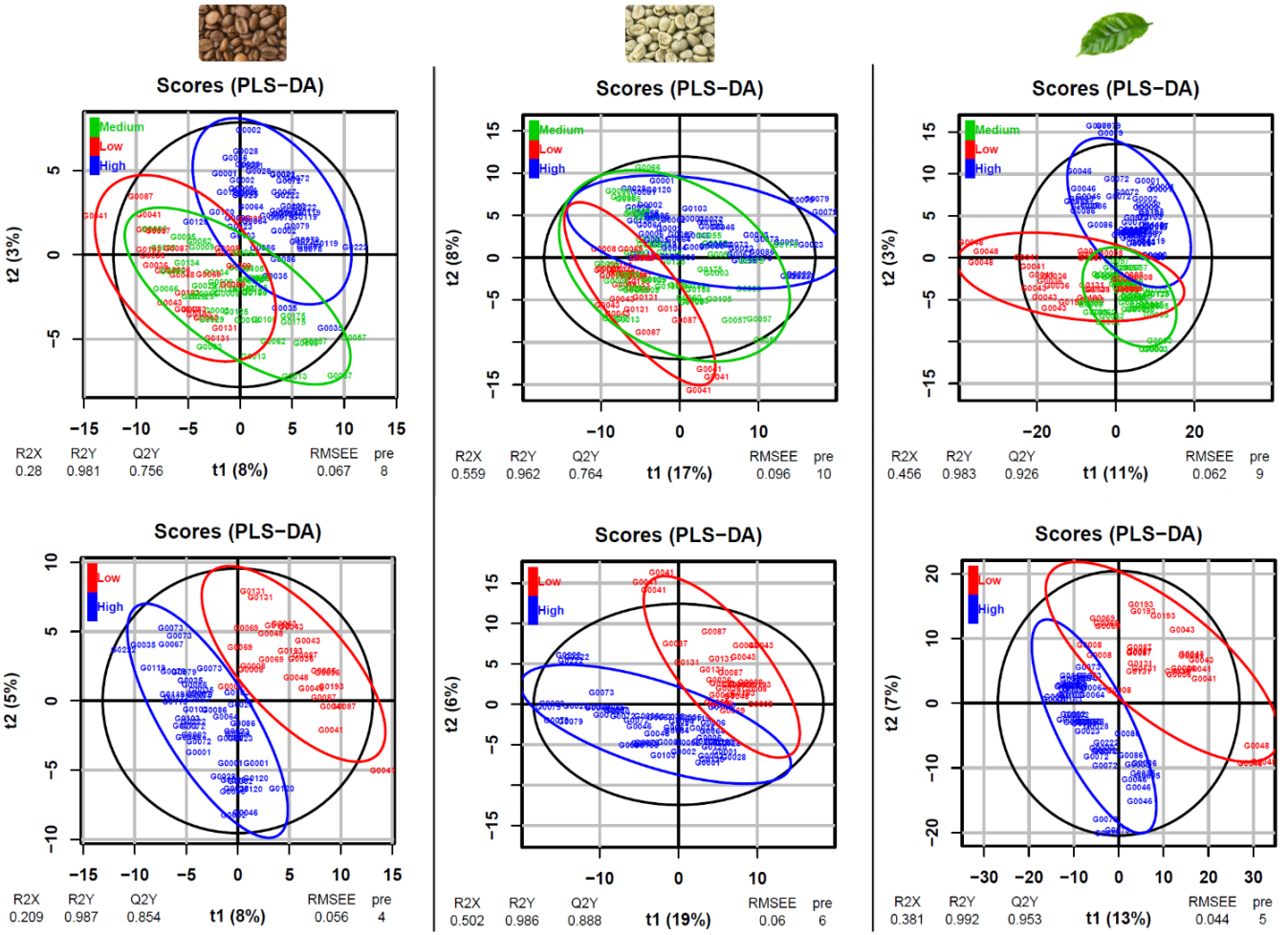

Figure 5. Score plots for the multivariate modelling of variation in data using PLS-DA for the separation of the roasted coffee, green beans, and coffee leaves (from left to right, respectively) based on the sensory quality of the roasted coffee. Sensory quality classes are: High (blue), Medium (green) and Low (red). The top row shows the score plots for all genotypes belonging to the three sensory quality classes, while the bottom row shows the separation of the samples belonging to the High and Low sensory quality classes. For each score plot, the percentages of total variation explained by latent variables 1 and 2 (t1 and t2, respectively) are indicated in parentheses.

Coffee processing involves various steps, from harvest to the storage of dried green coffee beans, each of which can significantly affect the beans' chemical composition and sensory qualities. Yet, a comprehensive evaluation that includes the coffee's genetic background and chemical, sensory, and biological aspects is still uncommon for Robusta coffee. Four Robusta (*C. canephora*) genotypes from the Democratic Republic of the Congo were subjected to five different coffee processing methods: Strip-picked, unsorted, sundried cherries; Overripe, sorted, sundried cherries; ripe, sorted, sundried (Natural) cherries; ripe, sorted, Pulped (pulped natural), sundried parchment; and ripe, sorted, wet fermented (Washed), sundried parchment were processed separately. The resulting green beans underwent sensory descriptive cupping, seed germination tests, and metabolite profiling using LC-HRMS. The Pulped Natural and Washed methods produced coffees with higher sensory attributes scores, while the Overripe method was associated with the sensory 'potato taste' defect. Washed coffee was characterized by smooth, fruity, cocoa notes and was negatively correlated with rough mouthfeel, tobacco, and leather flavours (Figure 6). The Pulped Natural and Washed method had significantly higher germination success after four months of storage. The processing method influenced caffeine concentration in green beans, depending on the genotype, while trigonelline levels varied significantly between genotypes but not between processing methods. The grouping of the metabolite profiles of roasted coffee and green beans was consistent with their genetic background rather than the processing method. Two metabolite marker compounds predictive of genotype in roasted coffee were putatively identified as cafamarine and likely theobromine, theophylline, or paraxanthine. A metabolite feature, putatively identified as O-methylcorypalline, was a marker compound for genotype in both roasted coffee and green beans. Overall, we demonstrate that genotype plays a significant role in mediating the outcomes of different processing methods.

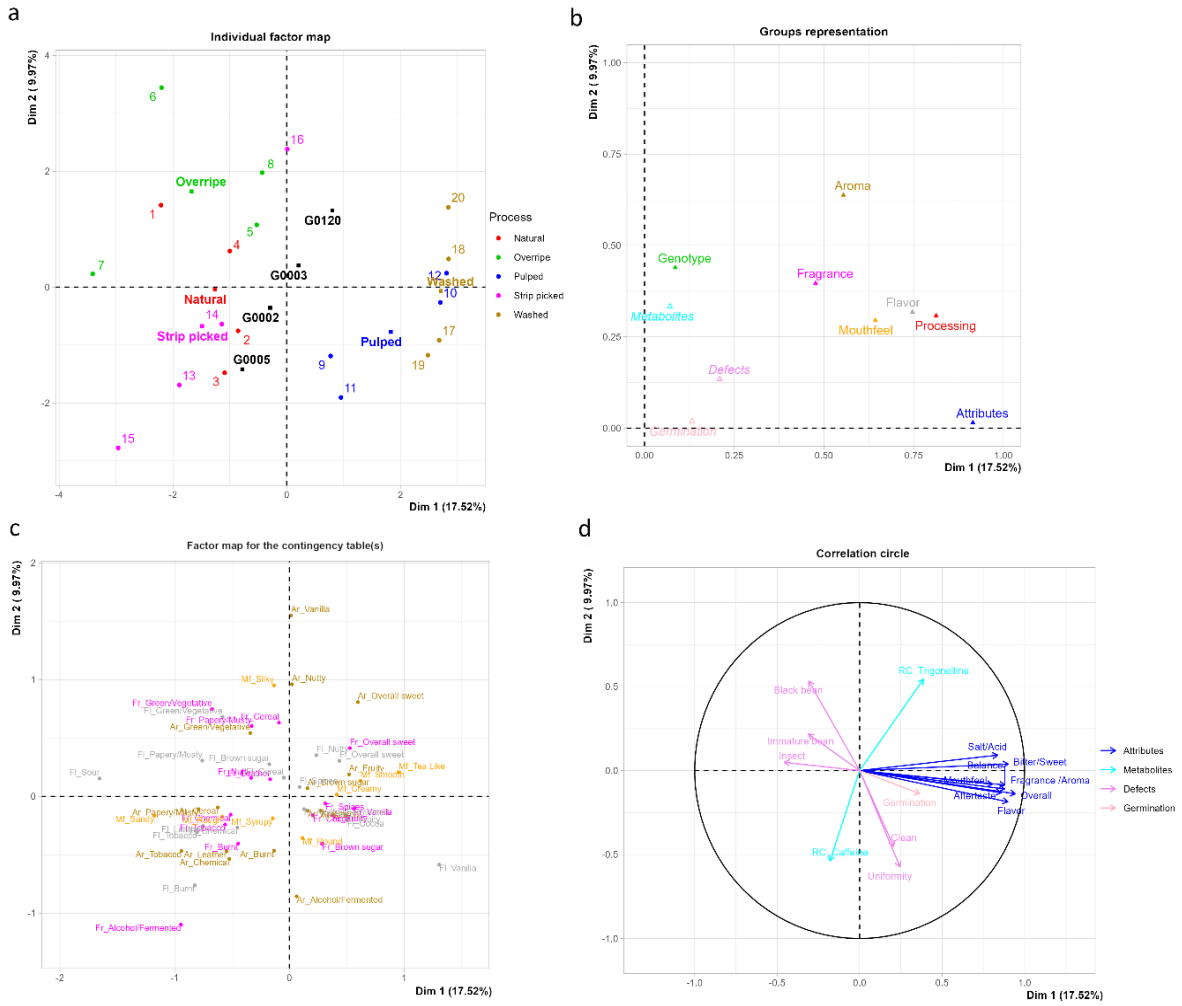

Figure 6. Multiple factor analysis of coffee sensory quality to differentiate five coffee processing methods for four Robusta genotypes from the DRC. (a) Individual factor map of the coffee samples for the first two dimensions. (b) Variable group representation on the first two dimensions of the MFA. Supplementary variable groups: metabolites, defects (black bean, immature bean, insect, uniformity, clean cup) and germination. (c) Factor map for the contingency table of sensory descriptors for variables (Fr) fragrance, (Ar) aroma, (Fl) flavor, and (Mf) mouthfeel. (d) Correlation circle of the quantitative active and supplementary variables in the first two dimensions.

Implications for *C. canephora* cultivation and breeding

Our research demonstrates the untapped potential of the *C. canephora* genetic resources in the INERA Coffee Collection. We identified promising genotypes with desirable traits such as large bean size, high cupping scores, and traits that indicate a fitness advantage in dry environments. Such genotypes are interesting to study further as larger bean sizes and improved sensory profiles meet market preferences. The detailed characterization of the selected genotypes can now serve as a basis for the commercial activities of the INERA Yangambi research station. Both the production of seed material and cuttings provide an economic benefit for the local government, and the distribution of promising genetic material could assist development projects to revitalize the Robusta coffee sector. Multiple Robusta coffee development programs have been set up in the DRC in recent years (ACRAM, 2023; Paul Carlson Partnership, 2024), and even large coffee value chain actors dare to reinvest in the high-quality coffee potential of the DRC (Nestlé Nespresso SA, 2024). The ongoing development of these different projects supports the argument that there is a need and a potential to increase the Robusta production in the DRC, supported by the increasing global demand for Robusta and the record-breaking Robusta coffee prices (ICO, 2024). Based on our research results, public or private Robusta development projects can now benefit from our detailed characterization and adjust their cultivation strategies. Whether it would be to cultivate the highest-yielding material, the lowest caffeine material, or the best sensory profile material. Interest in the promising genotypes from commercial coffee producers and development projects has peaked after our scientific outreach efforts. The revival of the local and national Robusta coffee sector will largely depend on the profitability of coffee cultivation and the quality of the coffee produced. Achieving this requires adopting suitable coffee processing methods and introducing new genetic material for cultivation.

In terms of breeding, the findings highlight the importance of integrating DRC's genetic diversity into global breeding programs. There is a need for improved Robusta varieties to support the demand for increased productivity, overall quality, and market differentiation (WCR, 2023c). Breeding programs should establish clear, need-based objectives and conduct cross-border, multi-environment trials using diverse genetic material from different germplasm collections. Collaborative, multinational efforts should replace isolated, country-centric approaches, enabling access to a broader range of breeding populations and modern tools (Ngure & Watanabe, 2024). Such collaborative breeding networks, like those employed in the World Coffee Research Arabica program, have already proven that this approach is possible (WCR, 2023a). The genetic resources of the DRC are omitted from breeding networks as proven by their absence or lack of an origin reference in the current Robusta variety list of the World Coffee Research (WCR, 2023b). Recently, a new research project has launched the development of improved Robusta varieties (WCR, 2024), an opportunity for the genetic resources of the DRC to be reintroduced in the breeding programs, as their potential is currently untapped. For example, hybrids in the 'Lula' – Wild group exhibited low stomatal density and SLA, traits associated with adaptation to dry environments. Also, unique sensory profile genotypes discovered could for example be crossed with high-yielding varieties from Brazil or Vietnam.

Our results also demonstrate that integrating metabolomics and genetic data will be essential for identifying markers associated with desirable traits, enabling more efficient selection of superior genotypes for breeding programs. A previous genome-wide association study of coffee accessions identified genomic regions associated with key compounds of coffee quality (Sant'Ana et al., 2018), whereas a metabolome-wide association study correlated heritable metabolites in leaves from young

coffee plants with sensory quality (Gamboa-Becerra et al., 2019). Our research suggests that coffee leaf metabolomics could serve as a screening tool for detecting material with desired traits, as we have identified a relationship between coffee leaves and sensory quality. These findings can complement previous research on coffee leaf metabolites, such as studies on defence-related metabolites (Castro-Moretti et al., 2023) and drought stress leaf metabolites (Chekol et al., 2024), creating opportunities to screen and select more stress-resilient varieties with improved sensory quality. Untargeted metabolomics using various analytical techniques continues to identify novel compounds associated with coffee quality (Gamboa-Becerra et al., 2019; Rocchetti et al., 2020; Sittipod et al., 2020). The ongoing discovery of such metabolites in coffee beans and leaves provides valuable markers for selecting plants with desirable traits, making untargeted metabolomics important to coffee breeding. By integrating genome-wide and metabolome-wide association approaches, researchers can identify metabolite markers for traits like coffee quality and uncover the genomic regions linked to these markers.

Work package 3 not only highlights the potential of *C. canephora* from the INERA Coffee Collection but also illustrates the broader implications of screening its genetic diversity. Screening part of the Robusta genetic resources from the DRC has identified genetic material with desirable traits, highlighting the value of studying these genetic resources. By bridging this knowledge gap, we can accelerate the development of improved Robusta varieties, potentially reducing both the cost and time required (Hein & Gatzweiler, 2006). By promoting the inclusion of the DRC's genetic material in international breeding programs, we advocate for a more diverse genetic pool that supports the development of Robusta varieties adapted to global challenges, including climate change and market demands for quality. The conservation of *C. canephora*'s genetic resources is therefore critical. These (wild) genetic resources are scattered across forests across Central Africa and in ex-situ collections, some of which remain uncharacterized. However, these wild populations are threatened by introgression from cultivated genotypes and deforestation due to anthropogenic activities, leading to a loss of genetic diversity (Verleysen et al., 2024). Their conservation and utilization in breeding efforts could help safeguard the future of coffee in the region and beyond.

Implications for Robusta coffee quality and marketing

Traditionally, Robusta coffee has been viewed as inferior to Arabica due to its bitter, earthy flavours and high caffeine content. However, this research demonstrates the sensory quality potential of Robusta coffee. We discovered genotypes that exhibited sensory profiles atypical to the current Robusta market and lower caffeine concentration. In recent years, demand for Fine Robusta coffee has gained traction as consumer interest in diverse coffee profiles has grown (WCR, 2023c). Quality competitions like the Robusta Golden Cup now provide a platform for showcasing high-quality Robusta coffees. Through sensory descriptors, we revealed a substantial range of sensory profiles hidden in the germplasm of the coffee collection and provided evidence of how coffee processing impacts the sensory profile. In 2024, the Specialty Coffee Association put forward three new SCA cupping standards to expand and evolve the initial 2004 SCA cupping protocol into a more holistic coffee value assessment system (SCA, 2024). One of these expansions includes a more detailed cupping form for the notation of sensory descriptors using the classes from the Coffee Flavor Wheel, similar to the extended cupping form we created for our research. The recognition by the Specialty Coffee Association to expand the evaluation of coffee quality beyond quantitative cupping scores implies that our research methodology was adhering to the shift in coffee quality assessment.

Additionally, as the Coffee Flavor Wheel is biased towards Arabica coffee, a flavor wheel for Robusta coffee is needed. Fortunately, Brazilian research institutes have finished the development of the Canephora Flavor Wheel (unpublished data), which will establish a standardized sensory language for Robusta coffee. Robusta coffee samples from across the world were included in the development of the Canephora Flavor Wheel, including coffee samples from our research project to represent the underrepresented Congolese Robusta market.

Previous research has reported on the positive impact of soil nutrient composition (Santos et al., 2023; Yadessa et al., 2019), elevation (Avelino et al., 2005; Koutouleas et al., 2023), increased shade level (Ahmed et al., 2021) and improved agricultural management (Bigirimana et al., 2019; Vaast et al., 2006) on coffee quality. The genotypes studied in our research were growing in strongly weathered soil with low nutrient-holding capacity, full sun exposure, and minimal agricultural management. Thus, it was surprising to discover such high-quality sensory profiles. This implies that the promising genotypes could perform well in difficult environmental conditions. Secondly, one can argue that the sensory quality of the promising genotypes is only a baseline and that, under the right cultivation and environmental conditions, its potential could be elevated.

Caffeine concentration in coffee remains an important marketing aspect, with low and high-caffeine coffees being desired. The quantification of green bean caffeine levels in the 39 analysed genotypes already revealed a substantial range in caffeine concentration (19.2 mg/g to 40.0 mg/g). Many genetic identities in the collection remain unquantified, and they could exhibit an even lower or higher caffeine concentration, emphasizing the importance of screening Robusta genetic resources. Our research also indicates the importance of considering the viability and health of coffee seeds when aiming to improve coffee quality. The impact of coffee processing on seed germination and viability has been reported before (Selmar et al., 2014) but the implications for commercial coffee production are yet to be put forward. Only recently are researchers experimenting with the re-imbibition of dried green coffee beans to initiate germination and fermentation in the hopes of improving the coffee sensory quality (Wang et al., 2023).

The impact of coffee processing methods on the sensory profiles also presents an opportunity to improve the marketability of Robusta coffee. Our study demonstrated that coffee processing methods, such as pulping and washing, significantly improve the sensory quality of Robusta. The Pulped Natural processing method, indicated here as a potentially cost-effective alternative to washed coffee, could find a position in the Fine Robusta market. The Pulped Natural processing method was repeated in 2022 on a larger scale with pooled coffee cherries (50 kg) from the selected four genotypes to assess the market potential. Coffee samples were sent to independent actors within the specialty coffee value chain for sensory quality evaluation. Similar quality observations were made by the companies, which all indicated the potential of the coffee sample in the Fine Robusta market. Researcher Robrecht Bollen has participated in numerous Fine Robusta cupping sessions over the past five years, featuring high-end, innovatively processed coffees from around the world. Based on this experience, he can confidently affirm that the sensory profiles of the INERA Coffee Collection show great potential.

The question now is, how would the sensory profile of the best-scoring genotypes improve when cultivated under optimal conditions and processed as Pulped Natural or Washed coffee? We believe that this is only the start of the quality potential of the Robusta genetic resources, and the true quality

potential will only be revealed with continued research of the genotypes. As a starting point, we have shown that a low-caffeine Robusta coffee with fruity and sweet flavours is possible instead of the earthy and bitter-flavoured high-caffeine beverage known today.

