TREND ANALYSIS OF UGANDA'S COFFEE SECTOR

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ABSTRACT

Coffee (*Coffea arabica* and *C. canephora*) is an important commercial crop globally, and the second most traded global commodity by developing nations after oil. Uganda is among the top 10 coffee exporters worldwide, and second in Africa. The total export amounted to 301,366 tons of "green" coffee in 2021, forming the second-largest commodity export, and contributing about 12.4% to Uganda's total formal exports. However, the country's overall performance over time remains unclear given the fluctuations in production and export prices. This study aimed to evaluate the production and export trends of Uganda's coffee sector by: (i) defining the overall direction of coffee production and export value, (ii) assessing the market variability, and (iii) evaluating the global cross-cutting issues regarding coffee production and export. Data was extracted from FAOSTAT and Uganda Coffee Development Authority (UCDA) databases. Trends were analysed using the Mann-Kendall and Sen's Slope test, while market variability was analyzed using the fixed base index (FBI) and coefficient of variation. VOSviewer software was used to analyze literature from the Web of Science database to highlight cross-cutting issues. Results indicated a significant positive increase in coffee production and export value ($p = 0.0001$, Slope = 1736.67 tons and $p = 0.001$, Slope = 4.44 million USD) respectively. Among the top ten coffee producers, Uganda presented the third worst unstable coffee export value with a 20.1% coefficient of variation. Fairtrade, climate change, and certification were the most outstanding global cross-cutting issues. Market stabilization mechanisms should be developed through value addition by establishing coffee processing and roasting plants, as well as strategic governance and policy support to counter emerging global challenges such as climate change.

Keywords: coffee, market variability, sector analysis, trends, Uganda

JEL Code: Q02, Q13, Q17

INTRODUCTION

Coffee (*Coffea arabica* and *C. canephora*) is a high-value commercial crop worldwide, and the second most traded global commodity by developing nations after oil (Trade-Map, 2021), and also a major income source for many smallholder farmers within developing nations. (Sarmiento-Soler et al., 2020). Africa's coffee exports were estimated at about USD. 2 billion in 2020, a rise from USD.1.99 billion in 2019 (Trade-Map, 2021). Over the years, Uganda has maintained a strong coffee production position globally, and dominance in Africa as the second producer behind Ethiopia. (ICO, 2021b).

Evidently, coffee is a historical and most important cash crop, and a key source of foreign exchange, generating about 15% of Uganda's overall export revenue every year in the past decade. It is also Uganda's second most exported commodity whose revenue accounted for 12.6 percent of total exports generating about US$ 50 million in 2021 (UBOS, 2021). Uganda mainly produces Robusta coffee which forms about 80% of the total coffee exports. A bit of Arabica coffee is cultivated in the highland parts, mainly on the slopes of mountains like Rwenzori and Elgon. While the Arabica coffee variety is known to have originated from Ethiopia, Uganda merits itself in being the birthplace of Robusta coffee, which was long grown around Lake Victoria. Several wild Robusta coffee trees can still be found growing naturally around Mount Rwenzori and are gathered for niche markets in the form of Kibaale wild eco-coffee (UCDA, 2020b).

Uganda's long history of coffee production has been cherished and embraced with extensive advancements in the production of high-quality coffee, consequently rated third best globally by the Coffee Quality Institute (CQI) (Bean-Poet, 2020). According to UCDA (2020a), coffee farmers in Uganda are grouped into three major categories including smallholder farmers, commercial farmers, and plantation farmers. The smallholder farmers comprise subsistence farmers with low organizational ability, practicing intercropping by growing coffee (about 1000 trees), bananas, beans, and other staple food crops. The commercial farmers are relatively organized into cooperatives and farmers' associations, growing coffee as a main cash crop (1000-10,000 trees), and some bananas for partial shade. The last category is the plantation

farmers, which constitute the private sector agribusiness enterprises growing coffee as a monocrop with more than 10,000 trees.

Essentially, the coffee sector's contribution to livelihoods and economic development is undoubtable. However, the country's overall performance over time is not clear given the fluctuations in production and export prices. This study aimed to evaluate the production and export trends of Uganda's coffee sector by: (i) defining the overall direction of coffee production and export value, (ii) assessing the market variability, and (iii) evaluating the global cross-cutting issues regarding coffee production and export.

MATERIALS AND METHODS

A mixed methodology approach involving the use of qualitative and quantitative methods was adopted for this study. Qualitative data was gathered through content review of multiple coffee resource documents, while quantitative statistical data was obtained from the Uganda Coffee Development Authority (UCDA), Uganda Bureau of Statistics (UBOS), FAOSTAT and Statista databases. A descriptive analysis was done to evaluate the status quo of Uganda's coffee sector in comparison to other top-producing countries.

Mann-Kendall and Sen's Slope test was utilized to define the overall direction of coffee production and export value, with the aim of determining whether it was a significantly increasing or decreasing trend for both production and export value.

Simple linear regression was done to analyze the correlation between area harvested and quantity harvested, where the area harvested was the independent variable, while quantity harvested was the dependent variable, using the equation $y = b0 + b1 * x$, Where: y is the value of the dependent variable, x is the value of the independent variable, b0 is the intercept of the line (the value of y when x is zero), and b1 is the slope of the line (the change in y per unit change in x). Fixed base index (FBI) was used to calculate the relative price changes, while the coefficient of variation was used to estimate the market risk variability.

