Article

Profitability Analysis of the Robusta Coffee Value Chain in the Tshopo Province, Democratic Republic of Congo

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Abstract: This article addresses the financial viability of agents in the robusta coffee sector. The objective is to calculate and analyze the profitability performance of the coffee sector in Tshopo in order to inform the subsequent development of business projects in the robusta coffee sector. Moreover, the analysis will assist decision-makers and investors in determining the optimal allocation of funds to the most profitable links in the robusta coffee sector in Tshopo. A cost-benefit analysis was conducted, employing a discounting methodology to evaluate the cash flows of agents engaged in the robusta coffee sector. This entailed the calculation of the net present value, internal rate of return, and payback period. The results demonstrate that the coffee sector is performing well, with agents' cash flow sufficient to repay the initial investment. It can thus be concluded that, in consideration of the favorable profitability criteria, there is minimal risk in investing in the robusta coffee sector in Tshopo.

Keywords: investment; profitability; net present value; internal rate of return

1. Introduction

Democratic Republic of the Congo (DRC) is the second largest country in Africa (2,345,410 km^2) after Algeria. The country has considerable agricultural potential, with 75 million hectares of arable land [1]. However, the DRC faces a deficit in agricultural development. Only 10 million hectares, i.e., around three percent of land, is cultivated [1,2]. Congolese agriculture is affected by factors that limit its productivity. These include technical factors, such as crop diseases and pests, the failure of the agricultural extension system, the deterioration of the production and transport infrastructure, and poor access to agricultural inputs [3]; institutional factors, relating to the governance of public and private agricultural support institutions; and economic factors, such as producers' lack of market competitiveness, poor access to agricultural credit, and a lack of diversity in financial products [4,5].

However, efforts continue to be made to improve the governance of public and private institutions supporting agriculture in the DRC. In addition to the 2002 investment code and the 2011 law on fundamental principles relating to agriculture, an agricultural investment plan was drawn up in 2013. The aim is to plan national and external funding for the agricultural sector. More recently, in 2022, an ordinance was signed to promote

entrepreneurship in all areas of national life, including agriculture. Despite these efforts, access to agricultural credit remains low [4]. The low profitability of agricultural activities due to technical problems and the risky nature of agricultural activities due to the lack of financial products, including agricultural insurance, do not encourage financial institutions to lend to farmers [5].

A decision to invest, particularly in the robusta coffee sector, can only be justified by the profit generated and/or the sustainability of the activity [6–8]. In addition to the opportunity cost of capital and the agricultural risks linked to yields, production costs, and market price volatility [7–9], the possession of an economic or financial resource does not have the same value at different times. There is a strong preference for the present over the future [10]. To this end, economists have introduced profitability criteria that may or may not involve discounting in order to reconcile costs and benefits [11–14]. The calculation and analysis of the performance of an economic activity enables the determination of profitability and provides investors with the assurance they require regarding the allocation of funds to the sector. That is why we conducted this research.

The main question of this study is formulated as follows: Is an investment in the robusta coffee sector profitable for agents in different chain links? Two main scenario assumptions are: (i) all agents in the Tshopo coffee sector are solvent with creditors or commercial banks, and (ii) by comparing the profitability indicators of different agents, priority in resource allocation will be given to those offering the highest returns. The profitability of the initial investment made by agents in the coffee sector has been evaluated, i.e., to assess over time whether the agents' cash flow will be able to repay the initial investment. A complementary assumption of a variation in the cost of capital and goods prices was retained for the NPV sensitivity analysis. The aim of this study is to assess the profitability of robusta coffee sector activities, to evaluate the relevance of investing in the coffee sector, and to help decision-makers, investors, and banks decide whether to allocate funds to robusta coffee sector agents in Tshopo. By analyzing the sensitivity of the NPV, we were able to assess the risks and uncertainties of each link in the chain as the opportunity cost of the price of capital increases. In addition, given the limited access of coffee agents to capital markets, the updated profit/cost ratio (RBC) was calculated. The RBC can be interpreted as the return on investment (ROI) per unit of cost [15]. The RBC calculation helps to assess the risks associated with each link by taking into account different assumptions and ensuring that each link is financially viable and profitable, taking into account the time value of money [16]. It is used to guide decision-making in resource allocation, especially when there are several competing alternatives or projects.