Given the growing market demand for quality coffee and the challenges faced in Arabica cultivation (Craparo et al., 2015; Davis et al., 2012), Robusta presents the best short-term solution to mitigate the issues affecting Arabica production, provided it receives the same level of investment and processing as high-quality Arabica. Breeding programs designed to tackle future climate challenges are underway but take substantial development time (WCR, 2023a). While research into other coffee species, such as *C. stenophylla* and *C. congensis*, reveals promising sensory profiles, their agronomic potential still needs to be tested, and they do not provide immediate solutions (Bertrand et al., 2023). The emergence of higher-quality Robusta in the global commercial market provides a temporary solution. Coffee roasters worldwide are increasingly incorporating higher-quality Robusta into blends to replace lower-quality Arabica, while single-origin Robusta coffees of exceptional quality are gaining popularity in niche markets. However, while this strategy is effective in the short term, it is unlikely to address the long-term challenges of global coffee production. It relies on varieties that were not originally selected for superior sensory quality and require significant investments to improve the final coffee flavor (WCR, 2023c). As our understanding of Robusta's genetic resources advances, more specifically in the DRC, we have an opportunity to improve the quality of commercial Robusta. Rather than relying on old varieties with inferior sensory quality as substitutes for Arabica, we can introduce genetic material with improved sensory attributes, providing a potential long-term solution to the uncertainties surrounding coffee production.

This work package unveiled the potential of the Robusta genetic resources currently growing at the INERA Coffee Collection in Yangambi. From our comprehensive characterization, we have selected 40 genotypes based on sensory profile, agronomic performance, green bean quality, caffeine concentration, and genetic background. The selected genotypes are being multiplied through vegetative propagation at the INERA Coffee Collection (Figure 7). Once the cuttings are ready, they will be planted in a new clonal field for further agronomic and sensory quality evaluation, thereby addressing one of our research limitations. This clonal field can then also serve as mother material for further (vegetative or generative) propagation. Furthermore, the promising genotypes from the 'Lula' group, abundantly present at the INERA Coffee Collection, were used to produce seed material. This seed material was germinated to seedlings and will be used to install field trials of Robusta agroforestry systems in the local area. Involving actors from the coffee value chain will be crucial, as such collaborations will be vital if we wish to distribute and cultivate the promising material on a larger scale. Scientific outreach through coffee samples from the promising genotypes has already sparked interest with several coffee value chain actors, such as green coffee buyers and private investors active in the agricultural sector.

Figure 7. Propagation of promising *C. canephora* genotypes at the INERA Coffee Collection. (**A**) Orthotropic shoots ready for harvest. (**B**) Harvested shoots prepared for vegetative growth. (**C**) Cuttings transferred to polypropylene bags. (**D**) Seedling material from the 'Lula' cultivars ready for planting.

Recommendations

In total 102 genotypes of the 263 were tasted (cupped) at least once in WP3. Only 70 of the 263 genetic identities discovered in the Screening Panel have been studied in detail for their sensory and agronomic potential, while 39 genotypes underwent metabolic screening. Continued screening of the accessions and newly introduced wild material from field missions remains essential. We also advocate for the screening of Robusta genetic resources in other regions. For example, the INERA field genebank in Luki, located in the Luki biosphere of the Kongo-Central province, also holds an underexplored *C. canephora* collection including accessions with origin from the Kwilu river region, an essential geographic origin of Robusta diversity. The famous Conilon variety cultivated in Brazil has its origins in the Kwilu region (Montagnon et al., 1998), prompting further research.

As addressed earlier, field trials should be designed to test the promising genotypes across multiple locations under varying environmental conditions, including higher altitudes and shaded cultivation systems. This will help to improve the knowledge gap on how these factors influence agronomic and sensory quality traits in Robusta coffee (Ahmed et al., 2021).

The sensory profile ideotypes discovered in our project (WP3) could be evaluated as Pulped Natural or Washed coffees to explore potential improvements in their sensory characteristics. Additionally, cultivating these promising genotypes under optimal environmental conditions could further enhance their sensory profiles. We also propose to continue the research on the fermentation and germination

of coffee beans and their impact on coffee sensory quality and extend this to the storage viability of green coffee. For example, can we initiate the germination process of stored, dried, Natural processed coffee beans and consecutively redry them to improve the storage and sensory profile of the coffee towards that of a Washed coffee? This would benefit green coffee buyers, who could purchase Natural processed green coffee and trigger the germination processes post-storage to potentially increase the sensory quality.

The predictive power of coffee leaf metabolites for sensory quality should be further explored by extending the sampling time frame. Can we predict the coffee sensory quality from metabolites present in the coffee leaves months or even years before the harvest? We also propose further studying the hypothesized quercetin derivate as a possible predictive marker for coffee sensory quality in green beans. If the identification of this quercetin derivate is possible, we would advise adding this pure compound to the coffee bean matrix and evaluating if the sensory quality would be negatively impacted (Sittipod et al., 2020). Future studies could benefit from integrating GC-MS for volatile compound analysis, optimizing extraction conditions and increasing the number of replicates to enhance the reproducibility and completeness of the metabolite profiles.

This research has identified promising genotypes from a mixed population of heterozygous plants, which were created through crossings and natural hybridization between different genetic classes within the INERA Coffee Collection. To further increase intragroup genetic diversity, these genotypes should be crossed with more distant genetic material (Alkimim et al., 2021; Campuzano-Duque & Blair, 2022). Within the INERA Coffee Collection, we could start by crossing the promising material from the 'Lula' – Wild class with those of the 'Lula' – subgroup A class. Additionally, crossing the material from the Wild and subgroup A class is particularly interesting, as admixture between these two genetic classes is currently non-existent. Lastly, the discovered promising genotypes should ideally also be crossed with more distant genetic material, such as the Guinean group (Vi et al., 2023), given the potential genetic gains of such intergroup crossings (Leroy et al., 1997; N. S. Prakash, 2018; Tran et al., 2016). Such crossing experiments can only be realized in international collaborative breeding programs like those currently undertaken in Arabica (WCR, 2023a). We advocate that the Robusta genetic resources from the DRC be (re-)introduced in the global breeding networks of Robusta coffee.

Given these findings, it is crucial to protect these genetic resources by expanding and rehabilitating ex-situ collections and safeguarding their natural in-situ habitats. The wild populations of the Yangambi forest maintain a genetic makeup that is closely related to cultivated varieties, providing a genetic reservoir that could be invaluable for future breeding programs aiming to produce robust, climate-resilient Robusta varieties (Verleysen et al., 2024).

WP4: Agroforestry and Environmental Impact

A comparison of different coffee production systems in Tshopo reveals important distinctions in productivity. Table 1 shows how the median robusta yield, planting densities, and canopy closure differ across monoculture (MC), cultivated agroforestry (CAF), and wild agroforestry systems (WAF). The highest median coffee yields per plant were observed in Cultivated Agroforestry (0.96 ± 0.14 kg green beans) and monocultures (0.92 ± 0.07 kg green beans). Per hectare, monocultures (800 ± 80 kg/ha) and Cultivated Agroforestry (650 ± 135 kg/ha) yielded the most, while Wild Forest Coffee had the lowest yields (<1 kg/ha, $p<0.0001$).

Table 1. Robusta yield across coffee systems in Tshopo, DRC (n = 75) (Broeckhoven et al., 2025).

	Monoculture (n=27)		Cultivated AF (n=15)		Wild AF (n=12)	
	μ	± se	μ	± se	μ	± se
Yield [kg green coffee/plant]	0.916[a]	(± 0.0746)	0.956[a,b]	(± 0.143)	0.586[b]	(± 0.101)
Yield [kg green coffee/ha]	798[a]	(± 79.9)	648[a,b]	(± 134)	503[b]	(± 94.2)
Coffee density [plants/ha]	960[a]	(± 47.0)	896[a]	(± 61.6)	880[a]	(± 63.5)
Canopy closure [%]	0.00[c]	(± 0.475)	38.2[b]	(± 4.75)	52.9[b]	(± 3.67)

No significant differences in Robusta planting densities were found between monocultures and agroforestry systems. However, canopy closure was highest in Wild Forest Coffee (91%), significantly exceeding wild agroforestry (53%) and cultivated agroforestry (38%). Carbon stocks were also highest in Wild Forest Coffee (289 ± 13.6 Mg C/ha), compared to agroforestry systems (96.1 ± 10.2 Mg C/ha) and monocultures (58.1 ± 2.63 Mg C/ha). Biodiversity indices followed a similar pattern, favouring Wild Forest Coffee. Common shade plants in agroforestry included bananas, plantains, oil palm, and safou. Despite similar yields between coffee monocultures and cultivated agroforestry systems, the latter is the preferred option as it balances productivity with environmental sustainability. To optimize coffee yield in agroforestry, excessive shading should be avoided, maintaining canopy closure below 50%. No trade-offs were found between carbon storage and biodiversity across coffee systems, meaning both can be optimized simultaneously. Wild Forest Coffee systems provide the highest carbon storage and biodiversity value but have minimal yield, making them vital for genetic conservation and ecosystem services rather than commercial production.

Coffee agroforestry systems offer a practical balance, delivering significantly greater carbon sequestration and biodiversity than monocultures while maintaining comparable yields. Given these advantages, agroforestry is recommended over monoculture, especially since it also provides valuable non-timber products such as fruits, edible caterpillars (an important protein source), and medicinal plants. Furthermore, agroforestry aligns with farmers' natural preference for diversification rather than specialization, making it a viable strategy for achieving both economic and environmental goals. Farmers generally favour diversified systems over specialized coffee production. Conservation of Wild Forest Coffee remains crucial for genetic diversity and ecosystem services.

Half of farmers identified NTFP provisioning as the primary advantage of shade trees, with coffee shade (18%) and soil fertility improvements being secondary concerns. The most valued NTFPs were edible caterpillars and edible fruits. Tree selection criteria prioritized NTFP production, neutral or positive effects on coffee yield, and wind resistance. The most preferred species included *Petersianthus macrocarpus*, *Ricinodendron heudelotii*, and *Uapaca guineensis* for caterpillar hosting, and *Persea americana*, *Dacryodes edulis*, and *Spondias dulcis* for fruit production. Inventory data showed that oil palm, safou, *Spondias dulcis*, avocado, and bananas were the most frequently occurring trees in coffee fields.

Agricultural management is the most critical factor influencing yield. Specifically, maintaining 3–4 stems per plant was found to optimize production. The use of improved planting material from local research institutes significantly increases yields, yet only 10% of farmers have access to this material, highlighting a major dissemination gap. Planting densities remain far below recommended levels, largely due to knowledge gaps—99% of farmers are unaware of optimal spacing, and 93% do not regulate stem numbers. Increasing planting density represents a low-cost opportunity to improve yields. Pests and diseases pose the second most significant constraint. Coffee Berry Borer and dieback have the strongest negative impact, while pests like Coffee Leaf Pyralid cause moderate damage. Coffee Wilt Disease, with its history of devastating outbreaks, remains a threat that should not be underestimated. Interestingly, some common pests, such as stem borers and Black Coffee Twig Borer, did not show measurable yield effects, warranting further investigation.

Soil fertility analysis identified deficiencies in magnesium (Mg), potassium (K), and calcium (Ca), but no significant effect on coffee yield was observed for most nutrients. Only manganese (Mn) and zinc (Zn) had a statistically significant but small impact. Despite these deficiencies, leaf nutrient concentrations were generally low, and soil pH was suboptimal. This raises the question of why nutrient imbalances had limited impact on Robusta coffee yield in Tshopo. Likely factors include crop management practices, such as stem density per plant, planting density, shade levels, the origin of planting material, pruning techniques, and pest and disease pressures. Improving soil fertility management would only be cost-effective if farmers receive better farmgate prices and agronomic challenges such as pest control and pruning are addressed. Fertilization should follow Integrated Soil Fertility Management (ISFM) principles, combining mineral fertilizers, organic matter, and lime application, as using only one approach is unlikely to be cost-effective. While certain leaf nutrients, particularly zinc and manganese, have a modest influence on yield, soil fertility alone has minimal direct impact compared to management practices and pest control. Fertilizer investments should therefore be accompanied by liming and improved agronomic techniques to maximize benefits.

The farmer household surveys revealed that coffee farmers in Tshopo identify the limited presence of buyers at the local level as a major constraint (Table 2), caused by poor market access resulting from the dilapidated transportation infrastructure. Dysfunctional road and river networks increase transaction and transport costs, heighten risks, and depress farm gate prices. Given their weak bargaining position, rural coffee farmers are effectively price-takers. Unsurprisingly, many farmers report that coffee cultivation is unprofitable—one of the most critical challenges they face. Farmers also noted that low coffee prices and poor market access hinder their ability to understand market dynamics and access market information. This puts them at a clear disadvantage in price negotiations with traders, as corroborated for Congolese farmers in general by the World Food Program (WFP, 2010).

Table 2. Main factors mentioned by (non-)coffee farmers as constraining coffee production and the proposed enablers, Tshopo province, DRC (*n = 120*).

Constraining factors for coffee production	Coffee Farmers [%, n = 60]	Non-Coffee Farmers [%, n = 60]	*p-value*
Lack of regular coffee buyers	23 [b]	40 [a]	0.022 *
Long vegetative cycle (before 1st coffee harvest)	28 [a]	15 [b]	0.047 *
Unprofitability	13 [a]	20 [a]	0.098
Lack of state support (material and training)	18 [a]	10 [a]	0.11
Land ownership rights	10 [a]	10 [a]	0.83
Coffee pests and diseases	6.7 [a]	5.0 [a]	0.64
Main enablers mentioned by farmers			
Rehabilitation of roads	32 [b]	43 [a]	0.048 *
State support (material and training)	38 [a]	29 [a]	0.073
Regular coffee buyers in the villages	25 [a]	17 [a]	0.24
Farmers' cooperatives and associations	5.1 [a]	10 [a]	0.41

Different letters indicate significant differences between Coffee Farmers and Non-Coffee Farmers based on Fisher's Exact test.

Considering these constraints, farmers consistently point to the rehabilitation of transport infrastructure as the top enabling factor, an issue they believe the government should prioritise. Closely linked to this is the need to facilitate the presence of coffee buyers in rural areas, which farmers also regard as a key intervention. These findings underscore the need for targeted interventions that enhance access to improved planting materials, promote best agronomic practices, and strengthen market linkages to ensure the long-term sustainability of coffee production. The most significant production constraints include low coffee prices, lack of buyers, long maturation periods, and poor infrastructure. Farmers emphasize the need for road rehabilitation, improved market access, better profitability, and enhanced training opportunities.

The studies within WP4 provide a holistic analysis of Robusta coffee production in Tshopo Province, DRC, focusing on ecological sustainability, farmer preferences, and key yield determinants. Addressing agronomic knowledge gaps and economic barriers will be critical for the long-term success of Robusta coffee farming in the region. To ensure this success, efforts must first focus on making coffee farming more profitable before expecting widespread adoption of improved practices. Strengthening road infrastructure to enhance market access is a crucial first step, as limited buyer availability remains a major constraint.

Addressing knowledge gaps is equally important. Targeted training programs should be launched to educate farmers on optimal planting density, pruning, stem management, and pest and disease control. Additionally, access to improved high-yielding planting material must be scaled up by expanding distribution from research centres.

Agroforestry systems should be prioritized as the optimal production model, offering a balance between yield, biodiversity conservation, carbon sequestration, and farmer needs. Given farmer interest in diversification, integrating caterpillar-hosting tree species into coffee agroforestry systems should be explored further, alongside efforts to improve tree seedling availability. At the same time,

Wild Forest Coffee populations must be protected for their ecological and genetic value, even though they contribute little to commercial production.

Ultimately, for Robusta coffee to thrive in Tshopo, farmers need to capture more value within the supply chain. One promising approach is to support them in integrating post-harvest processing in their activities, enabling them to benefit from higher-value market segments.

WP5: Historical Research on Robusta Coffee

The historical research component of WP5 focused on reconstructing the early development and dissemination of *Coffea canephora* (Robusta) in the Congo during the colonial era. The research scope was refined to cover the period from 1890 to 1926, allowing for a more detailed and focused investigation. This revised timeframe enabled the completion of a comprehensive study based on archival materials, providing critical insights into the introduction, early cultivation, and global dissemination of Robusta coffee (Annex 2).

A total of 22 archival repositories were consulted, and 174 portfolios of historical documents were examined. From these, 44 key portfolios were selected for in-depth analysis. The most significant materials were drawn from eight primary archival collections:

- **NEAC/NILCO collections**: Documentation of experimentation, selection processes, research programs, inspection reports, status of plant collections, and the distribution of seeds and plants.
- **Jardin Colonial archives**: Records of seed and plant exchanges, correspondence and shipment statistics, and participation in international exhibitions (e.g., Paris 1900, Ghent 1912–13, London 1914).
- **Direction de l'Agriculture (AGRI) files**: Research programs at experimental stations, agricultural missions, coffee cultivation studies, international plant and seed exchanges, Robusta memoranda, botanical collections, and analytical reports.
- **Edmond van Eetvelde (AGR/Ruysbroeck) papers**: Development plans for the agricultural service and coffee cultivation.
- **Cyriaque Gillain papers**: Founding and development of the Lusambo camp, including maps and references to coffee trees, and travel documentation with Emile Laurent.
- **Paul Le Marinel papers**: Documentation of the Lusambo camp foundation, the Lomami expedition, early mentions of coffee trees, and visual sketches.
- **Georges Descamps papers**: Notes on Lusambo camp development, the Katanga expedition, and initial references to coffee trees.

A detailed 70-page working document was produced, synthesizing the findings into a coherent historical narrative. The analysis covered the chronology of Robusta's introduction and spread (1895–1907), its origins as "Sankuru coffee," and the key roles of missions led by Emile Laurent and Edouard Luja. It also addressed the strategic promotion of Robusta at the Paris Exhibition in 1900, its global dissemination by 1910, and its classification within botanical systematics. The report further explored the onset of systematic agronomic research in Congo, including the establishment of the Lula research station, early efforts at crop improvement, and the initial wave of Robusta exports (1908–1921).

A survey was also conducted to identify archival materials of high historical value suitable for digitisation and public access. While a report on these materials was submitted, digitisation was not pursued further, and the documents remain inaccessible to the broader research community and public.

The dissemination of research results encountered setbacks due to long-term illness of the temporary project collaborator and his consequent replacement; the budget was not sufficient for the digitisation of the selected documents and the Archives were not able to allocate additional budget for this task. Despite these challenges, a source guide to Robusta coffee was completed (Annex 2), and a scientific article based on WP5 findings was drafted and revised. The results have since provided the foundation for a doctoral thesis project launched in late 2025, focusing on the historical development of scientific knowledge about Robusta in the colonial context.

Early colonial records confirm that the introduction of Robusta coffee from Sankuru in the 1890s played a crucial role in global coffee cultivation. Historical research has also established a connection between Congolese genetic resources and the development of Vietnam's Robusta coffee industry, highlighting the significant influence of Congolese coffee varieties on international production. In this project we focussed on the period between 1880 and 1932 (pre-INEAC). Therefore, the extensive archives from the INEAC remain to be explored in order to shed light on the importance of the coffee breeding program for Robusta cultivation up to today.

In order to preserve and make this important heritage online accessible, it is recommended to digitize key historical documents and integrate these findings into contemporary conservation efforts. This would ensure that valuable data and knowledge remain accessible for future research and sustainable coffee development.

WP6: Value Chain and Policy Analysis

The research and activity of this work package resulted in the development and publication of two key documents:

- **A Roadmap to Unlock the Market Potential of Robusta Coffee from Tshopo, DRC** - *A Stepwise Market Entry Strategy Gradually Addressing Challenges and Unlocking Opportunities* (Annex 3). This document outlines strategic actions to enhance the region's coffee value chain.