A bibliometric analysis was done to analyze the global cross-cutting issues regarding coffee production and export. Bibliometrics analysis helps in the logical investigation of recorded discourse (Rousseau et al., 2018). A total of 215 English documents published between 1975 to

2022, were retrieved from the Web of Science database using the following search string: ((Coffee and (production or productivity) and (export or "export value" or "export prices")). The search was limited to the topic (title, abstract, author keywords, and keywords plus). VOSviewer 1.6.18 software was used to analyze the different research publications. The main unit for analysis was the cooccurrence of keywords plus, and link strengths. This helped to analyze the published content in a broader sense rather than a narrow representation based on only author keywords. A minimum threshold level of 4 cooccurrences was used.

RESULTS AND DISCUSSIONS

Changes in coffee area harvested and quantity harvested

The average coffee area harvested was 252,751 ha between 1961 and 2006. Interestingly, the area has more than doubled in the past decade, with a steady increase from 285,000 ha to 692,553 ha between 2007 and 2021 (**Figure 1**). This can be attributed to the revamped role of Uganda Coffee Development Authority, that was established in 1991 by the act of parliament (UCDA, 2023), as well as various agricultural initiatives by the government of Uganda through "operation wealth creation" that have highly promoted planting of coffee through giving of coffee seedlings to farmers to establish new plantations (OWC, 2023). On the other hand, the earlier years between 1961 and 2006 highlight the impact of the lack of sector prioritization from the government, as well as the initial years after the establishment of the Uganda Coffee Development Authority (UCDA), representing the organizational capacity development phases.

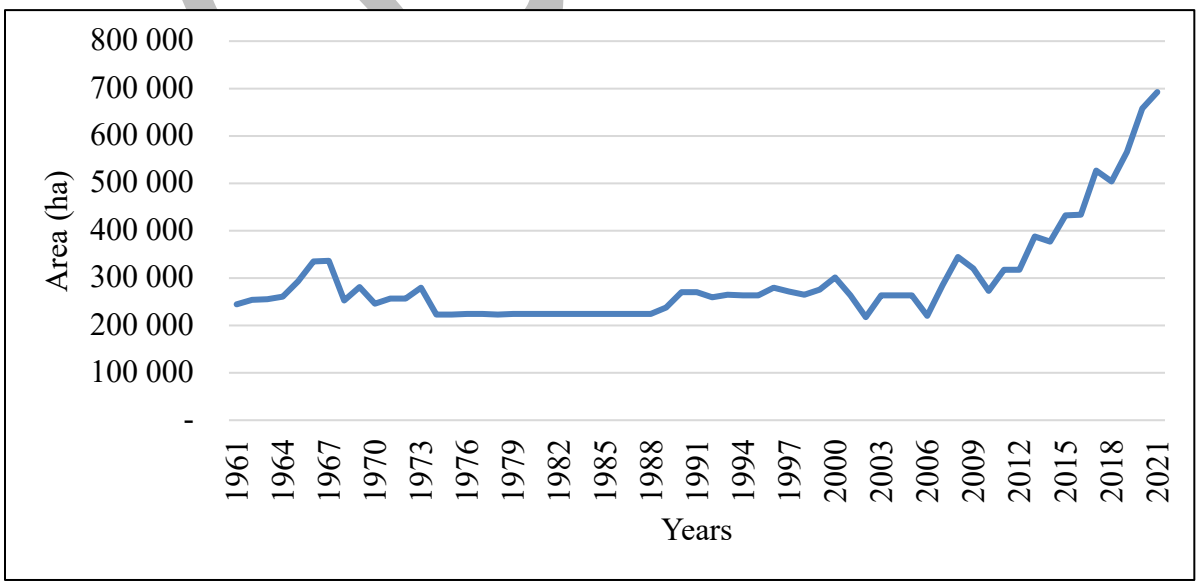

Figure 1: **Coffee area harvested in Uganda (ha)**

Source: Author's own editing with data from FAO

Besides, intensive research has also been undertaken by the National Agricultural Research Organization (NARO) to enhance productivity and disease resistance of the various coffee varieties in Uganda. As a result, about 7 new varieties with resistance to Coffee Wilt Disease (CWD) have been developed (Mulindwa et al., 2022). However, there is no significant improvement in the yield per hectare between the two periods, that is 1961-2006, and 2007-2021. The average yield for 1961-2006 was 6,569 hg/ha, while that of 2007-2021 was 5,809 hg/ha, indicating a slight reduction. Nonetheless, a moderate correlation has been established between the area harvested and the quantity harvested (R^2 = 0.6657). Furthermore, the area harvested has been found to have a positive effect on the quantity harvested (**Figure 2**).

Since coffee is a perennial crop, understanding the area harvested and yield dynamics requires analysis of a wide range of factors such as variety, growth conditions and the likely impact of the tree age on productivity. Notably, studies do not indicate a clear correlation between the age of coffee trees and the technical efficiency of their productivity (Nalunga, 2021). This complicates the attempt to compare and account for the changes in the quantity of coffee harvested with changes in the area harvested over time.