2. Theoretical Framework: Performance of Economic Activity

Economic performance defines the techno-economic aspects of a farm. It can be used to compare farms with different economic structures [17]. It refers to the marginal value of product per unit of input expenditure. However, farmers are interested in indicators and scientific methods for evaluating this performance. These indicators and methods should make it possible to qualify activities and report on their individual or collective performance towards a viable agriculture, i.e., one that meets the long-term security of each source of income. In other words, the sustainability of the farm [18]. The scientific method used to assess economic performance is basically financial and economic analysis. In this study, cost-benefit analysis based on discounting was used. Agent cash flow and indicators such as net present value, internal rate of return, and the payback period (PP) were analyzed. These indicators help the financial institutions and banks to grant loans to the coffee farmers.

Investing means giving up consumption in the present in order to increase future income. Investment is therefore a flow that requires capital formation [19]. A cost-benefit analysis is a method used to manage investment risks and to evaluate the value of money over different chronic. In this study, this method is used to assess the value of money. The concept was developed with the objective of operationalizing social well-being, which can be conceptualized as a function of individual well-being. This well-being is linked in a non-linear way to income (i.e., all forms of monetary value). NPV is an indicator of the real value of a project [11–20]. In finance, any activity requiring an initial investment is considered an investment project [8]. NPV captures the precise opportunity cost of capital and the cost of delayed/lost revenue when demand is in arrears/lost [21,22]. In principle, an investment is profitable if the NPV is greater than zero [22,23] and, out of a set of mutually exclusive projects, the one with the highest NPV should be chosen. The aim of this study is to determine the most viable link in the coffee chain.

Although the NPV allows for the assessment of an investment's capacity to generate value over time and at a fixed rate of return [8], it does not account for the distribution of net benefits among the various stakeholders in a value chain [24]. Furthermore, given the limited access of coffee sector agents to capital markets, a ratio called the profitability index (PI) was calculated. It represents the current rate of return or NPV efficiency for groups of agents in the robusta coffee sector in Tshopo province. The PI is a suitable indicator for comparing the performance of private equity with that of financial markets [25]. It is a profitability indicator that measures the value of each franc invested [8]. The internal rate of return is the discount rate that cancels out the net present value. In principle, IRR is often used to make investment decisions. For an investment to be selected, its IRR must be positive, and in the case of two exclusive projects, the project with the high IRR is preferred to the one with the low IRR. The IRR indicates the risk-bearing capacity of the project. In this study, the aim is to identify the link with the lowest financial risk. Payback Period (PP) is a method to find out how long it will take to return the funds invested in a project. It is the time required for the sum of annual net cash flows to be equal to the initial investment [23,26]. This concept gives an indication of the time period needed to reach the break-even point on an investment. The shorter the payback period, the better the project [27].

3. Materials and Methods

3.1. Study Area Location

The data for this study were collected in the seven territories of Tshopo Province (Figure 1), Democratic Republic of the Congo (DRC). This one is situated in the northeastern region of the DRC, spanning latitudes between 2° N and 2° S and longitudes between 21°24′ E and 28°2′ E [28]. The choice of Tshopo was motivated by the fact that it has historically played an important role in both the selection and production of Robusta coffee in the DRC [29–31].

The Tshopo economy is based on subsistence farming and traditional livestock breeding [32], with equipment that is largely consistent across territories [33]. Tshopo's climate is classified as Af according to the Köppen system, which denotes an equatorial climate. The region is distinguished by elevated temperatures and a considerable amount of precipitation throughout the year, which contribute to a distinctive climate. The annual temperature range is 24.2 ± 0.4 °C in July and 25.5 ± 0.6 °C in March. The annual precipitation is 1842 ± 254 mm [34]. Precipitation occurs in two distinct seasons. The lowest precipitation levels (150 mm) are observed from December to February and from June to July, while the highest precipitation levels occur in March to April and in October to November [34,35]. The predominant soil type in Tshopol is ferralitic, with a sandy-clay texture [35]. This pos-