- **Policy Brief: Policy Recommendations to Unlock the DRC's Quality Robusta Potential**, which presents targeted strategies and recommendations for advancing the Robusta coffee sector in Tshopo province. This policy brief is published in parallel with the final report of the project.

The value chain and policy analysis revealed significant challenges within the Congolese coffee sector. Notably, no formal land ownership was found among coffee farmers, with only 5% attempting to secure tenure. Critical gaps were identified, including the lack of processing facilities, high transport costs, and excessive taxation, all of which hinder the sector's growth. Business modelling explored opportunities for expanding the domestic market, with Kisangani and Kinshasa emerging as potential hubs for local coffee trade.

The following is a summary of the main findings of the document **Roadmap to Unlock the Market Potential of Robusta Coffee from Tshopo, DRC** (Annex 3), which was developed within the CoffeeBridge project.

Interviews conducted with private sector actors revealed that there is clear market potential for Robusta coffee from the DRC. Compared to several West African countries, the DRC benefits from a more favourable image, largely thanks to the reputation established by the Kivu provinces. However, Robusta from Tshopo faces several distinct challenges that limit its market competitiveness when compared to Kivu's Arabica, including weaker storytelling, market appeal, and higher volume expectations.

At the farm level, several structural and logistical barriers hinder productivity and profitability in Tshopo. These include the absence of local buyers, poor transportation infrastructure, persistently low farmgate prices, unfavourable fiscal policies, and an extended vegetative cycle that delays returns on investment. The processing stage is equally constrained, characterized by very small farm sizes (typically less than 0.10 hectares), limited access to processing infrastructure, and the need to optimize the balance between production capacity (for which Natural processing is favourable) and coffee quality superior in Washed coffee, but requiring more resources and infrastructure).

To compare potential market scenarios for Tshopo coffee, five studies were carried out across Tshopo, Kisangani, Kinshasa, and Bas-Uele. Interviews were carried out with 412 actors along the coffee value chain, complemented with data from other CoffeeBridge publications. Three market scenarios were proposed and discussed (see Annex 3 for more details):

Roasting & selling coffee in Tshopo

Due to the extremely small average farm size, farmers currently earn between 70 and 127 USD per year from coffee cultivation. This very low income underscores the need to significantly increase the value generated at farm level. Enhancing product quality is one potential avenue. At present, practices such as adulterating coffee with avocado seeds or using plastic waste as a fuel source for roasting coffee are not only detrimental to quality but also raise serious public health and safety concerns. Addressing these issues will be critical in improving consumer trust and building long-term market potential.

Selling coffee in open-air markets in Tshopo results in low or negative profits, with coffee being sold at a rate of $3.08/kg. Supermarkets do not carry any regular roasted coffee brands; instead, the only available option is Nescafé instant coffee, sold at a converted price of $13.64 to $16.92 per kilogram. The study suggests that there is currently no consumer segment (and thus no market) for standard packaged coffee in Kisangani. However, the fact that some consumers are willing to pay up to $16.92/kg for instant coffee indicates that there could be a latent market opportunity for a good-quality, no-nonsense local coffee at intermediate prices, as exemplified by Bomani coffee - a product that is modestly packaged but still fetched respectable prices. Calculations suggest that a product in the $5-$9/kg would be profitable, as well as technically and economically feasible from an investment perspective. Further research is recommended, though, specifically on potential annual volume of this market segment.

Selling coffee in Kinshasa

Selling Tshopo coffee in Kinshasa's open-air markets currently appears economically unfeasible. Open-air market prices in the capital are significantly lower than in the Tshopo region, and coffee from Tshopo cannot compete with produce from regions closer to Kinshasa, such as Congo Central, which benefit from lower transportation costs and faster delivery times. Supermarkets in Kinshasa, however, offer a more premium retail environment, with Congolese coffees selling for $17.40 to $37.67/kg. Nonetheless, successfully entering this space would require strong branding, consistent quality, and strict compliance with packaging and shelf-life requirements, which could present barriers to entry.

Exporting green coffee

Exporting green Robusta coffee offers more promise. The estimated cost of export logistics, excluding the farmgate price, ranges from $1.63 to $1.71 per kilogram. Analysis shows that if this coffee were to be sold in international markets such as the European Union, the Middle East, or North Africa, the resulting value surplus could support a 2.5- to 3-fold increase in farmgate prices. This could potentially raise the median annual income of coffee farmers in Tshopo from its current range of $70–$125 to approximately $170–$215, significantly improving livelihoods.

However, the profitability of export is sensitive to global price fluctuations. Should prices fall from the current benchmark of $5,565 per ton (as of March 2025) to $3,500 per ton, low-quality coffee exports would become unprofitable. High-quality exports would remain viable down to a price of $2,500 per ton.

In terms of logistics, the export route via Matadi presents clear advantages over the more commonly used eastern route through Dar es Salaam or Mombasa. While the eastern route currently dominates, likely due to the historical presence of traders in that region, Matadi is more cost-effective (approximately $209/ton compared to $590/ton for the eastern route). Furthermore, shipping times from Kisangani to Antwerp via Matadi are shorter—roughly two months, compared to four to five months through East Africa. This reduces both financing costs and the risk of quality degradation during transit. In addition, the Matadi route avoids conflict zones and international borders, thus lowering administrative burdens and logistical risks.

In conclusion, the Robusta coffee sector in Tshopo presents a range of untapped opportunities. Improving quality control and food safety practices, investing in local processing capacity, and identifying the right market segments (domestic and international) could substantially increase the value captured by smallholder farmers. Strategic promotion of mid-range coffee products, combined with targeted investment and improved logistics, particularly through the Matadi corridor, would go a long way in unlocking this potential. With the right support, the Tshopo Robusta sector could become a viable contributor to both rural development and the broader Congolese coffee economy.

<u>Conclusions and recommendations</u>

To address the challenges laid across this report the document '**Policy Brief: Policy Recommendations to Unlock the DRC's Quality Robusta Potential'** provides policy recommendations developed as part of the CoffeeBridge project.

The DRC's history as a major Robusta producer, combined with its genetic diversity and agro-ecological conditions, provides a strong foundation for sector revitalisation. However, this potential will remain unrealised without deliberate and coordinated action from the government. History has shown that isolated interventions — without addressing market access, infrastructure, and farmer capacity — are unlikely to succeed. The policy brief emphasises that enhancing farmer profitability necessitates a dual focus on quality and productivity, supported by practical training and investment in processing infrastructure. Moreover, the long-term competitiveness of the sector depends on conserving and valorising the country's rich genetic resources through both in situ and ex-situ strategies. While broader governance challenges remain outside the scope of this brief, concrete actions such as pilot projects, nursery development, and targeted research can lay the groundwork for private sector engagement and future scale-up. Establishing a national strategy and action plan for Robusta revitalisation — while leveraging early successes in pilot initiatives — will be key to repositioning Tshopo and the DRC more broadly as a credible Robusta origin in the global market.

A final stakeholder workshop was organised on 07 and 08 May 2025 to present the key findings of the CoffeeBridge project, discuss implementation strategies, and showcase the best-performing coffee varieties through sensory 'coffee cupping' evaluations (press release). The table discussions during the event brought together key stakeholders to address the challenges and opportunities in the DRC Robusta coffee sector across four critical areas.

1. Coffee Genetic Resources

Discussions emphasized the need for renewed exploration and collection of wild coffee species, particularly in regions like Yangambi and Virunga. There was strong consensus on enhancing both *in situ* and *ex situ* conservation strategies, training field botanists, and developing a shared national database of coffee genetic resources, including passport, morphological, and resistance data. Participants also stressed the importance of reactivating research infrastructure (e.g. Lulimbi station) and using initiatives like the Green Corridor to safeguard biodiversity. However, sustainability and governance structures remain unresolved.

2. Coffee Production and Supply Chain

Critical infrastructural gaps were identified, notably the absence of electricity and triage capacity. The potential use of Yangambi's biomass energy pilot for coffee processing was highlighted. Establishing a sorting and grading facility in Kisangani emerged as a priority to ease logistics toward Kinshasa and reduce dependency on eastern routes. The lack of viable organizational models was evident. Farmer cooperatives are currently unfeasible, while associations face legal challenges. Despite interest in farmer field schools, no clear consensus was reached on structuring the local supply chain.

3. Coffee Quality and Processing

Quality production hinges on better germplasm, agronomic training, and risk reduction through agroforestry. The need for farmer education on coffee quality and the shift toward a producer-driven market was underlined. The local market continues to absorb most production, though issues such as low volume and market perception of Robusta hinder international competitiveness. Alternative branding (e.g., "Petit Kwilu" or "Canephora") could enhance appeal. The impact of the EU

Deforestation Regulation (EUDR), which could deem many farms illegal, was flagged as an urgent concern.

4. Coffee Research Programs

Participants called for multidisciplinary research spanning chemistry, genetics, and local knowledge systems. Topics of interest included roasting effects, novel products (e.g., from pulp or leaves), adaptive models, and breeding proxies for quality. Strengthening research capacity in Africa through training, infrastructure, and south-south collaboration was widely supported. There was also a call to build a global *Coffea* accession database and improve science education in schools and universities. Research must also evaluate its impact on biodiversity and landscape dynamics.

Overall, the CoffeeBridge project made significant progress in understanding Robusta coffee genetics, sensory quality, agronomic performance, and value chain constraints in the Democratic Republic of the Congo. While the research highlighted the high potential of Congolese Robusta genetic resources, substantial challenges remain in infrastructure, policy, and market development. By laying the foundation for future interventions, the project has underscored the unique global value of Congolese Robusta coffee and the importance of addressing key structural challenges to unlock its full potential.

5. DISSEMINATION AND VALORISATION

Aside from the scientific articles (see **6. Publications**), the results of this project have been valorised and communicated via:

Conferences and public science outreach

- Stoffelen, P., et al.: Reizende tentoonstelling "Koffiestories", Centrum voor Agrarische Geschiedenis, Meise Botanic Garden & CERA, 2020–2022. (public science outreach)
- Bollen, R., Stoffelen, P..: Expo "Straffe koffie", Meise Botanic Garden, June 2021. (exhibition)
- Bollen, R.: Profiling of *Coffea canephora* genotypes in the Democratic Republic of the Congo, ASIC 2021, 28 June – 1 July 2021, Montpellier, France. (poster)
- Stoffelen, P.: Which genetic diversity was brought to Vietnamese Robusta coffee (*Coffea canephora*)?, ASIC 2021, 28 June – 1 July 2021, Montpellier, France. (poster)
- Bollen, R.: Evaluation of Robusta coffee genetic resources in the Congo Basin (DRC), Royal Academy for Overseas Sciences Talks, Kasteel van Bouchout, Meise Botanic Garden, April 2022. (presentation)
- Bamenga Bopoko, L. P.: Évaluation des savoirs endogènes et perception des populations locales sur les pratiques culturales du café Robusta dans le paysage de la Réserve de Biosphère de Yangambi en province de la Tshopo, 2nd Biodiversity Congress of the Congo Basin, March 2023, Kisangani, DR Congo. (presentation)
- Broeckhoven, I.: Robusta yield, carbon and biodiversity trade-offs and synergies, 2nd Biodiversity Congress of the Congo Basin, March 2023, Kisangani, DR Congo. (poster)
- Stoffelen, P.: The Democratic Republic of the Congo, the cradle of cultivated Robusta coffee (*Coffea canephora*), can we safeguard its coffee genetic resources of world importance?, ASIC 2023, 11–14 September 2023, Hanoi, Vietnam. (presentation)
- Bollen, R.: Sensory and metabolic profiles of *Coffea canephora* accessions from DR Congo, ASIC 2023, 11–14 September 2023, Hanoi, Vietnam. (presentation)
- Broeckhoven, I.: Arbuscular Mycorrhizal Fungi (AMF) Associations of Robusta Coffee (*Coffea canephora*) across a Management Intensity Gradient in the DR Congo using Illumina Sequencing, ASIC 2023, 11–14 September 2023, Hanoi, Vietnam. (presentation)
- Stoffelen, P., et al.: Expo "Kawa Elenge, le plaisir du café", Bilembo, Kinshasa, 5–29 October 2023. (exhibition)
- Bollen, R.: Genetic and sensory diversity of *Coffea canephora* in DR Congo, Royal Academy for Overseas Sciences Theme Day, December 2023, Brussels, Belgium. (presentation)
- Bollen, R.: Quality potential of *Coffea canephora* genetic resources of DR Congo, Leuven Plant Institute, KU Leuven, December 2023. (presentation)
- Bamenga, L. P.: The 20th African Fine Coffees Conference, African Fine Coffees Association, Addis Ababa, Ethiopia, February 2024. (participation)
- Bollen, R.: Conservation and research on *Coffea canephora* in the DRC, Canephorum V3, October 2024, Berlin, Germany. (presentation)

A final symposium was held to present the project's key results and to facilitate roundtable discussions aimed at strengthening the recommendations outlined in the policy brief. From Plants to People:

- Bollen, R.: Coffee in DR Congo: conservation, evaluation and knowledge transfer. From plants to people: Botanical expertise for a sustainable future in Central Africa, Green Ark, Meise Botanic Garden, May 2025. (presentation)
- Bollen, R.: The potential of Congolese Robusta. From plants to people: Botanical expertise for a sustainable future in Central Africa, Green Ark, Meise Botanic Garden, May 2025. (workshop)
- Stoffelen, P.: L'importance et le potentiel des ressources génétiques des caféiers de la République Démocratique du Congo. From plants to people: Botanical expertise for a sustainable future in Central Africa, Green Ark, Meise Botanic Garden, May 2025. (presentation)
- Broeckhoven, I.: Valoriser le potentiel commercial du Robusta, Tshopo & RDC. From plants to people: Botanical expertise for a sustainable future in Central Africa, Green Ark, Meise Botanic Garden, May 2025. (presentation)
- Van den Bruel, R.: Le robusta dans un marché international de café en évolution. From plants to people: Botanical expertise for a sustainable future in Central Africa, Green Ark, Meise Botanic Garden, May 2025. (presentation)

Support to Decision-Making

Policy Brief: Policy Recommendations to Unlock the DRC's Quality Robusta Potential, which presents targeted strategies and recommendations for advancing the Robusta coffee sector in Tshopo province.

Media and newspapers

The CoffeeBridge website was established for public outreach: www.CoffeeBridge.be
De Tijd: De toekomst van koffie groeit in Meise
Het Laatste Nieuws: 600J KU Leuven coffee
Nieuwsblad: 600J KU Leuven coffee blend
Onan Coffee & Tea: https://onan.be/nl/dr-congo/
Canephorum V3: Canephorum V3
Vilt (cfr. VRT NWS segment): Klimaatrobuuste koffie
Global Coffee Report (WP3 coffee samples representing the DRC): Canephora Flavor Wheel

6. PUBLICATIONS

Peer-reviewed scientific publications

Bamenga Bopoko, L. P., Trefon, T., Mate, J. P., & Michel, B. (2025). Profitability Analysis of the Robusta Coffee Value Chain in the Tshopo Province, Democratic Republic of Congo. *Agriculture*, 15(3), 1–12. https://doi.org/10.3390/agriculture15030312

Bopoko, B., Wabasa, M., Michel, B., Mate, J.-P., Collins, F., Stoffelen, P., & Trefon, T. (2024). Savoirs locaux sur les pratiques culturales du caféier robusta et représentations des communautés locales sur le café en Province de la Tshopo (République Démocratique du Congo). *European Scientific Journal, ESJ*, 30, 584. Retrieved from https://eujournal.org/index.php/esj/article/view/18293

Bopoko, B., Broeckhoven, I., Verbist, B., Stoffelen, P., & Trefon, T. (2024). The history of robusta coffee cultivation in the Tshopo Province, Democratic Republic of the Congo. *African Journal of Social Issues*, 7(1), 450–466. https://doi.org/10.4314/ajosi.v7i1.29

Bollen, R. (2025). *From leaf to bean: Unveiling the potential of Congolese Robusta coffee (Coffea canephora) through sensory, metabolite, and agronomic characterization*. [Doctoral dissertation, KU Leuven]. Lirias repository ID lirias4208147

Bollen, R., Rojo-Poveda, O., Katshela, B. N., Tshimi, E. A., Stévigny, C., Delporte, C., Vandelook, F., Stoffelen, P., & Honnay, O. (2025). The impact of coffee genotype and processing method on the sensory and metabolite profiles of Robusta coffee (*Coffea canephora*). *European Food Research and Technology*. https://doi.org/10.1007/s00217-025-04696-z

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Broeckhoven, I., Depecker, J., Muliwambene, T. K., Honnay, O., Merckx, R., & Verbist, B. (2025). Synergies and trade-offs between robusta yield, carbon stocks and biodiversity across coffee systems in the DR Congo. *Agroforestry Systems*, 99(2), 46. https://doi.org/10.1007/s10457-025-01140-9

Verleysen, L., Bollen, R., Kambale, J.-L., Ebele, T., Katshela, B. N., Depecker, J., Poncet, V., Assumani, D.-M., Vandelook, F., Stoffelen, P., Honnay, O., & Ruttink, T. (2023). Characterization of the genetic composition and establishment of a core collection for the INERA Robusta coffee (*Coffea canephora*) field genebank from the Democratic Republic of the Congo. *Frontiers in Sustainable Food Systems*, 7, Article 1239442. https://doi.org/10.3389/fsufs.2023.1239442

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Verleysen, L. (2024). *Challenges for the in-situ and ex-situ conservation of the Robusta coffee (Coffea canephora) gene pool in the Democratic Republic of the Congo*. [Doctoral dissertation, KU Leuven]. Lirias repository ID lirias4190430

Manuscripts in review:

Bollen, R., Kambale, J. L., Tas, A. Katshela, B. N., Tshimi, E. A., Wyffels, F., Vandelook, F., Honnay, O., Stoffelen, P. (2025b). Agro-morphological characterization of Robusta genotypes from the INERA Yangambi Coffee Collection, DRC. *Coffee Science*. (In Review)

Broeckhoven, I., Merckx, R., Verbist, Bruno (2025). Management Practices Outweigh Biotic and Abiotic Factors in Driving Robusta Coffee Yield in Tshopo DRC. *Agricultural Systems* (In Review)

Manuscripts in preparation

Broeckhoven, I., Muliwambene, T. K., Anio, J. A., Djailo, B. D., Verbist, B. Farmer Preferences and Selection Criteria for Shade Trees in Robusta Coffee Agroforestry Systems in Tshopo Province, DRC. Available at SSRN: http://dx.doi.org/10.2139/ssrn.5012351

Kambale, J. L. (2025) *Traits floraux de l'espèce Coffea canephora Pierre ex. Froehner dans la collection de l'INERA Yangambi, Province de la Tshopo, RD Congo.* [Master thesis, UNIKIS]. In preparation

Bamenga Bopoko, L. P. (2025). *Évaluation socio-économique du café Robusta (Coffea canephora Pierre ex A. Froehner) (Rubiaceae) dans la province de la Tshopo en République Démocratique du Congo : statut et potentiel* [Doctoral dissertation, ERAIFT]. In preparation

Broeckhoven, I. (2025). *Unpacking the Agro-ecological Potential of Robusta Coffee Systems in Tshopo, DR Congo.* [Doctoral dissertation, KU Leuven]. In preparation

Tas, A. et al. (2025) A phylogenetic, ecological and agronomic characterization of the coffee crop wild relative, *Coffea dactylifera* from the DR Congo. In preparation

Publications related to the project

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potential of coffee agroforestry relative to coffee monoculture and tropical rainforest in the DR Congo. *Agriculture, Ecosystems & Environment*, 379, 109375. https://doi.org/10.1016/j.agee.2024.109375

Hendrickx, A., Hatangi, Y., Honnay, O., Janssens, S.B., Stoffelen, P., Vandelook, F., & Depecker, J. (2024). Leaf functional trait evolution and its putative climatic drivers in African *Coffea* species. *Annals of Botany*, 134(4), 683-698. https://doi.org/10.1093/aob/mcae111

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ANNEXES

Annex 1

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Annex 1

ARCHIEFGIDS

Onderzoek naar *Robusta*-koffie in Belgisch Congo (1885-1960)

Sven Van Melkebeke

2021

BELGIË[1]

[1] Algemene inventarissen: Matthys C. & Lefebvre W., *Gids van landbouwarchieven in België, 1795-2000*, Leuven: Universitaire Pers, 2006; Tallier P.-A., Van Eeckenrode M., Van Schuylenbergh P. & Bompuku Eyenga-Cornelis S. (éds.), *Vers un patrimoine mieux partagé ! Guide des sources de l'histoire coloniale belge (Congo, Ruanda et Urundi), 19ème-20ème siècle. Recherches et notices réalisées par Lien Ceûppens, Laure*

1. Algemeen Rijksarchief 1 (Ruisbroekstraat 2, 1000 Brussel)

1. Archief van de Rijksplantages en de Regie der Plantages van de Kolonie (REPCO), het Nationaal Instituut voor de Landbouwkunde in Belgisch-Congo (NILCO/INEAC) en de Documentatiedienst (Serdat)

- Specifieke toegang: geen gepubliceerde inventaris, inventarisnummer 546 (raadpleegbaar via: https://search.arch.be/nl/zoeken-naar-archieven/zoekresultaat/ead/index/zoekterm/ineac/eadid/BE-A0510_003812_005470_DUT) [12/11/2020]
- Inhoud: Een aantal stukken hebben betrekking op de rechtsvoorganger Repco of de Rijksplantages, die vóór 1926 al actief waren, en het Serdat tot het einde van de 20ste eeuw. Vaak gaat het om algemene stukken die te maken hebben met rapportering. Het grootste deel van het archief heeft betrekking op de periode 1933-1962. Er bestaan uitgebreide reeksen van de voornaamste bestuursorganen, met name het Bestuurscomité en de Administratieve Commissie. Andere reeksen die een overzicht bieden van de Nilco-activiteiten zijn de minuten van uitgaande brieven aan bestemmelingen in Europa en bestemmelingen in Afrika. Verder treft men documenten aan over de algemene organisatie van het Nilco. De relaties met andere actoren in de kolonie worden in mate van het mogelijke apart vermeld. Algemene stukken betreffende personeel, boekhouding en de verspreiding van informatie komen eveneens aan bod. Het grootste deel van het archiefbestand handelt over het beheer en de activiteiten van stations in Afrika. Hierbij komen ook financiële en personeelsaangelegenheden aan bod. Tenslotte bevat het archiefbestand een rijke diversiteit aan bronnen door de aanwezigheid van grote collecties foto's, glasplaten, kaarten en plattegronden.