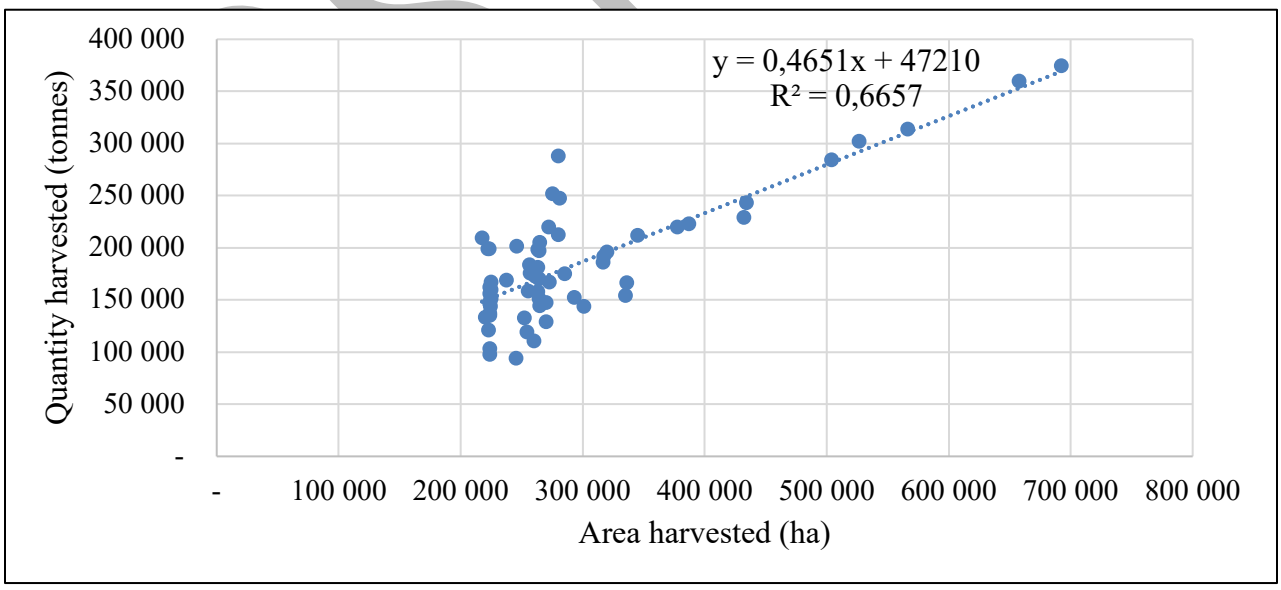

Figure 2: **Correlation between area harvested and quantity harvested (1961-2021)**

Source: Author's own editing with data FAO (2023)

The trend analysis using the Mann-Kendall and Sen's Slope test indicates a significant positive increase in coffee production (p = 0.0001, Slope =1,736.68 tons) (**Figure 3**).

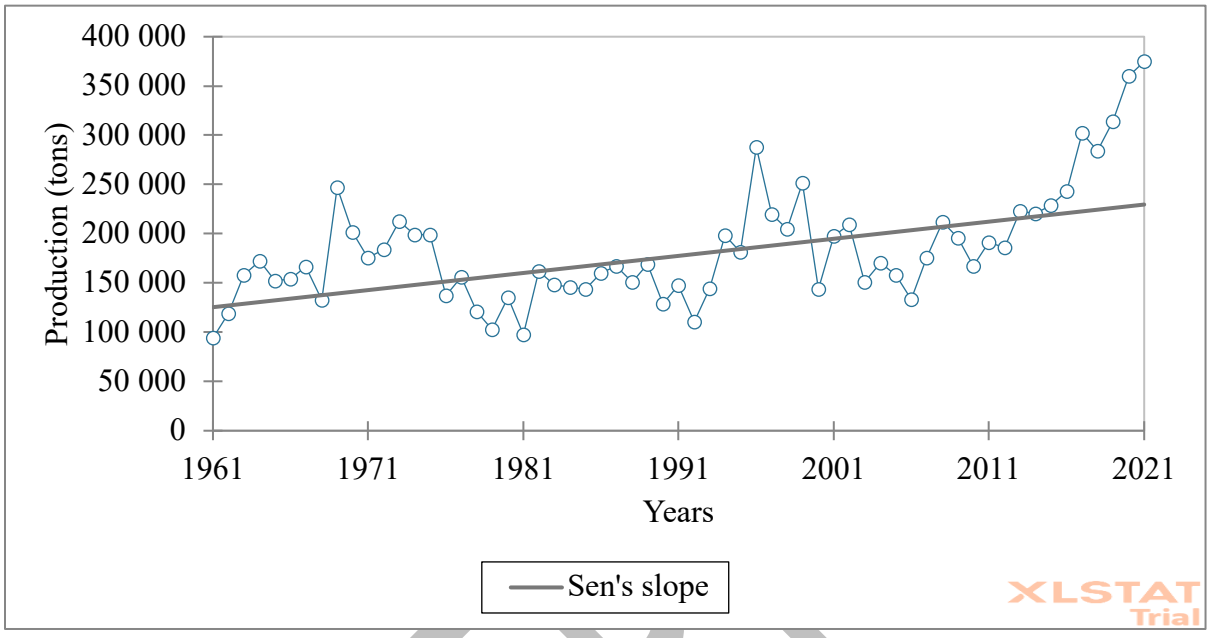

Figure 3. **Trend of Uganda's coffee production (1961-2021)**

Source: Author's own editing with data from FAO (2023)

Coffee trade dynamics

Previously, Uganda's major coffee trade partners were Sudan, India, and USA (**Figure 4**). However, the trend has since changed in the recent past with a shift to European markets taking a larger market share (58%), for example in January 2022, Uganda's main destination for coffee export was Europe with Italy holding the largest market share (30%). Other major destinations were Sudan, Germany, Belgium, and Spain with each purchasing 17.02%, 10.15%, 6.34% and 5.61% respectively. African market share accounted for only 24%, with Sudan as the main actor plus a few other countries such as South Africa, Morocco, Kenya, and South Sudan (UCDA, 2022). Given the current political instability in Sudan (Nima et al., 2023), the African market share for Uganda's coffee is expected to decline in 2023.