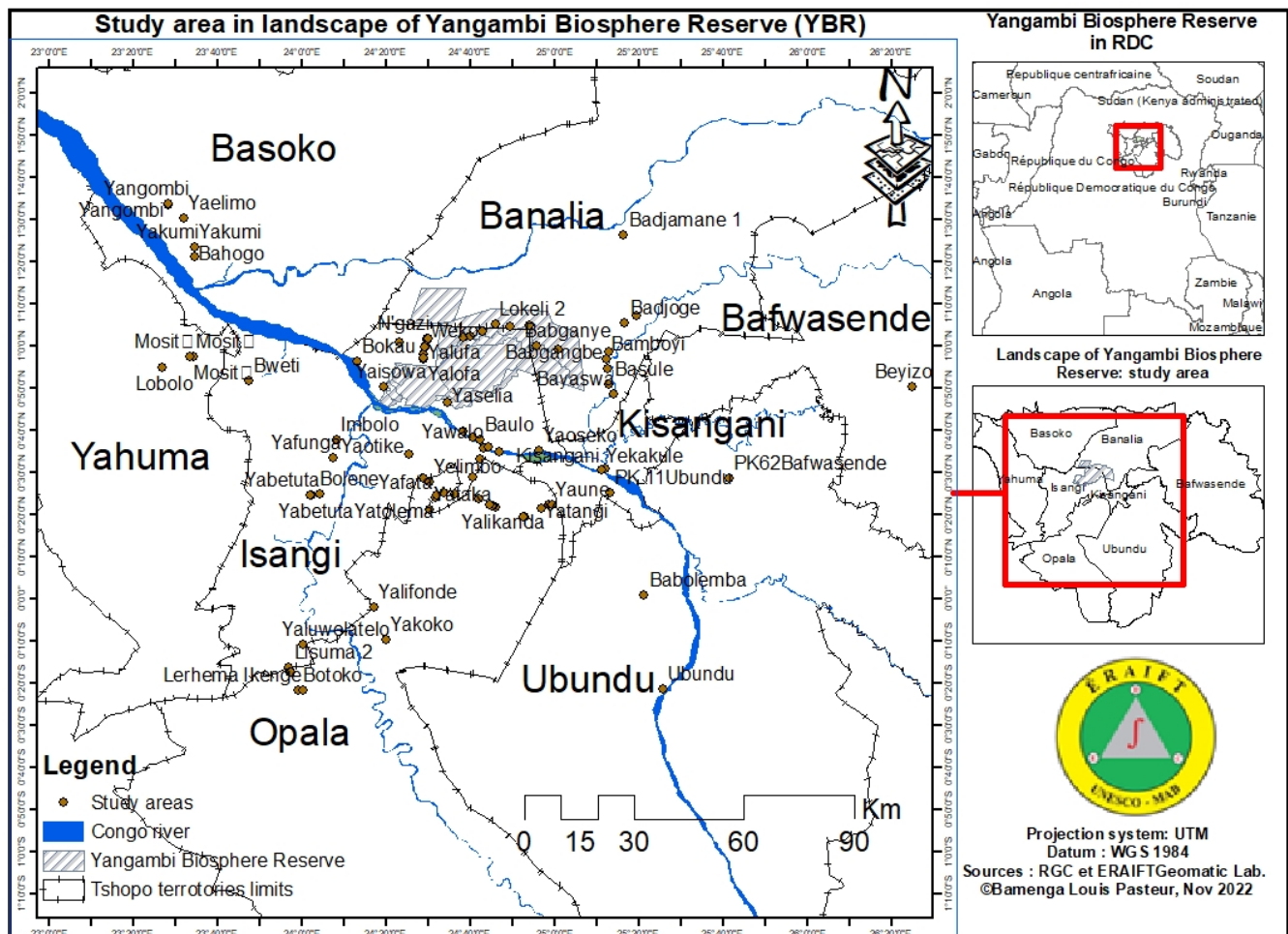tulates that Tshopo has edaphoclimatic conditions favorable to the cultivation of Robusta coffee [36].