1.1. Archief van de rijksplantages in Yangambi-Gazi, Lula en Barumbu (1901-1926) en de Regie der Plantages van de Kolonie (1926-1933)

I. Stukken betreffende het beheer van de plantages in Belgisch Congo

A. Algemeen

n° 1 Driemaandelijkse en halfjaarlijkse rapporten betreffende de culturen en de werkzaamheden in verschillende districten. 1907-1909. 1 omslag

n° 6-9 Verslagen van verschillende plantages. 1928-1933.

n° 39 Verslagen en programma van de Landbouwdienst (Service Agricole) van de kolonie. 1929-1930. 1 omslag

n° 42 Dossier inzake het Wetenschappelijk Comité voor Landbouwkundig Onderzoek in Congo (Comité Scientifique pour l'Étude Agronomique du Congo), het koloniaal landbouwbeleid en de oprichting van het Nilco. 1931-1940. 1 pak

B. Omgeving van Stanleystad

B.1 Algemeen

d'Ursel, Sigrid Dehaeck, Stéphanie Hocq, Patricia Van Schuylenbergh, Tom Morren, Luis Angel Bernardo y Garcia, Bérengère Piret, Marie Van Eeckenrode, Delphine Lauwers, Pierre-Alain Tallier et al., Bruxelles: Archives de l'État - MRAC, 2020 (in druk)

n° 44 Activiteitsverslagen betreffende de plantages van het Gebied van Stanleystad (Rayon de Stanleyville) in de Centrale sector. 1927-1933. 1 omslag

n° 46-48 Driemaandelijks rapporten betreffende de activiteiten van de plantages van Yangambi, Gazi, Lula en Barumbu, opgemaakt door directeur R. Govaert. 1928.

n° 49-52 Jaarverslagen van de afdelingen en de plantages van het Gebied van Stanleystad (Rayon de Stanleyville). 1930-1933.

B.3 plantage van Yangambi-Gazi

n° 138-139 Jaarverslagen betreffende de landbouwposten van Yangambi en Gazi. 1917-1925.

n° 140 Losbladig foto-album betreffende Yangambi-Gazi. 1924. 1 omslag

n° 143 Activiteitsverslagen betreffende de plantage van Gazi. 1927-1933. 1 omslag

n° 144 Foto's betreffende de plantage van Yangambi. 1930, z.d. 7 stukken

B.4 Station voor Selectie en Proefnemingen van Koffie in Yangambi

n° 148 Activiteitsverslagen betreffende het (Algemeen) Station voor selectie in Yangambi. December 1927 - december 1933. 1 omslag

n° 149 Dossier inzake koffieteelt. (briefwisseling) Februari 1929 - december 1931. 1 pak

n° 150 Rapporten van het 1ste trimester 1929 van de Administration Centrale en Afrique (ACA) van de Repco, opgemaakt door gevolmachtigde Arthur Ringoet voor de Repco en door Govaert van het Station voor selectie. Maart - mei 1929, z.d. 3 stukken

n° 151 Technisch rapport betreffende het Station voor selectie, de landbouwpost Yangambi-km 5 en de afdeling Koffie, opgemaakt door George Sladden, koffie-deskundige van de kolonie. 1 juli 1932. 1 stuk

n° 152-154 Technisch verslag van het Station voor Selectie en Proefnemingen van Koffie, opgemaakt door landbouwingenieur R. Van Laere, assistent van het vermelde landbouwstation. Juli-december 1933.

C. Steun en toezicht elders in de kolonie

C.1 Plantage van Eala

n° 160 Foto's betreffende Eala. Z.d. [begin 20ste eeuw]. 10 stukken

n° 161-164 Jaarverslagen van de plantage van Eala. 1930-1933.

II. Beeldmateriaal

A. Algemeen

n° 186 Steekkaarten met gedroogde planten afkomstig van het Herbario Horti Bruxellensis. 1914-1921. 3 stukken

n° 187-189 Negatieven en eventueel bijhorende foto's betreffende landbouw en reizen in Belgisch Congo en Ruanda-Urundi. 1921-1929, 1933.

B. Foto's

n° 191 Foto's en afbeeldingen afkomstig uit de verzameling Emile De Wildeman. 1903-1911, z.d. 51 stukken

n° 200 Foto's betreffende koffiecultuur. 1924-1955, z.d. (1902). ± 150 stukken

n° 202 Steekkaarten met foto's betreffende tentoonstellingen. 1927-1953, z.d. 89 stukken

n° 205 Foto's betreffende een koffie- en palmnootolieplantage in Nkolo. 1928. 25 stukken

n° 213 Steekkaarten met foto's betreffende landbouwtechnische aspecten. 1924-1958, z.d. 326 stukken

1.2 Archief van het Nationaal Instituut voor de Landbouwstudie in Belgisch-Congo (Nilco) (1933-1962)

I. Algemeen

A. Jaarverslagen

n° 279 Jaarverslagen en net-exemplaren ervan. 1935-1949. 1 pak

n° 281-290 Jaarverslag van het dienstjaar. 1949-1958.

IV. Beheer van de landbouwstations in Belgisch Congo en Ruanda-Urundi

A. Algemeen

A1. Stukken betreffende meerder stations of afdelingen

n° 2912 Steekkaarten met foto's betreffende laboratoria in onder meer Yangambi, Bambesa, Gabu en Kisozi. 1937-1954, z.d. 60 stukken

A2. Inspectierapporten

n° 2957 Diverse inspectie- en reisverslagen naar Congo en andere bestemmingen. 1936-1948. 1 pak

B. Onderzoekscentrum van Yangambi

B3. Onderzoeksafdelingen

c. Afdeling koffie en cacaoboom

n° 3094-3097 Verzameldossier. 1936-1956.

n° 3098 Inspectierapporten (o.m. Luki). 1938-1946. 1 omslag

n° 3099 Jaarverslag 1938. April 1939. 1 stuk

n° 3100-3107 Verzameldossier (in hoofdzaak technische rapporten, inspectieverslagen, o.m. Luki), genummerd 1 tot 164. 1939 - aug. 1959.

n° 3108-3109 Documents Techniques , ingebonden verzameling van technische documenten. 1944-1960.

n° 3110-3111 Ingebonden jaarverslagen. 1945-1959.

n° 3112 Maandverslagen. 1946-1953 1 omslag

n° 3114 Jaarverslagen. 1957-1959. 1 omslag

C. Sectoren en Landbouwstations

1. Sector van Centraal-Congo

l. Proefaanplanting van Lula

n° 3552 Verzameldossier. 1936-1953. 1 pak

n° 3553 Inspectierapporten. 1937-1945. 1 omslag

n° 3555 Verzameldossier, (jaar)rapporten (vaak per blok beschreven) genummerd 1 tot 36. 1940-1949. 1 omslag

n° 3557 Maandverslagen. 1947-1950. 1 omslag

2. Sector van Leopoldstad

d. Proeftuin van Eala

(1) Algemeen

n° 3613 Inspectierapporten. 1936-1948. 1 omslag

n° 3614 Verzameldossier, genummerd 1 tot 35. 1940-1958. 1 pak

n° 3614 Ingebonden jaarverslagen. 1945-1959. 1 band

n° 3615 Maandverslagen. 1946-1956. 1 omslag

(3) Inrichting en gebouwen

n° 3624 Foto's. 1939, z.d. 18 stukken

4. Noordelijke sector

e. Centrum voor Koffiecultuur van Nebanguma

n° 3894 Ingekomen maandverslagen. 1953-1956. 1 omslag

n° 3897 Jaarverslagen. 1954-1959. 1 omslag

V. Bevordering van het landbouwkundig Onderzoek

B. Reizen en missies

B1. Andere bestemmingen

n° 4993 Foto's betreffende Nederlands-Indië door Sladden. Z.d. 2 stukken

C. Onderzoeksonderwerpen

C3. Plantkunde en culturen

d. Genotsmiddelen

(2) Koffie

n° 5204 Foto's. 1924-1955, z.d. (1902). 67 stukken

n° 5205-5208 Steekkaarten met foto's. 1934-1951, z.d.

n° 5209 Dossier inzake de koffieteelt en in het bijzonder inzake de afdeling Koffieboom. 1936-1939. 1 omslag

n° 5210 Verslagen en nota's. 1936-1947. 1 omslag

n° 5211-5213 Briefwisseling en bijhorende stukken betreffende koffiecultuur. 1936-1963.

n° 5214 Onderzoeksrapport met schema en dia's van landbouwingenieur R. Van Laere, waarnemend directeur van het station in Mulungu, betreffende dek- en schaduwrijke planten te gebruiken bij de cultuur van Robusta- koffie. 1937. 1 omslag

n° 5215 Statistisch analyserapport van landbouwingenieur C. Schachmeyer betreffende een "blancoproef " op een Robusta-koffieaanplanting in Lula. [1938]. 1 omslag

n° 5216 Publicaties van G. Schmitz. Note aux planteurs sur la pyrale des feuilles du caféier Dichocrocis (Cotogethes) crocodora Meyrick, met begeleidend briefje en Deuxième note aux planteurs sur la pyrale du caféier Robusta Dichocrocis Crocodora Meyrick. Juli 1946 - februari 1948. 1 omslag

n° 5217 Memorie Les caféiers hybrides du groupe Congusta door Dr. P. J. S. Cramer. 1947, z.d. 1 stuk

n° 5218 Briefwisseling betreffende koffiecultuur hoofdzakelijk met de nv Bunge in Antwerpen. Juli 1948 - juni 1951. 1 omslag

n° 5219 Onuitgegeven licentiaatsverhandeling met praktische besluitenlijst betreffende L'Alimentation Minérale du Caféier Coffea robusta Linden (syn Canéphore Pierre) door André Molle, landbouw-ingenieur en licentiaat in de botanische wetenschappen van de Université libre de Bruxelles, faculté des Sciences. Januari 1953. 1 deel en 1 stuk

n° 5220 Stukken betreffende een memorandum van de FOA-missie over koffie in het kader van het Marshall-plan. Juni - november 1954. 1 omslag

n° 5221 Originele tekeningen en illustraties (foto's) bij de publicatie van Crisinel & Schmitz, La lutte contre le Scolyte des drupes dans le cadre de la défense chimique du caféier. December 1956, z.d. 1 omslag

n° 5222 Stukken betreffende fytopathologie, in het bijzonder de Stephanodoris en ziektes bij koffieplanten door entomologist G. Schmitz. Oktober 1956 - februari 1957. 1 pak

n° 5225 Afbeeldingen bestemd voor publicatie. Z.d. 6 stukken

n° 5226 Foto's betreffende koffiecultuur in Binga. Z.d. 2 stukken

2. Algemeen Rijksarchief 2 – depot Joseph Cuvelier **(Hopstraat 26-28, 1000 Brussel)**

1. Archives des groupes Compagnie du Congo pour le Commerce et l'Industrie (CCCI) et Compagnie du Katanga (alias « FINOUTREMER ») (1887-1984) [1° deponering 1988]

- Specifiek toegang: Brion R. & Moreau J.-L., *Inventaire des archives des groupes Compagnie du Congo pour le Commerce et l'Industrie et Compagnie du Katanga (alias « FINOUTREMER ») (1887-1984)*, 2007 (https://search.arch.be/ead/pdf/BE-A0545_006633_006537_FRE.ead.pdf) [10/11/2020]
- Inhoud: dit fonds omvat in hoofdzaak bedrijfsarchief. Het gaat hier in eerste instantie om het archief van de CCCI (°1886) en van de Compagnie du Katanga (°1891). In tweede instantie omvat dit fonds de 25 filialen verbonden aan deze twee overkoepelende instellingen. Ten derde omvat het materiaal ook diverse archieven (persoonlijke stukken van beheerders bijvoorbeeld). De bedrijfsarchieven in dit fonds zijn divers en omvatten ondermeer rapporten, boekhoudkundige documenten, correspondentie, jaarverslagen, beeldmateriaal, personeelsdossiers).

1.1 Archives de la CCCI (1887-1981)

5. Archives d'Auguste Sidoine Gérard

I. Mandats dans les sociétés commerciales

B. Société Coloniale Anversoise S.A. puis Société Commerciale Anversoise S.A. puis Société Commerciale Anversoise et Société belge d'Extrême-Orient Réunies S.A.

5. Exploitation

N° 225 Rapports et notes sur le marché des cafés et les initiatives de la société pour la vente des cafés robusta du Congo, 1947-1959. 1947-1959 1 farde

10. Secrétariat général (nouveau) de la CCCI

X. Investissements, relations avec les filiales et sociétés en portefeuille

B. Investissements sectoriels du groupe de la C.C.C.I.

1. Agriculture et colonisation

n° 576 Notes diverses sur l'agriculture et les industries agricoles au Congo belge: généralités. Flore et végétation de l'Afrique Tropicale. Pâtures artificielles. Notes sur la production du ricin, du café, du sucre, 1938-1962. 1938-1962 1 liasse

C. Syndicats industrielles dans lesquelles le groupe de la CCCI est impliqué

n° 592 transformation de l'Office du Café Robusta, 1947-1962. 1 liasse

XI. Participation de la CCCI aux délibérations de groupes de travail de la Société Générale de Belgique S.A.

B. Divers

n° 801 Participation à des comités de la S.G.B. s.a.: comités techniques du café et de l'elæis, comité technique du commerce d'exportation et du commerce d'importation (1933-1938).

XII. Documentation sur et correspondance avec des associations et fédérations professionnelles dans lesquelles la CCCI est impliquée

n° 827 Union des Producteurs de Café du Congo Belge Union Professionnelle (1935-1955). 1 liasse

13. Service documentation (1)

VIII. Industries agro-alimentaires et distribution

n° 1114-1116 Cafecongo (Comptoir de Vente des Cafés du Congo) s.c. (1948-1954). Cafco (Compagnie Congolaise des Cafés) s.c.a.r.l. (1926-1935, 1937). Cafegas (Compagnie de Plantations de Cafés et d'Exploitations Forestières à Stanleyville) s.c.a.r.l. (1934-1948).

1.2 Filiales et sous-filiales et participations de la CCCI

3. Compagnie des produits du Congo S.A. puis Profrigo S.A.

III. Secrétariat

C. Exploitation

3. Activités de la section « agricole » puis de la filiale produits (Compagnie des produits du Congo), puis produits (Compagnie des produits du Zaïre)

n° 1612 Plantations de palmiers (fruits, soins, maladies), de cacaoyers, de bananiers, d'hévéas, de caféiers (avec brochures et photos), 1935-1974. 1 liasse

n° 1614 Huileries: correspondance générale, matériel d'exploitation, questions propres à différentes exploitations (Kiniati, Yema). Production et prévision de production des différentes plantations (huile de palme et noix, cafés et cacao), 1937-1972. 1 liasse

6. Compagnie du Lomami S.A. puis Compagnie du Lomami et du Lualaba S.A. puis Compagnie du Lomami et du Lualaba S.C.A.R.L.

II. Exploitation

B. Activités su département agricole et industriel

2. Production et commercialisation du café

n° 1709 Correspondance notamment avec la S.C.A., la Société des exploitations Agricoles et Industrielles de la Biaro, le Comptoir des Cafés Victor De Haes s.a. et l'agence en cafés Alfred Pierre relative à la nouvelle organisation de vente des cafés (1934-1936). Étude de la constitution d'une coopérative de vente des cafés du Congo. Procès-verbaux de réunions du comité de direction de Cafecongo (Comptoir des Ventes des Cafés du Congo) s.c. (1946-1948). Notes, correspondance et procès-verbaux de réunions du comité de direction de l'U.P.C.C. (Union des Producteurs de Café du Congo) u.p. (1935-1945), 1934-1948.

n° 1712 Correspondance relative au transport, au prix de revient et au contrôle des cafés à l'exportation. Notes sur le marché des cafés en Belgique, et les possibilités de vente au Congo, rapports de la S.C.A. (Société Coloniale Anversoise) sur le marché des cafés, coupures de presse. Ouverture d'un magasin de détail pour la vente en commun avec la Société des Plantations de Gwese. Prime du Gouvernement en faveur de l'exportation des cafés Robusta. Correspondance avec la direction d'Afrique relative à la qualité du café, à son triage et classement, à sa torréfaction et son emballage (avec spécimens de sacs à cafés), 1929-1940. 1 liasse

24. Bureau d'études de la CCCI S.C.A.R.L. puis Bureau d'études industrielles agricoles et commerciales S.A.

IV. Exploitation

A. Activités du Service Agricole

n° 1959 Notes sur l'Urena-Lobata, le soja, le manioc, le derris et sa culture au Congo, les recherches sur l'amélioration et le maintien de la qualité des cafés "robusta" (par le Dr Roelofsen), la taille des robustoïdes au Congo Belge (par G. E. Sladden) (1938-1945). Note sur l'évolution de la production de l'industrie du palmier à huile dans les sociétés du groupe C.C.C.I.- Forminière de 1939 à 1948. Notes, graphiques et tableaux sur les superficies et productions des plantations des diverses sociétés du groupe C.C.C.I. (1951-1953), 1938-1953. 1 liasse

VI. Documentation et divers

n° 1975 "Bulletin du Café du Congo et du Ruanda-Urundi" (organe de l'Union des Producteurs de Café du Congo Belge et du Ruanda-Urundi U.P.) (1960). Notes documentaires de l'Union Professionnelle des Producteurs de Bois du Congo (1957-1961). Exemplaires du journal "Le Courrier Agricole", de "L'Informateur Agricole" (1951-1954) et de la revue "Idées d'Organisation" publiée par la société Remington Rand, 1951-1961. 1 liasse

2. Archives des groupes CCCI (Compagnie du Congo pour le Commerce et l'Industrie), alias Euroutremer et Compagnie du Katanga, alias Finoutremer (1884-1993) [2° deponering 1993]

- Specifiek toegang: Brion R. & Moreau J.-L., *Inventaire des archives des groupes CCCI (Compagnie du Congo pour le Commerce et l'Industrie), alias Euroutrmer et Compagnie du Katanga, alias Finoutremer (1884-1993)*, 2007 (ongepubliceerde inventaris)

- Inhoud: dit fonds omvat eveneens bedrijfsarchief. Het gaat hier om de tweede deponering en dit fonds omvat in eerste instantie het archief van de CCCI. In dit fonds worden lacunes van de eerste deponering opgevuld. Het eerste deel omvat in hoofdzak processen-verbaal van vergaderingen. Tevens zijn er persoonlijke documenten van beheerders, correspondentie, financiële en personeelsgegevens. In tweede instantie bevindt zich in dit fonds de archieven van de Compagnie du Katanga, periode 1970-1980. Ten derde omvat dit fonds documenten van de filialen van de CCCI. Zeer nuttig voor dit onderzoek is dat er in dit fonds een deel zit met foto's, kaarten, tekeningen en plannen van en over verschillende landbouwbouwgewassen.