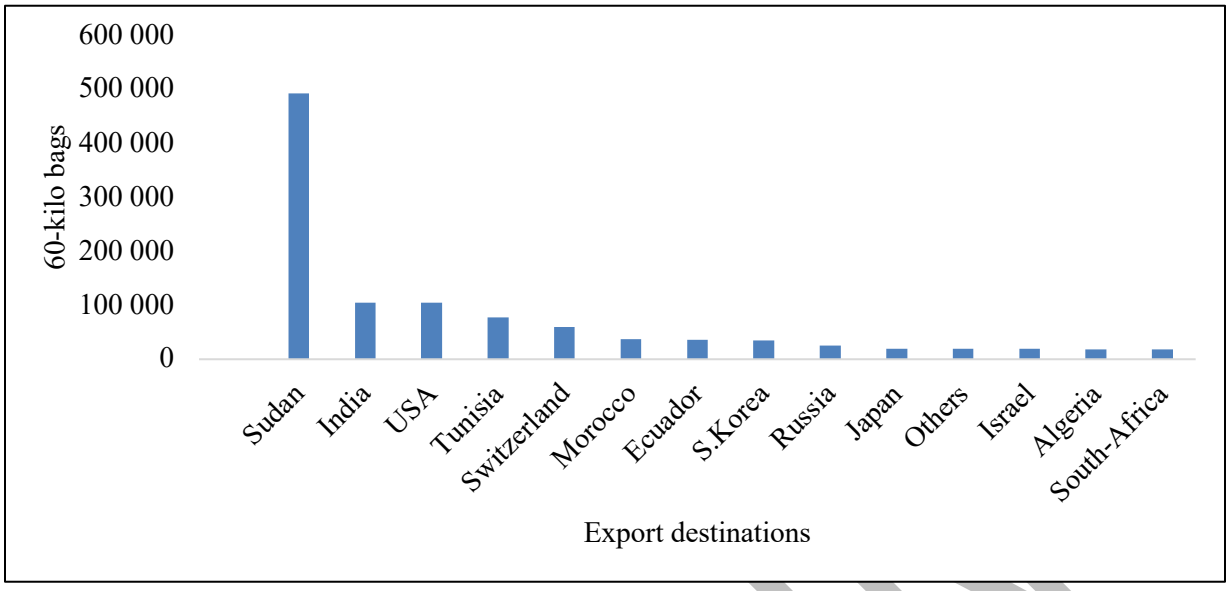

Figure 4: **Average coffee exports by destination 2007-2008 to 2016-2017**

Source: Author's own editing with data from UCDA (2022)

Amidist several challenges including, climate change impacts, Uganda's coffee exports have continued to grow both in volume and value (Nakaweesi, 2017). However, the export volumes are mainly comprised of Robusta coffee and very low Arabica coffee. Most parts of Uganda have the desirable conditions for growing Robusta coffee, that is a soil pH range of about 5.5-6.5, altitude range of 900-1,500 m above sea level, and rainfall between 1,200 mm - to 1,800 mm evenly distributed for at least 9 months every year (UCDA, 2019a). This has favored more production and export of Robusta coffee as opposed to Arabica coffee, with the favorable growth conditions in a few parts of the country. Arabica coffee requires a higher elevation of about 1,500-2,500 m above sea level, and cooler temperatures between 15^0C – 24^0C, which are only available in a few highland areas of the country (UCDA, 2019b). None the less, Uganda remained among Africa's top two coffee exporters and 8th globally by 2021 (FAO, 2023).

Evidently, progressive growth has been registered in the export of Robusta coffee with the current annual export above 6 million (60kg-bags), compared to Arabica coffee, where the export volume has remained slightly below 1 million (60kg-bags) from 1991 to 2020 (**Figure 5**).