Figure 1. Location of the study sites in Tshopo province, DRC.

3.2. Farmer Selection and Data Collection

The data for this study were collected between June 2021 and October 2022. The snowball method, which consists of asking a respondent for the address of another person, was used to reach the actors involved in coffee production in Tshopo Province, DRC. To avoid the bias associated with this sampling method, recruitment continued well beyond the "germ" and its recruits [37], up to the 16th wave.

Data production for this study included both qualitative data, particularly the presence or absence of investors and access to agricultural credit, and quantitative data. The quantitative data relate to the source of cash flow, which is revenue of the selling coffee, and the investment and operating costs of the robusta coffee exploitation. The depreciation calculation period was chosen based on the actual values of tool use by sector players. Producer tools (machete, hoe, and basket) have a useful life of 3 years, trader tools (basin, screen, and scale) have a useful life of 2–5 years, and processor tools (tarpaulin, scale, roaster, mill, and generator) have a useful life of 2–10 years. Information on the price of coffee, producer, trader, and processor tools was obtained from actors involved in the coffee sector and in the local market. Furthermore, survey data were compared with real market data [22]. This information was collected from the agents during the interview. The October 2022 market price was used. This price was converted in constant price, using the mathematical expression below. In Ex-ante analysis, constant price can be used to avoids

errors resulting from inflation [11], which was done in this study. This type of reasoning assumes that prices remain unchanged relative to one another: the impact of price increases is then identical for costs, benefits, and the net balance.

$$\text{Prices in constant currency} = \left(\frac{P_t}{\text{CPI}} \right) \times 100$$

with P_t: the price of goods and services at time t (t is the current date), and CPI the consumer price index $\left(\text{CPI} = \frac{P_t}{P_0} \right)$. P_0, is the price of goods and services at time t_0 (t_0 is the reference date). The timing of future profits was determined by the theoretical period of the physiological decline of the coffee tree fruitification. This period is 20 years under optimal maintenance conditions (weeding and pruning), without shading [38]. A project life of 20 years was assumed for all actors in the sector.

NPV and IRR have been calculated on the basis of a cash flow statement, including revenues and annual production costs (fixed and variable costs), using Excel. This one uses the following formula to calculate NPV [6–23] in thousands of constant Congolese francs:

$$\text{NPV} = \sum_{t=1}^{t=n} \frac{(B_t - C_t)}{(1 + I)^n}$$

where B_t is the benefit at time t, C_t is the cost at time t, t is time in years, and n is the number of years. Furthermore, I is the discount rate. Since the discount rate for a given period measures the relative variation in the price of capital [39], this rate corresponds to the prime rate for commercial banks in May 2023. This rate is 9%. It corresponds to the profitability expected by all the company's providers of funds (shareholders and creditors). It also takes into account the risk associated with an investment and helps companies to allocate their capital optimally. NPV sensitivity analysis was also carried out to assess the risks and uncertainties [40] of each link when the cost of capital and the price of goods vary by 16% and 11%, respectively, compared with the initial scenario. The Pearson coefficient was calculated using R 4.3.1 to determine the correlation between the net present value of the agents (producer, coffee collector, green coffee collector, green coffee trader, roasted coffee trader, and processor) based on the initial investment cost. Benefit/Cost Ratio: Is the ratio among the total benefits and total costs when brought to a present value [22]. The equation used was:

$$RBC = \frac{\sum_{t=1}^{t=n} \frac{B_t}{(1+i)^n}}{\sum_{t=1}^{t=n} \frac{C_t}{(1+i)^n}}$$

where B_t is the benefit at time t, C_t is the cost at time t, t is time in years, and n is the number of years. If the BC ratio is greater than 1, this means that the link in the robusta coffee chain is profitable since each invested CDF brings more benefits than it costs. If it is less than 1, this means that the cost incurred outweighs the resulting benefits [16]. Since the internal rate of return is the discount rate that cancels out the net present value, it was calculated using the following formula:

$$\sum_{t=0}^{n} \frac{CF_t}{(1 + \text{IRR})^t} = 0 = \text{NPV}$$

where CF_t is the cash flow, IRR is the internal rate of return, NPV is the net present value, and t is the year (from zero to n). The payback period (PP) was found by cumulating the costs and benefits until they were equal. The Kruskal–Wallis test was also performed in R to test the difference between the medians of the NPV, BC ratio, and the IRR of groups

of actors (producers, hull coffee collectors, green coffee collectors, green coffee traders, roasted coffee traders, and processors) in the robusta coffee sector in Tshopo.