2.1 Collections

2. Photos

n° 695 Photos encadrées: orage en brousse, installations de la Citas s.a. au port de Matadi, affluence sur un quai au port, machine à vapeur, plantation de caféiers. s.d. 1 liasse

n° 696 Photos (grand format, anciennement encadrées) prises au Congo: entrepôts, plantations, usines et notamment cimenterie, marché de bananes, marché de poisson, caféier, plantation de caféiers, installation de manutention, défrichage de forêt, chasseur congolais bandant son arc (ca 1928), bétail en pâture, bateau de pêche, installation industrielle en bord de fleuve, « stern wheels » de la Citas sur le fleuve, caféier en fleur de la Compagnie des Produits du Congo s.a. à Kiniati (Bas-Congo). s.d. 1 liasse

3. Cartes et Plans

I. Congo dans son ensemble

n° 709 Carte agricole du Congo belge, avec indication des zones de plantation de caféiers, cacaoyers, hévéas, canne à sucre, coton, riz, palmiers élais et fibres (échelle 1/500.000e). s.d.

IV. Congo: concessions et usines d'entreprises du groupe

C. Biaro (Exploitations Agricole et Industrielle de la Biaro) s.c.a.r.l.

n° 732 Prospection Bagandja : carte au 1/10.000e des « vocations café » (numérotée 9/57, 4 exemplaires dont un colorié). 1957

n° 741-743 Séchoirs à café de la société. s.d.

L. S.A.B. (Société Anonyme Belge pour le Commerce du Haut-Congo) s.a. puis s.c.r.l., Compagnie du Lomami s.a., Entreprises Agricoles de la Busira au Lomami

n° 777 S.A.B. (Société Anonyme Belge pour le Commerce du Haut-Congo) s.a.: carte (à main levée et colorisée) indiquant la situation des plantations de café, de cacao, de caoutchouc, de palmiers, les rizeries, les huileries et les usines de la société entre Coquilhatville et Stanleyville. ca 1945

n° 780 S.A.B. (Société Anonyme Belge pour le Commerce du Haut-Congo) s.c.a.r.l. : plan et calque des plantations de caféiers au Nord de Mokombe (« Bloc 78 »). 1952

M. S.C.A.M. (Société de Colonisation Agricole au Mayumbe) s.c.a.r.l.

n° 795 Plan au 1/100.000e du bloc n°43 avec mention des plantations voisines (1929); plan au 1/25.000e des plantations du domaine de l'Urselia: situation des cultures de cacaoyers, palmistes, caféiers, hévéas (4 feuilles). ca 1929

4. Graphiques et dessins

n° 810 Dessins de caféiers. s.d.

n° 811 Biaro (Exploitations Agricole et Industrielle de la Biaro) s.c.a.r.l.: graphique donnant la production moyenne de café à l'hectare entre 1926 et 1938. 1939

n° 812 Compagnie du Lomami et du Lualaba s.a.: graphique exprimant les rendements agricoles des plantations de café à Yaluwé de 1938 à 1940. 1940

n° 813 Compagnie du Lomami et du Lualaba s.a.: graphiques exprimant les productions entre 1938 et 1940 de café à Yaluwé, Djabir et Ekoli des palmeraies d'Ekoli et de Lieki-Kolongo, de Yaluwe. 1940

n° 814 S.A.B. (Société Anonyme Belge pour le Commerce du Haut-Congo) s.a.: graphiques de production de 1938 à 1940 des palmeraies de Likete, Busira, Bomputu, ainsi que des plantations de caféiers de Likete et de Bomputu. 1940

3. Afrika Archief – FOD Buitenlandse zaken[2] (Karmelietenstraat 15, 1000 Brussel)

- Algemene toegang: Van Grieken-Tavernier M., *La colonisation Belge en Afrique: guide des archives africaines du ministère des affaires africaines 1885-1962*, Bruxelles: Ministère des Affaires étrangères, du Commerce extérieur et de la Coopération au développement, 1981 & Van Grieken-Tavernier M., *La colonisation Belge en Afrique: guide des archives africaines du ministère des affaires africaines 1885-1962. Supplément*, Bruxelles: Ministère des Affaires étrangères, du Commerce extérieur et de la Coopération au développement, 1983

- Inhoud: De collecties van het "Afrika Archief" bestrijken de periode van 1885 tot 1962. Deze fondsen stemmen overeen met de taken van de Onafhankelijke Congostaat en het voormalige Ministerie van Koloniën. Daarnaast bevat het "Afrika Archief" ook documenten die afkomstig zijn van overheden in Afrika zelf. Voornaamste thema's: politiek, administratie, justitie, veiligheid, burgerlijke stand, economie, landbouw, openbare werken, mijnen, communicatie en telecommunicatie, onderwijs, godsdienst, etnografie, geschiedenis, officiële stukken van 1885 tot 1962. Daarnaast is er nog een fonds bestaande uit ongeveer negentig privélegaten en microfilms. Van belang voor het onderzoek naar koffie zijn voor-namelijk de documenten van de botanische tuinen in België en Congo. Ten tweede, de landbouw-archieven (Fonds Agriculture). Deze bronnen zijn rijk en divers: er zijn niet enkel rapporten van missies, documentatie en technische documenten (over ziektes bvb) in terug te vinden, ook relaties met de overheden in België en de plaatselijk overheden in Congo laten zich reconstrueren aan de hand van deze stukken (correspondentie bvb). Daarnaast is ook het Fonds Rapports Congo zeer nuttig, met daarin o.m. jaarrapporten van de diverse landbouwdiensten, documenten van onderzoeksstations (INEAC en onderafdelingen). Deze stukken bevatten inspectie-verslagen, statistieken, onderzoeksresultaten en overzichten van de situatie van de landbouw in de desbetreffende regio's.

1. Fonds 'Jardin Colonial' (JC)

Chapitre III: Activités du Jardin Colonial

1. Correspondance général

n° JC 663 note 'Jardin colonial de Laeken' 1908/1912/1913 (rapport annuel); coupures de presse; plantes pour exposition de Gand; note au sujet de l'ombrage temporaire et définitif de cacaoyers, de caféiers, etc. au Congo belge et particulièrement au Mayombe, 1908-1921

3. Correspondance avec des sociétés

n° JC 695 Jardin botanique de Buitenzorg. Demandes, envois, réception et échange de plantes et graines. Correspondances; listes; Liste générale des végétaux cultivés Jardin botanique d'Eala 1911; 'Indications pour la récolte et la préparation de graines de café' avec photo 1914), 1910-1914

n° JC 695 Société de colonisation agricole au Mayumbe. Renseignements culture du café et d'hévéa, 1925-1933

n° JC 695 Société Royale d'Horticulture et d'Agriculture de Laeken. Projet exposition d'horticulture d'agriculture et d'apiculture, 1924-1934

4. Correspondance avec des particuliers

[2] Alle fondsen worden op dit moment overbracht naar het Algemeen Rijksarchief 2 – depot Cuvelier.

n° JC 697 M. Laurent, Membre personnel Jardin botanique. Dossier individuel, 1900-1913 (Voir aussi JC 661)

n° JC 697 Vermoesen. Plantes ramenées des Indes, 1912

5. Correspondance relatives aux plantes et graines spécifiques

n° JC 699 Caféiers. Demandes, envois, réception et échange plantes et graines, 1921-1926; Tableaux des réceptions et expéditions de graines et de plants de caféiers, 1921-1929

6. Renseignements divers

n° 703 Photos et coupures de presse. Coupures de presse 'Le Jardin Colonial de Laeken'; 'Les collections botaniques de l'Institut agricole de l'Etat'; photos (e.a. cultures au Congo Belge; exposition internationale d'horticulture à Bruxelles 1927; Compagnie de Linea-Ile Idjwi Lac Kivu, Quinquina/cocotier/ théier/poivrier /palmier à huile; caféiers Lomami), 1899; 1907; 1921; 1924; 1928; 1938; 1939; 1941

Chapitre V: Enseignements et stages

2. Stages

n° JC 708 Notes pour stagiaires sur les différentes plantes. (e.a. cacaoyers; café; caoutchouc; hévéa; eucalyptus; quinquina; légumineuses)

Chapitre VI: Varia

n° JC 709 Participation du Jardin Colonial aux expositions. Exposition de Paris. 1. Correspondance générale. 1898-1900 (e.a. liste plantes; note envoi carte en relief au Musée de Tervueren; rapport et instructions mission horticole Luja-Duchesne) 2. Personnel - Mission horticole de Luja et Duchesne au Congo en vue de récolter des espèces pour l'exposition. 1898-1900. (e.a. dossier individuel ; rapports ; instructions) 3. Ivoire réparti entre les artistes - justification. 1899 4. Programme détaillé de la Section congolaise de l'exposition de Paris 1900 // Exposition de Gand. e.a. liste plantes; envoi plantes du Congo 1912-1913 // Exposition de Londres. e.a. liste et envois plantes 1914 // Expositions diverses. e.a. Floralies gantoises; 'Le Jardin Colonial de Laeken aux Floralies gantoises'; liste 'collection la plus complète de plantes utiles ou officinales (dites plantes coloniales)' 1923-1926 // Exposition universelle et internationale de Bruxelles. 1900-1934

2. Fonds 'Agriculture' (AGRI)

2. Organismes parastataux

I. Institut National pour l'Etude Agronomique au Congo belge/INEAC/I.N.E.A.C.

22. Yangambi-Gazi, Yambuya-Gazi, Yangambi

e) Yangambi km 5 – Station de sélection 1932-1935

n° AGRI 538 e.a. programme (e.a. palmier à huile et café); mission Opsomer; prévisions budgétaires; projet laboratoires avec plans; demande bétail d'Eala; demande personnel; choix terrains; 'Aperçu préliminaire des propriétés pédologiques et

de la valeur agricole des terrains de la région de Yangambi'; recrutement main-d'oeuvre indigène

III. Offices des produits agricoles

2. Offices des cafés

2) Documentation. 1940-1947

N° AGRI 50 e.a. 'M. Sladden nous parle de la réorganisation de l'Office du Café'; 'Note concernant la vente des cafés par les Offices de café du Congo'; 'Méthodes OCA'; note d'activité Huart; 'Note sur les Offices de café au Congo'; 'Organisation future des Offices du café'

11. O.C.R./Office du café Robusta

n° AGRI 52 Questions diverses. e.a. demande adresses colons en Belgique 1961; rapport annuel 1956 et 1958; 'Le conditionnement du café robusta'; assemblée générale 1957, 1954 et 1951; litige paiement café Service Social Ministère des Colonies; 'Installation de l'Office du Café Robusta'; nouvelles installations à Limete-rapport, photos et carte; projet constitution coopérative des cafés robusta; plainte A. Hizette/Plantations de la Bilua-prix d'achat et prix de vente; 'organisation de l'O.C.R.'; plainte Plantations de Katompe au Katanga-cotations, 1944-1958; 1961

9. Voyages et missions agricoles

17. Amrhyn. 1910-1911

n° AGRI 628 Voyage aux Indes-étude tabac et café. (e.a. notes ; comptabilité)

53. Sladden. 1930-1931

n° AGRI 630 Etude culture du café à Java; Réorganisation programme de travail culture caféier dans stations agricoles. Congo belge. (e.a. instructions; pro-gramme; rapport emploi de temps)

56. Lebrun. 1932. Mission botanique au Congo belge

n° AGRI 630 e.a. 'Rapport sur un voyage d'études botaniques dans le district de l'Uele-Itimbiri' avec carte botanique; photos végétation Uele; envoi échantillons Eucephalartos Laurentii pour Jardin botanique; carte botanique Uele-Nepoko; 'Note sur un caféier spontané au Kivu. Coffea Kivuensis, Lebrun'; 'Rapport sur un voyage d'études botaniques dans le district de l'Ubangi'; 'Notes sur un programme de reforestation au Kivu'

64. Hille Ris Lambers et Van der Veen. 1938

n° AGRI 631 Voyage d'Etude café Congo belge - Organisation.

10. Cultures tropicales

IV. Plantes stimulantes

A) Caféier

1. Correspondance générale et divers

a) 1906-1914; 1919-1923

n° AGRI 339 e.a. demandes et envois échantillons; résultats d'analyses/d'expertises; question plantations à Wangi; statuts Nederlandsch-Indische Rubber- en Koffie Cultuur Maatschappij; carte plantations au Congo; 'Rapport sur le greffage du caféier Liberia sur le caféier indigène de Popoie (Aruwimiensis)'; essais Coffea robusta de Java au Km 8 et Eala; rapports situation plantations café et cacao avec cartes Irebu, Coquilhatville, Ikenge et Bikoro; 'Le caféier au Congo'; étude 'Culture du caféier à Java'; 'Note sur les différentes méthodes employées pour la préparation des échantillons de café'

b) 1914-1918. Dossier de Londres

n° AGRI 339 e.a. 'Rapport sur les caféiers de Congo da Lemba et d'Eala'; rapports d'expertise/d'analyse; 'Notes sur les caféiers et leur culture à Lula (Stanleyville)' avec dessins; demandes et envois échantillons; rapports mensuels et PV remise-reprise magasins usine de café Kinshasa

c) 1924-1933

n° AGRI 340 e.a. demandes et envois échantillons; projet voyage expert café Wout pour société Kreglinger; demande renseignements; 'Culture du café au Congo'; 'Projet d'une plantation de café au Kivu'; rapport Wout; 'La maladie du café dans l'Etat de Sao Paulo'; instructions transit café congolais par Tanganyika Territory; Belgika propose création Comité du Café; proposition adoption exclusive cafés congolais pour l'Armée belge; possibilités vente cafés congolais à Hambourg; C.N.Ki-'Essai d'établissement du prix de revient du café arabica au Kivu'; protection caféiers sauvages du Kivu; observations échantillons Ruanda-Urundi; instructions désinfection semences; instructions lutte contre Stephanoderes; 'Influence du mode de préparation sur le pouvoir germinatif de la semence de café'; 'Usine de standardisation café robusta du Congo belge. Note sur le triage du café à la main'; tableau superficie plantations fin 1931; 'Etablissement des pépinières'

d) 1933-1938

n° AGRI 341 e.a. demande renseignements; question cafés congolais pour l'Armée belge; 'Note sur le moyen de relever le cours des cafés congolais'; 'Conseils relatifs à la cueillette et à la préparation des cafés arabica'; 'Séchage au soleil. Méthode indigène'; question cultures par indigènes Kibali-Ituri ; 'Rapport sur la propagande agricole du mois de mai 1934' territoire Bambole; instructions marquage des balles de café Congo; requêtes Association des Planteurs de Café du Congo; question tarifs Congo-Anvers; plainte Bamboli Cultuur Maatschappij-dénomi-nation café 'indigène'; crise du café; 'Situation des cafés congolais sur le marché belge'; limitation des plantations; PV séances

Comité restreint du Café; impression 'Taille du café'; 'Aide-mémoire pour la détermination des maladies et des ennemis des caféiers'; projet Fonds temporaire de Crédit agricole; conflit Plantations de Café La Gomia-administration à Tshofa; rapport d'inspection plantations caféiers indigènes territoires Mahagi et Faradje; notes subvention 70 millions

e) Café s.d.

n° AGRI 341 'Facteurs de réussite de la culture du café robusta au Congo' 1934; 'Note sur la valorisation du café congolais' 1934; 'La culture du café au Vénézuéla' 1940

2. Dossiers particuliers

D. Documentation 1933-1934; 1938-1939; 1945-1952

n° AGRI 516 e.a. qualité Maragogype K9 acheté par Sarma à O.P.A.C.; renseignements Inga Elulis; situation marchés café mondial; ordonnances ; 'Union des Producteurs de Café du Congo belge. Rapport sur l'exercice 1950' avec observations et 1948; 'Recommandations concernant la lutte contre la Pyrale du caféier'; 'Décaféination des cafés crus'; typing des cafés du Congo belge; statistiques exportations café Congo belge et Ruanda-Urundi 1941-1944; note propagande en faveur des cafés congolais; 'Périodicité de la floraison du caféier. Facteurs de la floraison'; listes planteurs et superficie plantations café Congo belge et Ruanda-Urundi 1939; 'Le café au Congo belge et au Ruanda-Urundi' ; statistiques/enquête café Congo belge et Ruanda-Urundi 1933 avec cartes district Kivu, province Equateur et province Orientale et Ruanda-Urundi, territoires Walendu et Babira-Walese

E. Divers 1935; 1939; 1945-1953

n° AGRI 343 e.a. projet Prix Van Gysel; projet introduction café Robusta chez indigènes; bonification exportation cafés; crise café Arabica et café Robusta; Union des Producteurs de Café du Congo belge 'Situation des cafés Arabica du Congo'; 'Avantages présentés par la vente des arabica du Congo à Nairobi'; 'Situation des cafés congolais sur le marché belge'; prix; note plantations indigènes région Saké (Kivu-Nord)

G. Maladies 1931-1932; 1936-1937; 1947-1953

n° AGRI 343 e.a. lutte contre Trachéomycose; 'Inspection phytopathologique des cultures caféiers de l'Ituri'; avortement des fleurs du caféier au Kivu (dossier Lygus); dossier prêt C.N.Ki au Coopérative des Planteurs du Kivu pour constituer stock insecticides

3. Divers

3. Documentation et publications

N° AGRI 516 'Culture du café au Congo' 1925; 'Le commerce des cafés sur la Place d'Anvers' 1927; 'Projet de plantation de café au Kivu. Considérations générales sur la culture du café au Kivu' s.d.; 'Note sur la culture du café' s.d.; 'Note sur la culture du caféier' s.d.; Sans titre-p. 5 à 10 (avec statistiques); 'Introduction à la question du traitement du café' 1960; 'De koffieteelt' 1935; 'Plantations de caféiers' (listes par province et territoire-s.d.); 'Le Café' 1941.