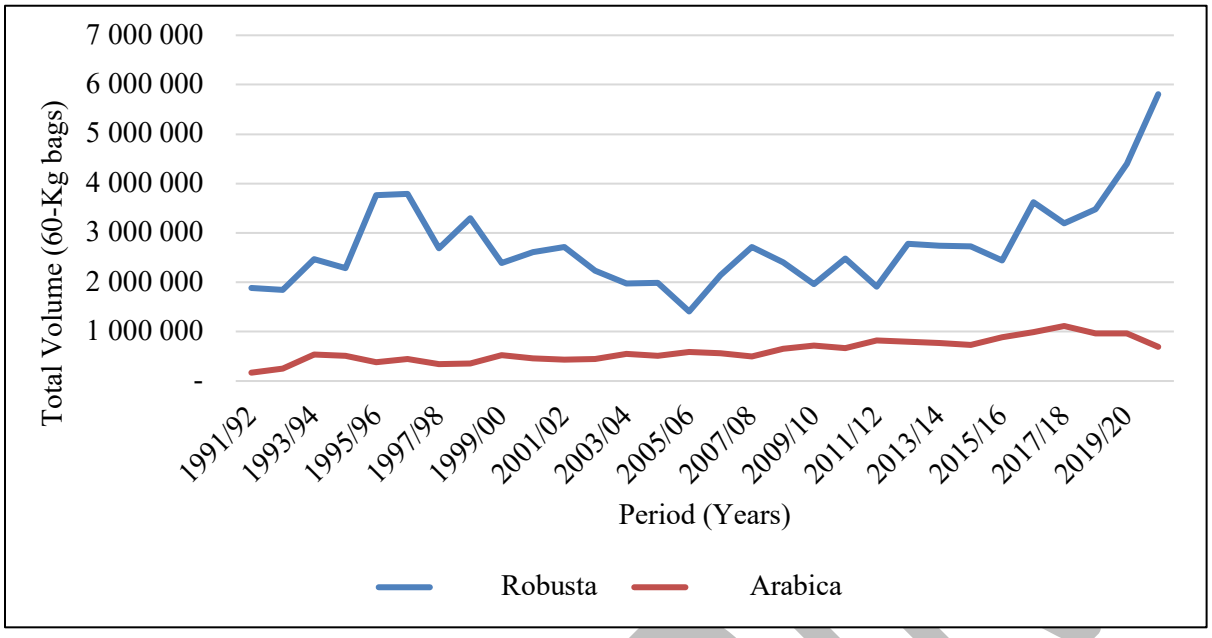

Figure 5. **Uganda's coffee exports by type since liberalization by coffee year**

Source: Author's own editing with data from UCDA (2020)

Interestingly, non-coffee producing countries like Germany, export more coffee than some producing countries such as Uganda and Ethiopia, for example, in 2021, Germany exported 343,911 tons of coffee-green, performing better than Ethiopia and Uganda that exported 303,679, and 301,366 tons respectively. Germany coffee market relies on importation from producer countries and re-export to other countries. It is not surprising that in 2021, Germany was the second global coffee importer after the USA, importing 1,112,216.52 tons of coffee-green (FAO, 2023). It is also evident that the market power is concentrated within the importing countries rather than the producing countries (**Figure 6**). Only Brazil has a substantial amount of revenue due to the exportation of much higher volumes compared to other producing countries (**Table 1**). It can also be asserted that the exportation of raw coffee by most producer countries limits their revenue potential from the coffee trade.

Table 1.**Top 10 Coffee Exporting countries (Coffee, Green) 2021**

Position	Country	Quantity (tons)	% share
1	Brazil	2,282,846	29.23
2	Viet Nam	1,218,370	15.60
3	Colombia	687,866	8.81
4	Honduras	387,661	4.96
5	Indonesia	380,348	4.87
6	Germany	343,911	4.40
7	Ethiopia	303,679	3.89
8	Uganda	301,366	3.86
9	Belgium	265,116	3.39
10	India	263,401	3.37
-	Others	1,375,810	17.62
-	Total (World)	7,810,374	100.00

Source: Author's own editing with data from FAO (2023)

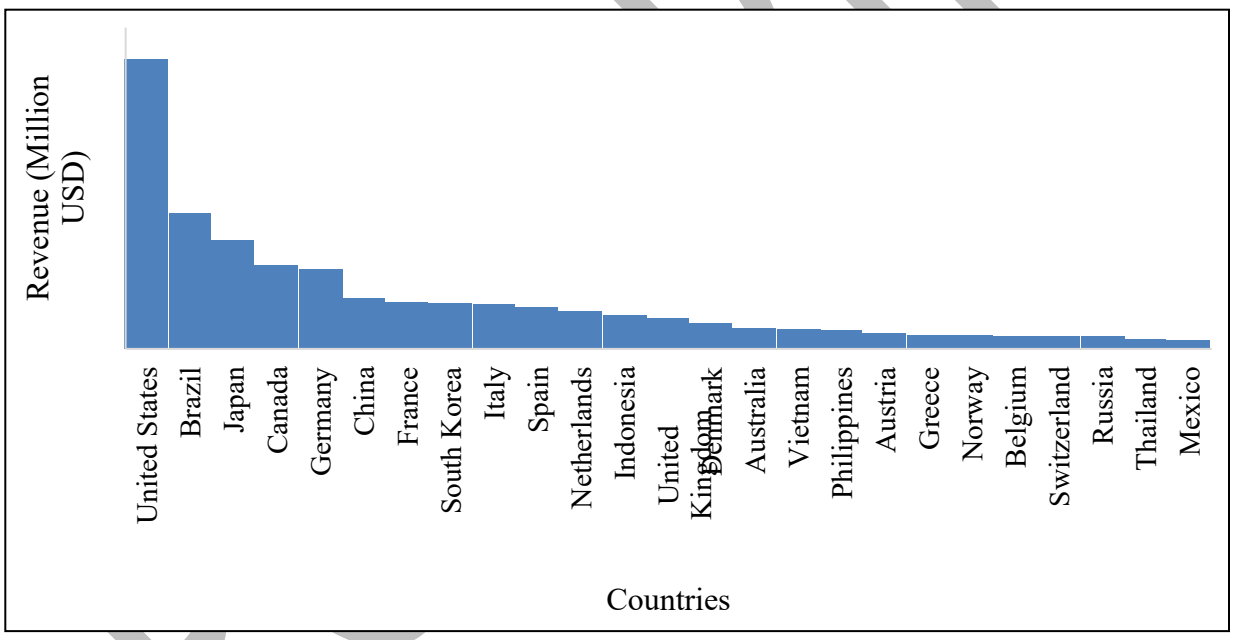

Figure 6: **Global coffee market revenue by country in 2021**

Source: Own editing - With data from Statista (2023)