10. Mesures de sauvegarde que réclame le développement de la culture du café

n° AGRI ??? 'Note concernant la constitution d'une association de planteurs dans le but de la création d'une station de recherches avec la collaboration étroite du Gouvernement de la Colonie' avec observations, 1929

67. Campagne café en Belgique. 2000.000frs (Office belge du café). 1959-1960.

n° AGRI 113 e.a. notes; programme; publications; comptabilité; taxe de propagande; enquête

74. Documentation et correspondances diverses. 1954-1960.

n° AGRI 116 e.a. installation dépôt de café brésilien à Trieste; Cafékivu-problème goût de pomme de terre des cafés arabica et plainte taxe d'exportation; demandes renseignements; 'Colletrotichum coffeanum Noach' (maladie) ; observations rapport avaries café Biaro; 'Note au sujet de prix de revient du café Robusta'; N. Rockefeller demande à l'INEAC graines/plantes café Robusta pour plantations en Equador; PV réunion Société coopérative des planteurs de café de l'Uele 31 décembre 1953

75. Documentation-études, rapports, notes, statistiques, etc. 1953 -1960.

n° AGRI 116 e.a. 'Le café au Congo'; 'Notes sur le café arabica du Kivu et tous les cafés du Congo en général'; 'Café congolais en Norvège'; 'Situation actuelle et perspectives du marché mondial du café'; 'Notice sur le caféier et sa culture au Congo belge'; 'Office du café-1re journée du Café'; 'Le marché mondial du café et la production caféière de l'Afrique belge'; 'La culture et l'usinage du café au Congo belge'; visite Mac Kiernan président National Coffee Association; statut Coopérative des planteurs de café de la Nkora; plans Likati et Socobom Boro-usine café ; 'La trachéomycose du caféier Robusta au Congo belge'; 'Informations sur la culture du café au Congo belge et au Ruanda-Urundi au Cours de 1953'; ordonnances prix achat'; Note concernant les programmes de plantation de caféières en milieu indigène'; 'Le café' avec statistiques 1935-1954; 'Coffee frost survey Brazil 1953'

77. Café soluble. 1954-1959

n° AGRI 118 e.a. notes; proposition installation usine au Congo belge; documentation

78bis Maladies diverses. 1951 ; 1954-1957

n° AGRI 118 e.a. note attaques colletotrichum au Ruanda-Urundi; participants et programme conférence agricole africaine trachéomycose du caféier à Yangambi; 'La lutte chimique contre la pyrale du caféier en Uele'; 'Susceptibilité du caféier Robusta à l'intoxication par l'arsenic'

V. Parastataux Agricoles

2. Jardin botanique d'Eala – correspondance

n° AGRI 520 e.a. envois échantillons et rapports d'analyses et d'expertises (e.a. fibres, café, cacao et caoutchouc); listes plantes et graines expédiées par Eala; listes herbiers envoyés à Eala (éléments botaniques recueillis par fonctionnaires); rapports de stage; réquisitions matériel; rapport d'inspection; rapports semestriels avec cartes et photos; PV remise-reprise; rapports et tableaux essais extraction latex/Hévéa; plan magasin à outils agricoles; proposition rattachement centre agricole de Bakusu à Eala), 1908-1911

n° AGRI 521 e.a..'Liste générale des végétaux cultivés.'; listes plantes et graines expédiées par Eala; PV remise-reprise poste agricole Bakusu-Eala et Eala; réquisitions matériel; rapports mensuels et 'Rapport sur l'état des plantations'; carte Bakusu; recherche 200 ha avec carte des environs d'Eala; rapport et tableaux essais extraction latex/Hévéa; rapports de stage; 'Notes sur les engrais verts cultivés à Eala'; 'La canne à sucre japonaise comme plante fourragère'; proposition création musée; carte ferme de Bandaka-n'Kole; demande engrais chimiques pour caféiers; expériences de saignées avec photos; carte Eala; outils défectueux; rapport semestriel 1912-II et 1913-I et II avec cartes; échantillons pour Exposition de Gand; rapport d'inspection, 1911-1914

5. Régie des Plantations de la Colonie

n° AGRI 529 Avec 'Rapport de voyage dans l'Ubangui en vue de la reprise de la station de sélection de la Banga'; 'Rapport de voyage au Maniema en vue de la reprise de la station de sélection de Kakumba'; 'Régime de la main d'oeuvre'; Connaissements cacao, caoutchouc, café et coton embarqués pour Anvers, 1929

c) Plantations industrielles. 1931-1934

n° AGRI ??? e.a. expériences à entreprendre à Lula; rapports trimestriels 1930 à 1933; instructions récolte, préparation et emballage semences caféier; programme café à Lula et Yangambi; programme rayon Stanleyville; tableaux frais grevant produits; 'Note sur l'exploitation de l'huile et des palmistes de Barumbu'; rations travailleurs indigènes; rapport d'inspection du travail à Lula; 'Rapport technique sur

l'année 1930'; rapports judiciaires main-d'oeuvre à Yangambi; rapport Ringoet avec cartes rayon Stanleyville, station de sélection Yangambi km 5, plantations de Yangambi, Barumbu, Lula et Gazi; mission Opsomer 'Examen des terrains de Yangambi (km5), de la Station avicole de Stanleyville et de Lula (I) en vue de l'installation d'une Station de sélection des plantes vivrières'; 'Station de sélection Yangambi Km 5 Département caféier. Rapport technique'; 'Station agricole de Lula. Expériences'; rapport annuel 1933; rapports d'inspection; rapport de stage caféiers à Yangambi et Station de Lula

14. Direction de l'Agriculture et autres services des Affaires Africaines

III. Recherches scientifiques

E. Stations agricoles expérimentales

2. Documentation. 1932-1933. Avec cartes/plans

2. Rayon de Stanleyville

n° AGRI 739 'Rayon de Stanleyville; 'Station générale d'amélioration des plantes. Yangambi Km 5' avec carte/plan et 'Court aperçu sur l'activité de la station de 1928 à 1932'; rapports plantation de Yangambi, Gazi, Lula et Barumbu

3. Eala

n° AGRI 739 'Jardin botanique d'Eala' avec cartes/plans Eala, Bolombo et Mongo

3. Fonds 'Rapports Congo' (RACBGG)

II. Rapports Annuels/Officiels

2. Agri/econ

B. Provinces

Orientale

n° 283 Stations Agricoles, 1913-1915

D. Postes Agricoles

n° 416 Lula (met maandrapporten), 1916-1927

n° 417 Yangambi-Gazi, 1912-1927

n° 419 (+ n° 477) Eala, 1914-1932

n° 433 Lula INEAC, 1935-1945

n° 434 Eala INEAC, 1933-1946

n° 447 Yangambi INEAC, Division Caféiers et Cacaoyer, 1934-1944

n° 458 Régie des plantations de la colonie rayon Stanleyville, Rapport générale et Stations agricoles divers (repris par INEAC), 1933-1935

4. Archief van het Koninklijk Paleis **(Hertogsstraat 2, 1000 Brussel)**

- Inhoud: in dit fonds worden archieven bewaard die gevormd zijn door de Departementen en Diensten van het Paleis of door leden van de Koninklijke Familie. Belangrijk voor dit onderzoek zijn de bescheiden die betrekking hebben op de landbouw in Belgisch Congo (rapporten, verslagen van agronomen, brief-wisseling, algemene stukken).

1. Archief periode Albert I

- Specifieke toegang: Janssens G., *Inventaris van het Archief van het secretariaat van koning Albert I (Max-Léo Gérard), (1815-1918) 1919-1924 1925-1928)*, Brussel: Algemeen Rijksarchief, 2014

1.1 Fonds 'Secretariaat van de koning'

1.1.1. Dossiers gevormd door de secretaris van de koning

C. Politieke, sociaaleconomische, koloniale en wetenschappelijke aangelegenheden

11. Koloniën

g) Economie, landbouw en industrie

n° 889 Stukken betreffende de landbouw in Belgisch Congo, 1920-1924. 1 omslag

2. Archief periode Leopold III

- Specifieke toegang: Capelle R., *Inventaris van het Archief van het secretariaat van koning Leopold III*, 2018 (ongepubliceerde inventaris)

2.1 Fonds 'Secretariaat van de koning'

III. Deel 2 Algemene aangelegenheden en studiedossiers

L. Kunst en wetenschap

123/18. Dossier betreffende de door de heer W. Robyns, directeur van de Rijksplantentuin te Meise toegestuurde brochure (W. Robyns, *L'avenir du Domaine Royal de Bouchout et le Nouveau Jardin Botanique de l'État*, s.l., 1941), 1941, 2 stukken

O. Koloniale aangelegenheden

G. 129. Stukken betreffende onderzoeksprogramma's in Congo m.b.t. diverse teelten, 1932-1933 en z.d., 1 omslag

G. 205. Rapport van dr. P.J. Cramer over de ontwikkeling van de teelten in Belgisch Congo, [1934?], 1 stuk

5. Archief en Bibliotheek Plantentuin Meise (Nieuwelaan 38, 1860 Meise)

- Toegang: Coulier J., *Inventariseren van archief van een wetenschappelijke instelling. Casus: de nationale plantentuin van België*, 1992 (ongepubliceerde inventaris)

- Inhoud: dit archief is uiteenlopend en bevat grosso modo 2 delen: stukken betreffende de organisatie van de plantentuin (gebouwen, boekhouding, enz) en stukken betreffende de wetenschappelijke activiteiten (missies, archief van directeuren, nota's, briefwisseling tussen en met botanici, tussen en met andere wetenschappelijke instellingen).

1. Archief gevormd door de directie

A. Stukken van algemene aard

2. Briefwisseling

2.1 Ingekomen en uitgaande post

n° 52 Briefwisseling met het Ministerie van Koloniën, 1908-1949

C. Stukken betreffende bijzondere onderwerpen behorende tot het rubriekenstelsel Robyns 1931-1966

Wetenschappelijke activiteit

4. Relaties met instituten, organismen en personen in België maar buiten het Ministerie van Landbouw

4.1 Koloniale tuin van Laeken, 1952

n° 844 Koloniale tuin

4.3 INEAC

n° 850 Flora van Kongo, 1944-1955

n° 851 Flora van Kongo, 1942-1961

4.7 "Centre Botanique Africaine"

n° 862 Centre Botanique Africaine ULB

2. Archief gevormd door het departement SP 1922-1965

B. Stukken betreffende bijzondere onderwerpen

3. Dossiers met reisverslagen van verzamelaars

3.1 Tropische groep

n° 1047 Laurent 1893-1896

n° 1049 Lebrun 1929-1938

4. Veldboekjes

n° 1113-1141 Lebrun, 28 delen, 1929-1933

n° 1146-1175 Robyns, 30 delen, 1925-1963

5. Notities

n° 1279 Vermoesen, 1 deel, 1914-1918

3. Niet-geïnventariseerd deel (fichebakken)

- Briefwisseling van o.m. Luja, Goossens, Laurent, …

6. Koninklijk Museum voor Midden Afrika (Leuvensesteenweg 13, 3080 Tervuren)

- Algemene toegang: Van Schuylenbergh P., *La mémoire des Belges en Afrique Centrale. Inventaire des archives historiques privées du Musée royal de l'Afrique Centrale*, Tervuren: MRAC, 1997 (raadpleegbaar via: http://www.africamuseum.be/collections/museum/collections/docs/memoiredesbelges.pdf) [16/11/2020]

- Inhoud: Al sinds zijn oprichting in 1898 bewaart het Koninklijk Museum voor Midden-Afrika archieven van particulieren (persoonlijke dossiers, notaboekjes, dagboeken, …), bedrijven (waaronder mijnbouw-, bosbouw- of spoorwegbedrijven) en een aantal Belgische instellingen die een band hebben met de Onafhankelijke Staat Congo of Belgisch Congo. Daarnaast herbergt het KMMA ook tal van audiovisuele bronnen uit de periode 1940-1960: films en foto's voornamelijk afkomstig van de voormalige Voorlichtingsdienst van Belgisch Congo en Rwanda-Urundi (Inforcongo) en van particulieren, pers- knipsels.

1. Archieven van particulieren – Koloniale Periode

1.1 Fonds 'Félix Fuchs' (HA.01.0038)

B. Carrière coloniale et post-coloniale

III. Terme 3 (juillet 1892 - octobre 1893)

1. Gouverneur général faisant fonction (juillet 1892 - juin 1893)

1.4 Agriculture

n° HA.01.0038.71 Documents concernant la politique agricole coloniale ainsi que la culture du café, du cacao et du bois, 1890 – 1902 1 folder

XII. Terme 12 (novembre 1913 - avril 1915)

7. Agriculture et élevage

7.1 Généralités

n° HA.01.0038.505 Documents concernant l'agriculture: récoltes, étude agricole du Katanga, produits (bois, huile de palme, maïs, café, arachides), stations agricoles ainsi que l'organisation du service de l'Agriculture, 1910 – 1915 1 bundle

1.2 Fonds 'Frantz Cornet' (HA.01.0083)

J. Uele

XV. Agriculture

n° HA.01.0083.766 Dossier: Copie-lettres émanant de l'agronome du district de l'Uele à Dungu, 1912 1 enveloppe

n° HA.01.0083.767 Dossier: Lettres reçues (des) agents agronomes; divers. Concerne le district de l'Uele en 1911-1913 1 enveloppe

n° HA.01.0083.771 Dossier: Divers; lettres reçues. Concerne l'agriculture du district de l'Uele en 1911-1914 1 enveloppe

n° HA.01.0083.775 Dossier: Litige. Contient la correspondance en grande partie consacrée à l'agriculture au district du Bas-Uele à Dungu en 1913 1 enveloppe

n° HA.01.0083.776 Dossier: Copie-lettres émanant de l'agronome du district du Bas-Uele, L. Eschweil, datant de 1913-1914 1 enveloppe

n° HA.01.0083.779 Dossier: Agriculture; lettres reçues, 1916. Concerne le district du Bas-Uele, 1916 1 enveloppe

n° HA.01.0083.781 Dossier: Stations de culture et d'élevage du district du Bas-Uele, 1916-1917, 4/4. Contient la correspondance à ce sujet adressée au commissaire de district du Bas-Uele à Buta, 1916 – 1917 1 enveloppe

n° HA.01.0083.787 Dossier: Collections agricultures, 1914 et 1917, n° H/15. District du Bas-Uele., 1914 1 enveloppe

n° HA.01.0083.790 Dossier: Agriculture; stations agricoles et Elevage, n° H/3. Concerne le district du Bas-Uele, 1918 1 enveloppe

n° HA.01.0083.791 Dossier: Agriculture, 1918. Concerne le district du Bas-Uele, 1918 1 enveloppe

n° HA.01.0083.792 Dossier: Rapport agriculture indigène et européenne au district du Bas-Uele en 1918 1 enveloppe

n° HA.01.0083.793 Dossier: Agriculture. Concerne la correspondance à ce sujet au district du Bas-Uele en 1917-1919 1 enveloppe

1.3 Fonds 'Philippe Molitor' (HA.01.0111)

E. Dossiers

n° HA.01.0111.28 Colonat et paysannat indigène, 1935 – 1951 1 dossier

1.4 Fonds 'Charles Lemaire' (HA.01.0181)

C. Troisième séjour au Congo: la mission du Katanga de mai 1898 septembre 1900, 1897 - 1902

Carnets de route, 1898 - 1900

n°5, 28 juin-28 juill. 1898

n° HA.01.0181.27 Description de Blantyre et de ses belles plantations de café 1 notebook

n°23, 3 juill.-24 sept. 1900

n° HA.01.0181.45 Du 26 juillet au 1er août : Avec Van de Heuvel, visite des cultures du futur jardin botanique d'Eala 1 notebook

D. Mission dans le Bahr el Ghazal, de juillet 1902 à avril 1905, 1902 - 1905

Carnets de route, 1902 - 1905

n°1, 31 juill.-19 août 1902

n° HA.01.0181.147 Le 1er août, en mer: énumération des plantes provenant du Jardin botanique de Laeken que Georges Lefèvre, sous-contrôleur forestier, est chargé de convoyer jusqu'à Eala 1 notebook

n°3, 26 sept.-9 nov. 1902

n° HA.01.0181.149 Le 28 septembre, arrivée à Coquilhatville, Lemaire note: "Je fais une visite au vieux Boiera (Chef Mbandaka que Lemaire a connu lors de son 1er séjour dans l'Equateur de 1889 à 1893). Les jours suivants, Lemaire met ses calculs au net. Il visite le Jardin botanique d'Eala, le 30 septembre (longue énumération des plantes) 1 notebook

1.5 Fonds ‘Jean Lebrun’ (HA.01.0184)

- niet geïnventariseerd: bevat correspondentie en wetenschappelijke verslagen van colloquia en conferenties ; correspondentie en documenten: briefwisseling tissen INEAC en Ministerie van Koloniën

1.6 Fonds ‘Floribert Jurion’ (HA.01.0210)

A. Inventaire

- niet geïnventariseerd: bevat documenten die allemaal betrekking hebben op het INEAC: notaboekjes, stukken over onderzochte landbouwsectoren, stukken over diverse landbouwstations (Yangambi o.a.), foto’s over landbouwonderzoekstations in diverse landen, perscoupures, periode 1928-1974

1.7 Fonds ‘Pierre Staner’ (HA.01.0213)

- niet geïnventariseerd: bevat persoonlijke nota’s en rapporten over diverse gewassen, periode 1946-1973

1.8 Fonds 'Jean-Marie Henry' (HA.01.0228)

- niet geïnventariseerd: bevat 4 tijdschriften getiteld « Souvenirs de Yangambi: Matériaux pour servir à l'histoire de l'INEAC et plus précisément à celle du centre de recherches de Yangambi », schriftjes getiteld 'Missions à l'étranger, 1949, 1962, 1965, 1967 et 1968'' en « L'INEAC en Afrique pendant la Seconde guerre mondiale » (fotokopie van zijn manuscript)

1.9 Fonds 'Pierre De Schlippé' (HA.01.0351)

- niet geïnventariseerd: periode 1951-1960, agronoom actief in de koffiesector: bevat brieven, foto's en publicaties

1.10 Fonds 'J. Meessen' (HA.01.0481)

A. Inventaire

n° HA.01.0481.1 Manuscrit de "Souvenirs d'un planteur de café au Congo Belge, 1927 - 1958"., [1982]

2. Audiovisuele bronnen

- specifieke toegang: Maréchal P., *Inventaire des films conservés à la section d'histoire de la présence belge à l'étranger du Musée Royal de l'Afrique Centrale à Tervuren*, s.d., Tervuren: MRAC
- Periode 1938-1958: films (en foto's) over diverse teelten (o.a. koffiebonen), films over landbouwonderzoek, landbouwregio's, …

2.1 Agriculture, élevage, exploitation forestière

n° 62 Gérard De Boe, Le caféier (1956-1957)

n° 67 Gérard De Boe, Yangambi (1943)

n° 71 Al Vaner, Lula, land van belofte (1957-1958)

2.2 Géographie, reportages touristiques, mise en valeur du pays

n° 199 Reportage sur les jardins d'Eala

7. Université Catholique de Louvain **(Place Montesquieu 3, 1348 Louvain-la-Neuve)**

1. Archives historiques de la Faculté d'Agronomie:

1.1 Fonds 'Iconografisch materiaal'

- Toegang: geen inventaris
- Inhoud: foto's en glasplaten komen voort van de professoren Edmond Leplae en Joseph E. Opsomer, beiden actief in Belgisch Kongo, sommige ook van het agentschap *Congo Presse*. Het grootste deel foto's belicht de tropische landbouw, voornamelijk in Midden-Afrika. De afbeeldingen stammen uit de periode vanaf het begin van de 20ste eeuw tot 1960, maar de meerderheid belicht de jaren 1920 tot en met 1940.

1.1.1. Fonds 'Guy Malengreau' (FI 36) (foto's *Congo Presse*)

Boite 1 INEAC: agriculture, agro-industrie

1.1.2 Fonds 'Documentation photographique'

2. Agriculture générale

2.1 cartes, planes

2.5 méthodes de culture

2.6 méthodes de cultures

2.7 plantes, méthodes de culture

2.8 experimentalia. Centres de recherches

3. Cultures méditerranéenne et tropicale, pratiques traditionnelles et nouvelles

3.8 - 3.15 Caféier

9. Le Congo belge et le Rwanda Burundi

9.8 Agronomie, recherche et stations scientifiques

1.1.3 Fonds 'Plaques photographiques'

Boite C (43) Agriculture au Congo

Boite I (300) Congo: clichés de la collection Leplae

2. Fonds 'privé'

2.1 Joseph E. Opsomer (BE A4006 - FI 364)

- Toegang: Derauw C., *Archives de Joseph Opsomer*, s.d. (ongepubliceerde inventaris)
- Inhoud: dit fonds omvat verslagen over de geschiedenis van het Nederlandse landbouw-proefstation Buitenzorg op Java, foto's van het laboratorium voor tropische fytotechniek in Heverlee, een dossier met diverse foto's en illustraties van E. Leplae en een aantal rapporten over tropische landbouwkunde.

1. Ministère des colonies

1. Dossier concernant un rapport sur l'historique de la section pour l'amélioration des Plantes annuelles de Buitenzorg. 1905-1930. 1 chemise

2. Institut agronomique de l'Université catholique de Louvain

A. Dossier "Faculté des sciences agronomiques. Laboratoire de phytotechnique tropicale (Serres tropicales). LTP Heverlée. Photos 1954-1963".

5. Plantules de Coffea Canephora (L215) coupées, ayant reformé des feuilles. 1958. 3 pièces

6. Plantules de Coffea Canephora. 5 mars 1958. 8 pièces

B. Dossiers ayant appartenus à Edmond Leplae. s.d. 2 chemises

18. Article "La sélection et la greffe du caféier" de Georges E. Sladden. 6 octobre 1931. 1 volume

BUITENLAND

1. Yangambi Research Station (DRC)

- uitgebreide bibliotheek

- archiefmateriaal (dagboeken, rapporten, …)

- http://junglerhythms.org/

2. The National Archives, London – Kew (UK)

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AFRICAN (J): General (J)

n° FO 371/108151 Proposal for a conference on diseases of the coffee plant in the Belgian Congo, to which UK delegates would be invited, in 1955

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Annex 3

Roadmap to Unlock the Market Potential of Robusta Coffee from Tshopo, DRC

A Stepwise Market Entry Strategy - Gradually Addressing Challenges and Unlocking Opportunities

April 2025

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1. Introduction

1.1. Historical context

The Democratic Republic of the Congo has long held significant potential for coffee production, particularly Robusta. However, the country's coffee sector has been shaped as much by its natural endowments as by its turbulent history. Periods of conflict—including the Congo Crisis, the two Congo wars, and subsequent instability—have consistently disrupted production, underscoring the importance of peace and political stability as prerequisites for developing the coffee sector (Bamenga et al., 2024a).

Global coffee prices have historically played a decisive role in shaping Robusta coffee production in the Democratic Republic of Congo. Periods of international price booms—such as those triggered by Brazil's price control schemes in the early 1900s, during the late 1940s to early 1950s, and following the Black Frost of 1975—spurred rapid expansion in Congolese Robusta cultivation. In contrast, the collapse of the International Coffee Agreement in 1989 caused global prices to plummet, resulting in a sharp decline in export volumes. This historical pattern underscores the profound impact that global coffee price volatility has had—and continues to have—on production dynamics in producing countries like the DRC (Bamenga et al., 2024a).

During the colonial period and under Mobutu's early rule, key enabling conditions such as road infrastructure, export capacity, and relatively sound economic management supported the sector's growth. Coffee production in the DRC reached its peak in the mid-1980s, at around 110,000 tons per year (ICO, 2023). However, financial mismanagement—notably, Zaïrisation and entrenched clientelism—severely disrupted the sector and reversed much of the earlier progress. Subsequent political instability, combined with a collapse in international coffee prices, led to a sharp decline in national production, which had fallen to around 15,000 tons by the early 2000s—a level at which it has largely stagnated ever since (ICO, 2023; Bamenga et al., 2024a). In contrast, other countries, such as Indonesia and Vietnam, increased their global market share in the 1990s through macroeconomic measures and direct government support.

1.2. Global Demand for Robusta: An Opportunity for Congolese Robusta Coffee?

Despite these setbacks, the Congolese coffee sector has substantial potential. Looking beyond the global coffee market and production trends, international buyers expressed strong interest in Congolese coffee (Development Solutions, 2014), viewing it as a unique origin with significant potential for excellent taste profiles and compelling stories. However, they also identified several challenges. Chief among these were inconsistent quality and a multitude of quality defects resulting from weak quality control due to a lack of knowledge, training and standardised procedures. Coffee traders also noted a limited understanding of market needs at the producer level, a lack of traceability, and severe infrastructural and logistical constraints (Development Solutions, 2014).

In the 1980s, approximately 25% of the world's coffee production consisted of Robusta. While the Western coffee industry has continued to promote Arabica as the benchmark for quality—using the meaningless claim of "100% Arabica"—much of the annual growth in global coffee consumption has been covered by increased Robusta production. Today, Robusta accounts for around 43% of total coffee production.

At the beginning of the 1980s, over half of the world's Robusta production came from Africa. However, Africa's total Robusta production has collapsed, now representing only 11.5% percent of global output. Additionally, within Africa, production has largely shifted from West Africa to Uganda.

The collapse of Robusta production in Central and West Africa can be attributed to several factors, such as:

- Inability to compete with the low-cost and highly efficient production in Vietnam and Brazil
- Political instability
- High levels of government interference in the coffee sector
- Coffee diseases affecting yields

From 2000 to 2024, global coffee consumption has grown at an annual rate of 2,02% (ICO statistics). Between 2000 and 2018, Vietnam's rapid production growth supplied most of the coffee needed for the rising demand. Since 2018, Brazil has taken over as the supplier of the ever-increasing demand for robusta.

However, production growth in Vietnam and Brazil has plateaued in recent years. These countries are reaching their productivity and land expansion limits, while droughts, linked to climate change, have negatively impacted harvests. In July 2021, the Robusta price reference (RC futures) reached $2/kg for the first time since 2014. Since 2023, Robusta prices have steadily risen, reaching $5.50/kg —a price never previously achieved.

Most trade experts anticipate coffee consumption to increase by 1–3% per year, driven by projected population growth and rising living standards in certain highly populated regions. Although the recent surge in Arabica prices may slightly slow down this trend, it is unlikely to have a major impact. Higher prices for both Arabica and Robusta will incentivise higher investments in coffee farming, leading to increased production. However, the effects of climate change are expected to intensify, posing additional challenges. Even if current prices may represent a peak, high price levels will likely persist in the long run.

A Revival Opportunity for Robusta in Africa, Specifically the DRC?

In 2021, Raf Van den Bruel interviewed five major European coffee companies (traders and roasters) to gain a deeper understanding of their stance towards West African robusta, which they had previously purchased in large quantities. The key findings were:

- There is no doubt about the product's potential in terms of quality and consistency.
- Between 2010 and 2020, when some volumes were still sourced from countries like Togo and Cameroon, buyers had numerous negative experiences—including contract defaults, strong discrepancies between pre-shipment and outturn samples, shipment

delays, and logistical issues such as a lack of jute bags when eventually the coffee to cover a contract was found. These frustrations led to a complete loss of confidence in the region and substantial reputation damage!

- Despite this, the Democratic Republic of the Congo (DRC) was viewed more favourably, thanks to the good reputation established by Kivu's Arabica coffee producers and exporters. From 2010 onwards, they established a record of high-quality, consistent, and reliable exports. Buyers also recalled the excellent quality of washed DRC Robusta.

So, we can conclude that there is a window of opportunity. However, several challenges that led to the sector's collapse must still be overcome, as will be discussed below (Section 1.4).

1.3. Lessons from Kivu

Following the total collapse of the coffee sector in Kivu during the 2000s, initiatives to revive it began around 2010. At that time, coffee was still being produced, but most of it was smuggled to Uganda or Rwanda.

Initially, the revival efforts were led by local entrepreneurs, sometimes organised in cooperatives and supported by NGOs. The coffee was then bought by 'impact' coffee traders, such as Oxfam, Fairtrade and Twin Trading, who were willing to take greater risks than commercial players at that time. Gradually, the sector diversified. Private investors began to take a more active role in the supply chain, from building new milling facilities to establishing export companies.

Despite the continuously challenging political context, Kivu has maintained a consistent supply of high-quality Arabica coffees over the past decade. However, in recent years, the sector has faced setbacks. For instance, increasingly long shipment times have led to market frustrations and high (pre)financing costs, particularly for cooperatives and exporters.

An essential and perhaps paradoxical point to note: the re-establishment of **Robusta** coffee production is probably even more challenging than that of **Arabica**. While the post-harvest and quality standards required for exporting Robusta may be lower, several complications arise:

- **Storytelling and market appeal:** Arabica from Kivu benefits from a 'good story' and a distinctive flavour profile, which helped attract early buyers and investors. Robusta, by contrast, generally lacks such storytelling, as the Robusta and the story behind it are rarely highlighted in blends. Its flavour profile is also considered less important, given its use in blends.
- **Scale and pricing:** Buyers and investors are often willing to engage in small-scale specialty Arabica initiatives. Small volumes can be attractive. However, Robusta is a high-volume, low-price commodity, making small-scale efforts less viable and more challenging to finance.

In conclusion, the Kivu experience offers a promising case for the revival of the coffee sector in DRC. However, Robusta might be even more challenging than it has been in the case of Arabica.

1.4. Robusta Production and Processing in Tshopo

1.4.1. Challenges at the farm level in Tshopo

Coffee farmers in Tshopo identify the limited presence of buyers at the local level as a major constraint (Table 1), primarily due to poor market access resulting from the dilapidated transportation infrastructure. Dysfunctional road and river networks increase transaction and transportation costs, heighten risks, and depress farm-gate prices. Given their weak bargaining position, rural coffee farmers are effectively price-takers. Unsurprisingly, many farmers report that coffee cultivation is unprofitable—one of the most critical challenges they face (Broeckhoven et al., 2025a). Farmers also noted that low coffee prices and poor market access hinder their ability to understand market dynamics and access market information (Broeckhoven et al., 2025a). This puts them at a clear disadvantage in price negotiations with traders, as corroborated for Congolese farmers in general by the World Food Program (WFP, 2010).

In light of these constraints, farmers consistently point to the rehabilitation of transport infrastructure as the top enabling factor—an issue they believe the government should prioritise. Closely linked to this is the need to facilitate the presence of coffee buyers in rural areas, which farmers also regard as a key intervention.

Table 1 *Main factors mentioned by (non-)coffee farmers as constraining coffee production and the proposed enablers, Tshopo province, DRC (n = 120)*

Constraining factors for coffee production	**Coffee Farmers** [%, n = 60]	**Non-Coffee Farmers** [%, n = 60]	***p-value***
Lack of regular coffee buyers	23 [b]	40 [a]	0.022 *
Long vegetative cycle (before 1st coffee harvest)	28 [a]	15 [b]	0.047 *
Unprofitability	13 [a]	20 [a]	0.098
Lack of state support (material and training)	18 [a]	10 [a]	0.11
Land ownership rights	10 [a]	10 [a]	0.83
Coffee pests and diseases	6.7 [a]	5.0 [a]	0.64
Main enablers mentioned by farmers			
Rehabilitation of roads	32 [b]	43 [a]	0.048 *
State support (material and training)	38 [a]	29 [a]	0.073
Regular coffee buyers in the villages	25 [a]	17 [a]	0.24
Farmers' cooperatives and associations	5.1 [a]	10 [a]	0.41

Different letters indicate significant differences between Coffee Farmers and Non-Coffee Farmers based on Fisher's Exact test.

Interestingly, taxes were not widely reported as a major constraint, despite the DRC's notorious reputation for high formal and informal levies on coffee (van Wijnbergen, 2016). This likely reflects underreporting due to fear of retribution. Nonetheless, the World Food Programme (WFP, 2010) emphasises that government policies—particularly administrative delays, bureaucratic hurdles, and illegal fees known as *tracasserie*—have significantly

hindered agricultural and trade development. A well-known reality of the coffee value chain in the DRC (van Wijnbergen, 2016).

The second most cited constraint is coffee's long vegetative cycle, which requires three to four years between planting and the first harvest (Table 1). Important to note is that during the first years after planting coffee, farmers can intercrop annuals, reducing the pressure of a long time to the first harvest. Therefore, coffee agroforestry can partially mitigate these adverse effects compared to monocultures.

Given the severe financial constraints facing coffee farmers in the region (Bamenga et al., 2024b), it is unsurprising that state support is frequently cited as a crucial enabling factor (Broeckhoven et al., 2025a). In particular, farmers expressed a preference for government assistance in the form of agricultural inputs and equipment. Nonetheless, this should be interpreted with the necessary context. Training on good agricultural practices is also mentioned, albeit less frequently. Given the significant knowledge gaps regarding pruning, planting density, pest management, and stem regulation, targeted training could boost robusta productivity (Broeckhoven et al., 2025c). However, such efforts are unlikely to succeed unless market conditions—especially farm gate prices—first improve (Bamenga et al., 2025a; Broeckhoven et al., 2025a).

Finally, forming cooperatives or farmer associations is the least frequently proposed solution. Farmers report that many existing organisations are inactive and serve primarily to attract financial support from development actors. Hence, the reported request for state support (Table 1) refers in a large part to support in the form of agricultural inputs and equipment rather than farmer training. This aligns with the WFP's (2010) finding that farmer organisations in the DRC are few in number and often struggle to aggregate commodities from their members.

1.4.2. Coffee Processing Challenges in Tshopo

The INERA Yangambi coffee collection has demonstrated significant quality potential in its genetic material (Bollen et al., 2024). Among the promising accessions, a selection of 'Lula Large' genotypes has been identified for their high sensory quality, large screen size, and good yield. These genotypes have been chosen as preferred cultivars for future cultivation efforts. Furthermore, processing experiments at the coffee collection indicate that the Pulped Natural and Washed methods significantly enhance coffee quality (Bollen et al., 2025). Given the infrastructure constraints in Tshopo province, the Pulped Natural method is particularly advantageous as it requires considerably less water and infrastructure than the Washed method. As a result, it is recommended as the primary processing method for the initial development phase of the local Robusta value chain. A microstation has been established at the INERA Yangambi coffee collection to support post-harvest improvements. It currently can process coffee from 10 hectares of plantations and serves as a training site for processing techniques, quality control, and storage. With additional investment in drying surfaces and mechanised processing equipment, this facility could be expanded to handle up to 50 hectares, further strengthening the local value chain.

Despite these opportunities, several challenges must be addressed if the aim is to revitalise coffee production in the region:

- **Small-scale farming structures**: Current coffee farmers cultivate coffee on a small scale, with a median of 30 coffee plants per household. Experience with commercial-style coffee cultivation and processing is non-existent. Training programs will be vital for establishing a minimal level of coffee quality.

- **Limited processing infrastructure**: The lack of larger-scale facilities and infrastructure hinders efficient post-harvest processing and transport if larger coffee areas are to be planted in the future. Training programs and equipment for green coffee grading and sorting are necessary to meet the minimum quality requirements for green coffee beans.

- **Scaling up processing capacity**: If high-quality green coffee for export is the target, a new washing station will be required. Ideally, this facility should be centrally located near farming communities and integrated into a logistical hub for transportation. In the case of upscaling in different regions, multiple centralised drying and processing microstations should be installed. This would improve drying efficiency and storage conditions, which are crucial for maintaining coffee quality.

- **Balancing processing methods with scale**: As coffee production expands, the Natural processing method—where whole cherries are dried on individual farms or at centralised drying sites—will be more feasible for processing large volumes. The Washed method, while beneficial for quality, requires substantial infrastructure investments that may not be immediately feasible. If training programs and quality control workshops are provided, the natural processing method could be applied at the farm household level. Drawing from experiences in Arabica and Robusta coffee development projects across multiple countries, a common reason for failing to meet minimum quality requirements has been inadequate drying facilities and improper storage, even when substantial investments were made in infrastructure such as washing stations and hullers. It is essential to address these issues from the outset of any initiative.

Addressing these coffee processing challenges through strategic investments and capacity-building initiatives will be key to unlocking the full potential of Robusta coffee in Tshopo.

2. Market Scenarios for Robusta from Tshopo

Between 2021 and 2025, five surveys were conducted across Tshopo, Kinshasa, Kisangani, and Bas Uele, involving interviews with 412 actors along the coffee value chain. Three of these were market studies commissioned specifically for this analysis. We are grateful to Justin Asimonyio Anio for conducting the studies in Tshopo, Kisangani, and Bas-Uele, and to Benjamin Ntumba for the survey in Kinshasa. In addition, data from relevant scientific publications related to the CoffeeBridge project were incorporated (Bamenga et al., 2025a; Broeckhoven et al., 2025a).

The five studies covered a wide range of stakeholders, including 234 farmers, 60 traders, 13 processors, and various retail actors: 19 kiosk retailers, 29 open-air market sellers, 39 supermarkets, 9 grocery shop owners (alimentations), and 9 restaurant and hotel owners.

These studies offer valuable insights into the Congolese coffee sector's production, trade, processing, and retail dynamics, providing the basis for market scenario analysis.

2.1. Roasting and selling coffee in Tshopo

2.1.1. Is coffee cultivation in Tshopo profitable?

A comparison of different coffee production systems in Tshopo reveals important distinctions in productivity. Table 2 shows how the median robusta yield, planting densities, and canopy closure differ across monoculture (MC), cultivated agroforestry (CAF), and wild agroforestry systems (WAF) (Broeckhoven et al., 2025a).

Table 2: *Robusta yield across coffee systems in Tshopo, DRC (n = 75) (Broeckhoven et al., 2025a)*

	Monoculture (n=27)		**Cultivated AF (n=15)**		**Wild AF (n=12)**	
	μ	± se	μ	± se	μ	± se
Yield [kg green coffee/plant]	0.916[a]	(± 0.0746)	0.956[a,b]	(± 0.143)	0.586[b]	(± 0.101)
Yield [kg green coffee/ha]	798[a]	(± 79.9)	648[a,b]	(± 134)	503[b]	(± 94.2)
Coffee density [plants/ha]	960[a]	(± 47.0)	896[a]	(± 61.6)	880[a]	(± 63.5)
Canopy closure [%]	0.00[c]	(± 0.475)	38.2[b]	(± 4.75)	52.9[b]	(± 3.67)

We can estimate a coffee farmer's annual revenue per hectare based on the median yield per hectare (Table 2) and farm-gate price data collected for this report. For coffee monocultures, annual per-hectare revenues are estimated at 1104 - 1948 $/ha/year[3]. For coffee agroforestry systems, annual per-hectare coffee revenues are estimated at 897 - 1583 $/ha/year, excluding revenues from non-coffee products.

Given the median size of coffee farms in Tshopo, which is below 0.10 hectares (Broeckhoven et al., 2025b), and the estimated annual coffee revenues per hectare, we calculate that the median coffee farmer has an estimated yearly coffee revenue of 72 - 127 $/year for monocultures and 70 - 124 $/year for coffee agroforestry.

Although data on the cost structure of coffee farming in Tshopo is lacking, it is unlikely that annual revenues from coffee of less than $125 are sufficient for profitability. A survey was conducted to better understand farmers' challenges (Broeckhoven et al., 2025a). It revealed that two of the most frequently reported constraints are the unprofitability of coffee cultivation and the lack of buyers, both of which are closely linked to low farm-gate prices.

Given the context of low or even negative profitability and limited market access, coffee farmers in Tshopo theoretically have two broad avenues to improve their financial situation,

[3] A conversion rate of $ 1 = 2865 CDF was used (11 March 2025).

assuming they wish to continue cultivating coffee: either reducing costs or increasing revenues. However, reducing costs is virtually unfeasible, as current expenditures are already minimal. Most farmers operate without mineral fertilisers or agrochemicals and rely heavily on family labour, leaving little room for further cost-cutting.