Notably, a country's export value is determined by two major factors including the coffee variety and value addition. Uganda majorly exports green coffee which is of low value compared to other leading exporters like Germany and Italy that are the top exporters of roasted coffee (FAO, 2023). Robusta coffee fetches lower export value due to its low prices on the international

market, compared to Arabica coffee which has higher prices. For example, the unit price for Robusta was USD. 1.40/kg, while Arabica was bought at USD. 2.48/kg in the financial year 2020/21. Considering 2015/2016 base year, Robusta coffee prices reduced twice between 2019 to 2021 at a percentage relative price change of -3.37% and -8.96%, while Arabica prices increased by 10.02% and 25.12% in the same periods (**Table 2**). On average, both Robusta and Arabica coffee prices increased in the past 5 years at 4.29% and 12.12% respectively.

Table 2: **Average price changes per coffee type from FY 2015/16-FY 2020/21 (US $/kg)**

GRADE	**2015 /16**	**2016 /17**	**2017 /18**	**2018 /19**	**2019 /20**	**2020/21**	**Average**
Robusta weighted Price	1.54	1.83	1.75	1.57	1.49	1.40	1.60
Relative price change	-	118.54	113.58	101.68	96.63	91.04	104.29
Relative price change (%)	-	18.54	13.58	1.68	-3.37	-8.96	4.29
Arabica weighted Price	1.98	2.35	2.13	1.97	2.18	2.48	2.18
Relative price change	-	118.38	107.55	99.54	110.02	125.12	112.12
Relative price change (%)	-	18.38	7.55	-0.46	10.02	25.12	12.12

Source: Own editing with data from UCDA (2021)

The trend analysis of Uganda's coffee export value indicates a significant positive growth at ($p = 0.0001$, Slope = 4.44 million US $). However, the output value is marred by constant fluctuations especially between 1990 to 2010 (**Figure 7**). The drastic reductions were not only due to price fluctuations, but also drops in the quality and quantity of coffee produced. Rampant outbreaks of Coffee Wilt Disease (CWD) and Coffee Berry Disease (CBD) between 1990 and 2000 affected coffee production, for example, more than 40% reduction in coffee production around the 2000s was associated with Coffee Wilt Disease (CWD) (Baffes, 2006).

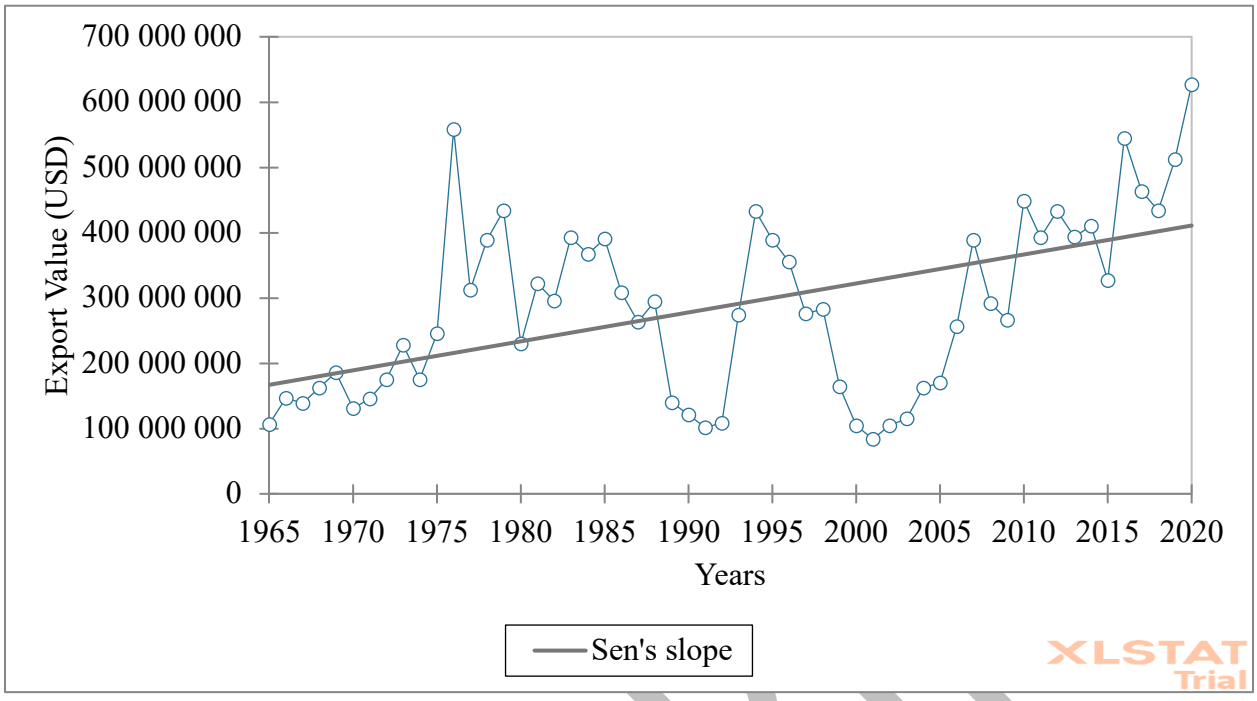

Figure 7.**Value of exports, as a function of unit export prices (1965-2020)**

Source: Author's own editing with data from UCDA (2022)