Therefore, the most viable strategy is to increase revenues. One possible approach is to boost yields, yet yields are already relatively high for a zero-input system (Table 2). Increased revenues might also be achieved by increasing the price received for coffee. Increased prices might be achieved by accessing different markets or improving the quality of their product, as the example of arabica cultivation in Kivu has proven. Whether these scenarios are feasible and desirable for coffee farmers in Tshopo, DRC, remains an open question. To explore this, several sales options will be assessed: (i) selling coffee in Kisangani, (ii) in Kinshasa, and (iii) to exporters. Within each of these market outlets, different segments will be examined, including (i) open-air markets, (ii) supermarkets, and (iii) other potential channels.

2.1.2. Coffee Processing and Trading in Tshopo - A Profitable Activity

A profitability analysis of the robusta coffee value chain in Tshopo (Bamenga et al., 2025a) shows that coffee traders and processors appear to operate profitably, which aligns with our data from the market studies in Tshopo.

However, several concerning practices were observed in the local processing sector. A significant amount of adulteration appears to occur. For example, ground avocado seeds have reportedly been added to ground coffee to increase volume. In other cases, dried coffee cherries are roasted whole, without being hulled first, as a cost-saving measure. Furthermore, it is common to use extremely low-cost fuels, such as burning plastic waste during roasting, which poses serious health and environmental risks.

The widespread lack of appropriate coffee processing equipment exacerbates these issues. Despite these challenges, coffee processing remains a lucrative business in Kisangani, even without resorting to adulteration. Addressing these health and quality concerns could enhance public safety, bolster consumer confidence, and ultimately lead to improved long-term profitability in the sector.

Another key challenge is ensuring farmers can capture the additional value created through coffee processing, a recurring theme worldwide.

2.1.3. Selling coffee in supermarkets in Kisangani?

As explained above, selling coffee in the open-air markets results in very low or negative profitability, so we investigate other options. According to a market study we conducted in Kisangani in 2024, regular packaged coffee is not present in supermarkets in the city, except for Nescafé instant coffee.
Prices for instant coffee in supermarkets range from $54.55 to $67.68 per kilogram of instant coffee, depending on packaging size and specific product characteristics. When these prices are converted to the equivalent cost of regular coffee—assuming that one serving of instant coffee equals 2 grams and one serving of regular coffee equals 8 grams—the resulting

hypothetical prices fall between $13.64 and $16.92 per kilogram for roasted coffee. This option is considered unrealistic because huge investments are required to make instant coffee.

In essence, this market study suggests that standard packaged coffee, similar to what is commonly found in European supermarkets, does not currently have a market in Kisangani. In contrast, packaged coffee is common in Kinshasa supermarkets. This difference implies that Kisangani lacks a consumer segment for this type of product, rather than that this product is unavailable or inaccessible for other reasons.

Nevertheless, it is notable that some consumers in Kisangani are willing to pay between $13.64 and $16.92 per kilogram of coffee. This observation raises the question of whether a market exists in Kisangani for roasted coffee priced above the open-air market rate of $3.08 per kilogram but below the price of instant coffee. If such a market exists, it would be essential to determine what kind of product and product characteristics would satisfy this demand. Producing instant coffee in Tshopo is not a realistic option, and it appears that consumers in Tshopo do not want expensive, nicely packaged coffee as we know it in supermarkets.

2.1.4. Selling good quality, no-nonsense coffee in Kisangani?

There have been previous efforts to market locally processed, decent-quality coffee in Kisangani. A notable example is Bomani Coffee, which gained a reputation for its quality despite being packaged in simple, see-through plastic bags. The product attracted a diverse customer base, including middle-class consumers, international organisations, hotels, and restaurants. The coffee was not sold in supermarkets or the major open-air markets; rather, it was mainly sold at the processing facilities of Bomani Coffee. In 2017, Bomani Coffee was sold at a significant premium compared to the open-air market, with prices around $5 per kilogram for roasted and ground coffee. Unfortunately, the business ceased operations around 2017 following the death of its owner. Nonetheless, Bomani Coffee indicates a latent market may exist in Kisangani for a similar, locally processed, no-nonsense, good-quality product.

Based on cumulative CPI data from the World Bank and the IMF to adjust for local inflation, the USD-equivalent price of Bomani Coffee in 2025 would be almost double that of 2017, namely $9.10 per kilogram. Note that this does not consider price (in)elasticity as we do not have such information on coffee consumers in the DRC. Nonetheless, if a product could be sold in Kisangani today at a price within the 5 to 9 $/kg range, this would represent a profitable business opportunity. Moreover, such a venture is both technically and economically feasible from an investment perspective.

That said, due to the limited availability of market data, further research is recommended before proceeding. Key questions remain unanswered, particularly concerning the potential annual volume of this mid-range market segment. Given these uncertainties, the success of this option cannot be guaranteed, and other possibilities are explored in the sections below.

2.2. Selling coffee in Kinshasa

2.2.1. Selling coffee from Tshopo in open-air markets of Kinshasa?

Interviews with coffee traders in Kisangani (2024) reveal that only 44.4% of them source their coffee from Tshopo, while 38.8% obtain coffee from Mongala and 16.7% from Bas-Uele. This suggests that Tshopo may not be self-sufficient in coffee production relative to local consumption and/or that Tshopo coffee may also face competitive disadvantages in price or quality compared to coffee from Mongala and Bas-Uele. While we don't know how much coffee from Tshopo is exported outside of the province, and traders in Kisangani only represent a part of the coffee traded in Tshopo, this does seem to indicate that overall, Tshopo is a net importer of coffee rather than an exporter.

Comparisons of coffee prices from open-air markets in the DRC provide additional insight. The current price of roasted and ground coffee in Kisangani, March 2025, ranges from 5,882 to 7,843 CDF/kg[4], with a median of 7,451 CDF/kg. In contrast, the current price in Kinshasa's open-air markets is approximately 6,588 CDF/kg. Simply put, most roasted and ground coffee in Kisangani costs more than in Kinshasa. As a result, attempting to sell roasted coffee from Tshopo in Kinshasa's open-air markets appears economically unfeasible, even more so given that additional transportation costs are not even factored in.

There is also no indication that coffee from Tshopo commands a quality-based price premium compared to coffee from other provinces. In fact, roasted and ground coffee from Boma and Matadi (Congo Central) currently sells for 5,000 CDF/kg, further underscoring the price disadvantage for Tshopo coffee. Proximity, lower costs, and faster delivery times give producers and traders from Congo Central a clear advantage in accessing the Kinshasa open-air markets. This likely also applies to coffee from Mongala heading towards the Kinshasa market. Thus, coffee from Tshopo in the open-air markets of Kinshasa is outcompeted by that from more nearby areas..

2.2.2. Selling coffee from Tshopo in supermarkets of Kinshasa?

While it is not recommended to enter the Kinshasa open-air market with coffee from Tshopo, given the structural disadvantages, maybe other market segments exist that could be of interest. Moreover, supermarkets in Kinshasa offer a wide range of packaged coffee products, including Congolese and international brands. The retail price for Congolese coffee in these supermarkets ranges from $17.40 to $37.67 per kilogram of roasted coffee, with an average price of $25.46 per kilogram (January 2024). Imported coffees tend to be even more expensive. This premium retail environment may offer very attractive margins based on the surprisingly high retail prices. However, entering this market would require strong branding, quality consistency, and compliance with packaging and shelf-life standards, which could be

[4] A conversion rate of $ 1 = 2865 CDF was used (11 March 2025).

a barrier. Multiple examples of Congolese coffees produced, processed, and packaged in supermarkets indicate this is possible.

2.3. Exporting green coffee beans

2.3.1. The general case for exporting coffee

An in-depth financial analysis was conducted to assess the feasibility of exporting green coffee from Tshopo to the EU, the Middle East or North Africa, based on the assumption of exporting one container (19.2 tons). The international benchmark price used in the calculation was the London Robusta C-price, at $5,565 per ton in March 2025. A market price differential of ± $400 per ton was also applied to reflect the quality variation between low- and high-quality Congolese robusta.

On the production side, farmers receive a median farm gate price of 2,786 CDF/kg for dry cherries, equivalent to $0.97/kg dry cherries. However, prices received by farmers can vary considerably. Farmgate prices ranged from $0.87 to $1.05/kg dry cherries after the harvesting season, with off-season peaks reaching $1.40/kg dry cherries. Traders typically pay 3,953 CDF/kg for green coffee, equivalent to a median of $1.38/kg for green coffee. Prices paid for green coffee varied between $1.24 and $2.44/kg after the harvest season, with some off-season transactions recorded at up to $3.25/kg.

The total cost of exporting green coffee—including transport, materials, processing, cooperative fixed costs, and other export-related expenses, excluding farmgate price—was calculated to be between $1.63 and $1.71 per kilogram of green coffee. Given these figures, the potential surplus that could be paid to farmers, in addition to the local market price of $1.38/kg, ranges from $1.97 to $2.70/kg. This implies a potential maximum 2.5- to 3-fold increase in the farm-gate price. Under current market conditions, exporting green coffee from Tshopo is a financially attractive option. However, sensitivity analysis shows that if global coffee prices fall to $3,500 per ton of green coffee[5], exporting becomes unviable for low-quality coffee. At $2,500 per ton of green coffee internationally, even high-quality exports would no longer be economically feasible.

The significant price premium of selling coffee to EU exporters could significantly improve farmers' livelihoods. Coffee farmer income per hectare per year could rise from the current range of $900–$2,000 to $2,200–$3,250 annually (Table 3). For the median farmer in Tshopo, who typically cultivates less than 0.1 hectares, this would mean an increase from $70–$125 to approximately $170–$215 per year (Table 4).

***Table 3**: Estimated coffee farmer revenues - Per hectare ($[6]/ha/year)*

[5] This assumes local market prices would remain constant irrespective of the global C price which is an oversimplification. However, it does provide a rough guideline. If the global C price drops to $3,500/ton green coffee, local coffee prices should remain constant at max, though it is more likely they will decrease. As local coffee prices decrease in line with global coffee prices, then exporting should be viable at global prices slightly below the $3,500/ton green coffee.

[6] A conversion rate of $ 1 = 2865 CDF was used (11 March 2025).

Coffee System	Local Market	Export – Low Quality	Export – High Quality
Monoculture	1104 – 1948	2680	3264
Agroforestry	897 – 1583	2178	2652

***Table 4**: Estimated coffee farmer revenues - Median actual farmer ($/year/farmer)*

Coffee System	Local Market	Export – Low Quality	Export – High Quality
Monoculture	72 – 127	175	213
Agroforestry	70 – 124	171	208

2.3.2. Export via East or West?

Although coffee export routes from Kisangani primarily run eastward toward Dar es Salaam or Mombasa, another viable route exists via the Congo River to Kinshasa and then onward by road to Matadi port. Let's compare the two options.

Transport by river from Kisangani to Kinshasa costs approximately $155 per ton of green coffee, while road transport from Kinshasa to Matadi adds another $54 per ton. Thus, the total transport cost from Kisangani to Matadi is around $209 per ton, significantly cheaper than the $590 per ton cost of exporting via Mombasa. While ocean freight from Mombasa to Antwerp can sometimes be more competitively priced than from Matadi, the cost difference in non-ocean freight, if any, makes the Matadi route more economical overall. It is important to note that cost estimates can fluctuate significantly due to changes in fuel prices, seasonal demand, and geopolitical developments.

Transport time is another critical consideration. The journey from Kisangani to Matadi takes 3 - 4 weeks or more, significantly faster than the 2 - 3 months or more required to reach Mombasa. The Matadi–Antwerp leg takes around 23 days, which should normally be faster than the 43–52 days from Mombasa to Antwerp. Thus, the Kisangani–Matadi–Antwerp route is estimated to take a minimum of 2 months, compared to 4 - 5 months or more for the Kisangani–Mombasa–Antwerp route. Shorter delivery times translate into reduced financing costs—an important factor in the coffee export business. Additionally, the Matadi route avoids crossing conflict zones and international borders, thereby reducing administrative burdens, risks, and potential delays.

Although Congolese coffee exports via Matadi represent a very small share of the total current export volume, they are technically feasible, seem economically more interesting than the Mombasa route, and are increasingly viable given the conflicts in the Eastern DRC. Additionally, transporting agricultural products from Kisangani to Kinshasa is a common practice. Notably, in 2025, the first container of coffee produced in Congo Central was successfully exported from Matadi to the EU, demonstrating the practical feasibility of this route.

Therefore, it is likely that the current main coffee export route via the East is largely the result of coffee traders being active in that region for historical reasons. Thus, we encourage further exploration of the coffee export route via the West (Matadi).

3. Stepwise Market Development Strategy

While the market development strategy is presented as a stepwise approach, multiple activity lines will have to be developed simultaneously. Progress will largely depend on the availability of initial and future funding, as well as the initiative's attractiveness to potential local, regional, or international investors.

Step 1: Launch Local Sales - Bomani Style

Product

Natural processed, medium-quality green coffee resulting in no-nonsense, decent roasted and ground coffee for the local market in Kisangani (in the spirit of *Bomani Style*).

Rationale

- Proven local demand
- Minimal equipment, packaging, and marketing needs
- Low capital and operational requirements
- Low risk
- Can be implemented in a relatively short time frame

Estimated target price

- $5–$9/kg (roasted ground)

Required actions

- Implement basic quality improvements in natural processing methods
- Organise trainings focused on harvesting, drying, and simple, effective processing techniques and protocols
- Seek support from externally funded (donor) projects for trainings and small-scale equipment financing

Step 2: Pilot Small-Scale High-Quality Washed Robusta

Set up a small-scale pilot capable of producing one lot of fully washed, well-dried, and properly stored Robusta coffee.

Product

High-quality washed Robusta (target: 1 container lot)

Rationale

- Test the market potential
- Stimulate sector interest by building credibility (quality and minimal volume potential)
- Gain interest from local coffee producers

Estimated target price

- Potential to double or triple current farm gate prices

Target Market

- Sell to an interested buyer— an exporter (North Africa, Middle East, Europe) or a regional coffee brand.

Required actions

- Trainings to implement more advanced quality improvements in washed processing methods
- Finalisation of the infrastructure to produce the quantity needed for the pilot.
- Market assistance: Identifying potential buyers and export requirements
- Requires support from external investors or project funding
- The preferred logistics route—Kisangani → Kinshasa → Matadi—has not yet been tested for coffee exports from Tshopo and requires piloting.

Step 3: Scale Up with External Investment

Utilise lessons from Steps 1 and 2 to attract external investors and scale up green coffee production and processing capacity, targeting both regional roasters within the DRC and its neighbouring countries, as well as international markets.

Product

Not always chasing the highest quality (fully washed Robusta), but always aiming for the best possible market value relative to quality and cost. Develop a differentiated product portfolio:

- Consistent quality, natural processed
- High quality, natural processed
- Medium quality, fully washed
- High-quality, fully washed

Required actions

- Look for external investors
- Expansion of coffee production and processing capacities, including infrastructure and training
- Assistance to overcome key challenges related to EUDR. Among the many challenges is the EU Deforestation Regulation (EUDR), which will take effect at the start of 2026! We foresee several difficulties, including the risk of misclassification in this region. Buyers in the EU will not be prepared to take any risk, as the fines are enormous.

❌ Scenarios to Avoid

1. Open-Air Markets in Tshopo

- **Why not?** Low farm gate prices, market saturation, and low profitability for farmers.

2. Supermarket Sales in Tshopo

- **Why not?** There is little to no demand; packaged coffee in Tshopo supermarkets is almost nonexistent, except for some instant coffee.

3. Open-Air Markets in Kinshasa

- **Why not?** Prices are lower than in Kisangani; Tshopo producers cannot compete with closer, cheaper suppliers (e.g. Congo Central, Mongala).

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Supporting data

Indicative price structure					Data input
Indicative Farm Gate price based on actual London price vs. actual farm gate price					Formula or fixed values
ESTIMATION					
Assumptions					
Quality of a natural should be uniform and good cup, diff. Compa	**High quality**		**Low quality**		
Differential (London Coffee Price Robusta)	400	USD/ton green	-400	USD/ton green	Apr-24
London Coffee Price (LIFFE - RC)	5565	USD/ton green			Mar-25
FOB potential natural Tshopo	5,965	USD/kg green	5,165	USD/kg green	
USD/CDF	2865	CDF/USD			11 March 2025

	Low quality dif -400 [$/kg]	**High quality** diff +400 [$/kg]
Farm gate price	**2,68**	**3,26**
Weight loss: farmgate > Green sorted	**25%**	**25%**
Price of Green sorted	3,35	4,08
Usinage, sechage, triage	0,12	0,12
Sac de Jute	0,07	0,07
Mise en sac, Bulcage, Gerbage, Chargement containeur	0,01	0,01
Free transport (1st mile via bicycle or on foot) (Farm >	0,00	0,00
Transport cost : by boat (Yangambi beach > Kisangani)	0,03	0,03
Transport cost : truck (Kisangani > Beni or Bunia)	0,30	0,30
Transport cost (Beni / Uganda border > Mombasa port)	0,26	0,26
% FOB Tax ONAPAC on Robusta	4,50%	4,50%
Tax ONC on Robusta	0,23	0,27
Informal Tax	0,075	0,075
Prefinance level [%]	70%	70%
Duration prefinancing period [months]	7	7
Interest rate [%]	12,5%	12,5%
Prefinancing cost	0,26	0,30
Fixed costs - COOP	0,60	0,60
Fixed costs - Exporter	0,04	0,04
Variable costs - Exporter	0,14	0,14
TOTAL COSTS (Excl Farm gate price)	**1,81**	**1,89**

	In-season			*Off-season*	
	Min	**Median**	**Max**	**Max**	
Farmgate price : Tshopo : Dried Cherries	0,87	0,97	1,05	1,40	USD/kg dried cherries
	2500	2786	3000	4000	CDF/kg dried cherries
Hypothethical : Farmgate price : Tshopo : Green coffee	1,24	1,38	2,44	3,25	USD/kg green
	3550	3953	6977	9303	CDF/kg green
Ratio Fresh cherry to Green coffee (Natural method)	16%	16%			ICO
Ratio Fresh cherry to Dried coffee (Natural method)	34%	34%			ICO
Ratio Dried to Green Coffee (Natural method)	48%	48%			ICO
Ratio Fresh cherry to Green coffee (Wet method)	16%	16%			ICO

Price simulation	**Coffee type**	**Currency**	**Low quality**	**High quality**	**Unit**
Local market price	Green	USD	**1,38**	**1,38**	USD/kg green coffee
	Dried cherry	CDF	**2786**	**2786**	CDF/kg dried cherry
Export price	Green sorted	USD	**3,35**	**4,08**	USD/kg green coffee
	Dried cherry	CDF	**4592**	**5583**	CDF/kg dried cherry
Price Diff: Export minus local price	Green	USD	**1,97**	**2,70**	USD/kg green coffee
	Dried cherry	CDF	**2702**	**3693**	CDF/kg dried cherry

Type	**FROM**	**TO**	**Estimated distance (km)**	**CDF / bag**	**USD / bag**	**kg / bag**	**USD / kg**	**USD / kg / km**
River	Kisangani	Yangambi	90	10000	3,49	100	0,035	0,00039
River	Kisangani	Lokutu	185	15000	5,24	100	0,052	0,00028
River	Kisangani	Bumba	374	20000	6,98	100	0,070	0,00019
River	Kisangani	Lisala	491	27500	9,60	100	0,096	0,00020
River	Akula	Kinshasa	1100	28650	10	100	0,100	0,00009
River	Kisangani	Kinshasa	1700	44277	15,45	100	**0,155**	0,00009
Type	**FROM**	**TO**	**Estimated distance (km)**	**Total cost ($/container)**	**USD / bag**	**kg / container**	**USD / kg**	**USD / kg / km**
Road	Kinshasa	Matadi	350	1031	5,37	19200	**0,054**	0,00015
TOTAL	**FROM**	**TO**	**Estimated distance (km)**		**USD / bag**		**USD / kg**	
River + Road	Kisangani	Matadi	2050		20,82		**0,208**	