Global coffee consumption trends indicate that coffee is among the world's most preferred beverages. For example, around 166.63 million 60-kg coffee bags were consumed globally in 2020/2021, an incremental from 164 million 60-kg coffee bags in the year before (Statista, 2023). Furthermore, those in the coffee business are always inventing new and creative techniques for preparing and serving coffee such as single cup brewing techniques that provide an instant, clean, and hassle-free method for producing one coffee cup minus the effort of brewing a whole pot. (ICO, 2021a). Such innovations present several opportunities for coffee producing countries like Uganda to improve their returns from coffee business. For a country to benefit, strategies must be laid to increase production efficiency as well as maintaining/improving the quality to compete favorably on the world market.

Additionally, the domestic coffee value chain should be enhanced through promotion of local coffee brewing and consumption. This was evident from Uganda's low coffee consumption per capita of only 2.23kg/capita/year, compared to other top consuming countries such as Luxembourg with a consumption per capita of 25kg/capita/year (FAO, 2023). A report by

UCDA (2021) indicated that 10% domestic consumption of the total coffee produced could add up to $2.3 billion annually to Uganda's economy.

Risk factors and Variability of the coffee sector

From a worldwide perspective, considering the top 10 top coffee exporting countries (only producers) as ranked by FAOSTAT, there is a high degree of variability in terms export earnings from coffee exports implying a huge difference in the stability of the earnings between different countries. It is worth noting that Uganda's earnings are highly unstable compared to the other top 10 exporting countries with a percentage coefficient of variation of 20.1% only below Colombia, Honduras, and Ethiopia with 21.5%, 22.4% and 23.6% respectively (**Figure 8**). The variability can be attributed to the unstable export volumes and the fluctuation in the world prices.

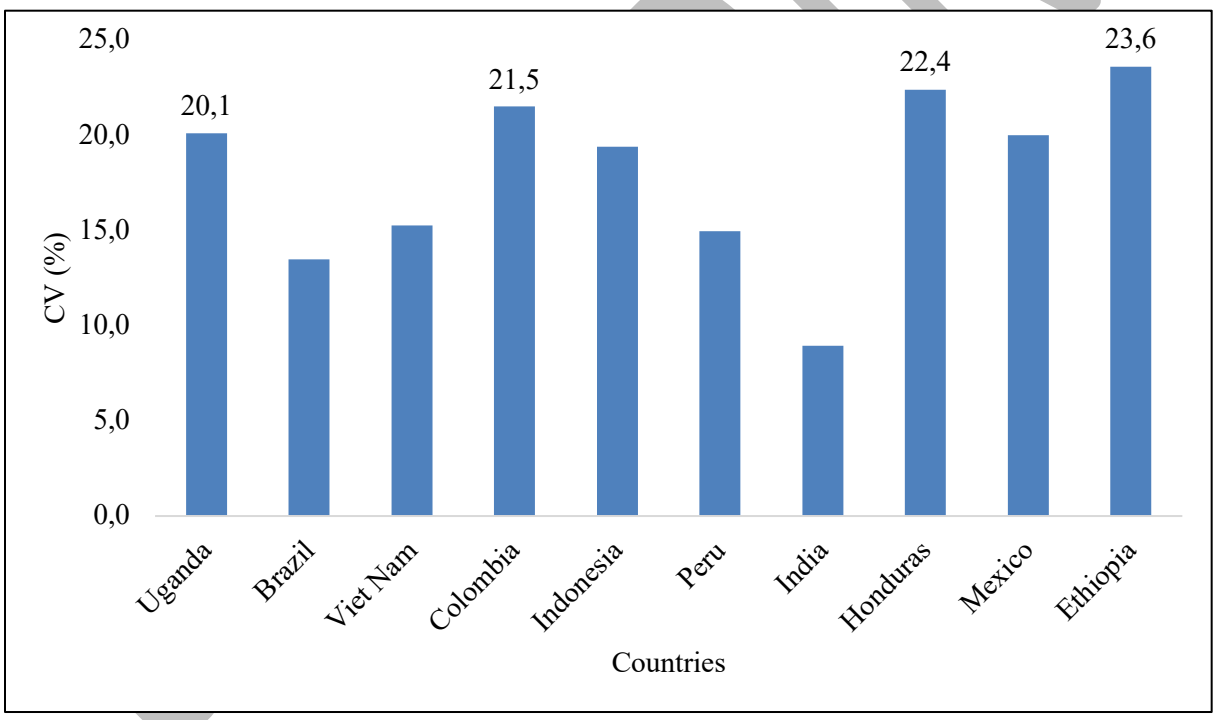

Figure 8: **Risk Variability based on export value of top exporting countries (2011-2021)**

Source: Own editing with data from FAO (2023)

Global cross-cutting issues regarding coffee trade

According to the bibliometric analysis of keywords plus for published literature regarding coffee production and trade from the Web of Science database between the years 1975 to 2022, the

most outstanding areas of global research focus included the “impact” of “climate-change”, and the role of “fair trade” and “certification” on the global coffee trade, each with a total link strength of 20, 16, 15, and 14 respectively (**Table 3**).

Table 3. **Cooccurrence of keywords plus**

Id	Keyword	Occurrences	Total link strength
1	Impact	11	20
2	Coffee	8	10
3	Fair trade	8	15
4	Climate-change	7	16
5	Certification	6	14
6	Farmers	6	15
7	Food	6	9
8	Growth	6	8
9	Management	6	13
10	Market	6	6

Source: Author’s own editing with data from the Web of Science

The connection between the keywords indicates that the latest areas of interest are certifications and land use, represented by the deep red circles (**Figure 9**). Certification is a fundamental prerequisite for access to specific global markets including niche markets such as organic markets. Questions remain on whether this is an enabler or barrier, especially for producer countries whose capacity to adjust to new market standards might be limited by resource constraints. For example, according to the Uganda Coffee Development Authority, export certification is highly bureaucratic involving a 13 steps licensing process (UCDA, 2020a). This has led to the concentration of market power among the very few certified exporters, thus unfair trade since there is limited competition. Besides, coffee farmers must accept the set prices by the few registered exporters despite the unfair low prices in certain circumstances.

Interestingly, there has been a steady increase in the number of export companies from 54 in 2016 to 88 by 2020, despite the very low number of value addition service providers such as, hullers, washing stations, roasters and grading plants (UCDA, 2021).

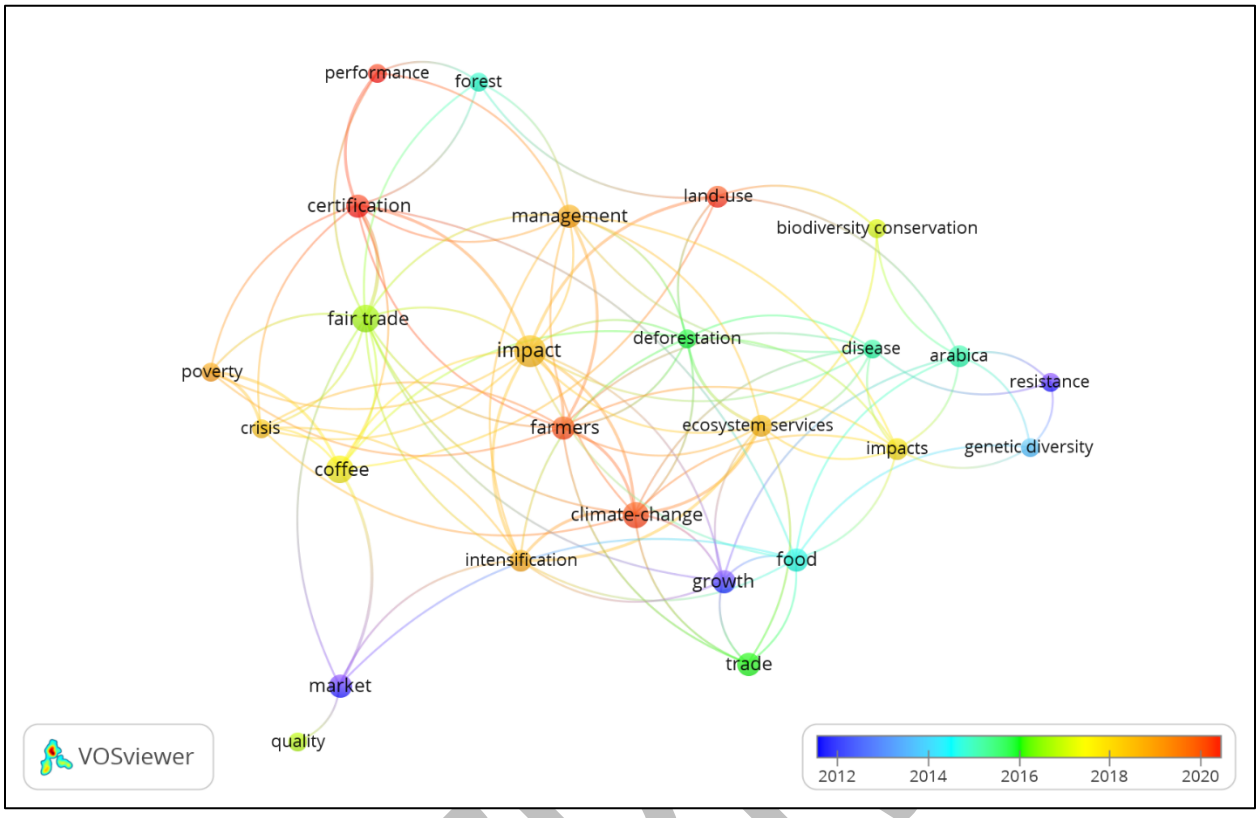

Figure 9: **Overlay visualization of the keywords' connections**

Source: Author's own editing with data from the Web of Science

CONCLUSION

A significant positive trend in coffee production and output value has been established, indicating a remarkable and strategic importance of the coffee sector to Uganda's economy. However, the risk variability analysis indicates a high level of fluctuation in output value which is associated with price instabilities, exportation of more Robusta coffee with low prices at the world market, limited value addition and low domestic consumption. The government Uganda through the Uganda Coffee Development Authority must be credited for the tremendous support to the coffee sector, although more must be done to improve the returns from the sector by promoting value addition through establishment of coffee processing and roasting plants, promoting domestic consumption, further research to counter emerging global challenges such the negative impacts of climate change on coffee production, and capacity development to enhance compliance to global standards and certifications. There is also a need to alter the global Robusta market preposition through better marketing and promotion campaigns.

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