4. Results

4.1. General Characteristics of the Respondents

This study involved 108 robusta coffee producers, two hull coffee collectors, four green coffee collectors, nine green coffee traders, 20 roasted coffee traders, and two processors. It was carried out among smallholders with an initial investment of between 330,343 and 27,104,100 CDF. The majority of respondents were men (85.5%), with a minority of women (14.5%). The age of the respondents ranged from 22 to 82 years, with an average age of 51 years. In terms of education, 0.9% had not attended school, 45.4% had attended primary school, 39.8% had attended secondary school, 8.3% had only vocational training, and 5.6% had attended high school and university.

The coffee farms visited in Tshopo vary in size (0.2–12 ha). 99.1% of farmers have fields of two hectares or less. Around half the coffee farms (49.6%) are 15 years old or younger. Harvesting takes place between August–October and November–April. The peak harvest period, called the "campagne" by stakeholders, begins in November and lasts until March. Local production of green coffee varies from 2.16 to 8070 kg, with a median of 60 kg.

4.2. Investors and Access to Credit or Subsidies

The results of our survey of companies investing in coffee in Tshopo showed that only one company has invested in coffee plantations in Tshopo Province: Jadora International, which has a coffee plantation in Yafunga in Isangi territory.

Regarding access to credit or subsidies, private agents involved in the robusta coffee business claim not to have access to credit. However, 2% of the agents involved in the coffee business, mainly producers, have received support in the form of farm equipment and seeds from international organizations such as FAO and Enabel.

4.3. Profitability Criteria for Investment in the Robusta Coffee Sector

The profitability criteria for agents in the coffee sector in Tshopo Province over a 20-year period are shown in Table 1 below.

Table 1. Profitability criteria for agents in the coffee sector in Tshopo Province.

	Producer	Hull Coffee Collector	Green Coffee Collector	Green Coffee Trader	Roasted Coffee Trader	Processor
Initial investment	330,343	27,104,100	5,901,000	77,877,341	16,941,391	21,025,420
NPV (9%)	653,814	35,870,152	10,917,484	130,970,798	27,573,387	28,660,938
BC ratio (9%)	1.38	1.16	1.37	1.99	1.35	1.25
PP (year)	8	8	8	8	7	7
IRR (%)	19.9	26.4	32.9	30.9	30.2	29.4
NPV (25%)	−109,498	1,158,099	1,447,609	14,158,294	2,736,905	2,596,415
BC ratio (25%)	0.96	1.01	1.11	1.17	1.07	1.05
NPV (25%) and price increase (11%)	−12,044	127,390	159,237	1557,412	301,059	285,605

Table 1 shows that the net present value is greater than zero for all actors involved in the robusta coffee business in Tshopo. This means that the robusta coffee business is profitable for all actors involved, from production to processing. According to the NPV rule, from a set of mutually exclusive projects, the one with the highest NPV should be selected. Thus, the green coffee collector activity is the best, followed by the green coffee trader, the roasted coffee trader, the processing, the husked coffee merchant, and finally the production activity. Various trade-offs were made by agents to obtain these results. These include making greater use of family labour and choosing to pay informal taxes

instead of all formal taxes, which are very onerous for some agents. Nonetheless, when the cost of capital increases, agents, particularly producers, have shown themselves to be sensitive to this increase, with a negative NPV. Even when the increase in the cost of capital is accompanied by an increase in the price of goods, this chain link has always shown itself to be sensitive, with a negative NPV. This analysis has shown that the variation in the cost of capital influences the viability of all the chain links in terms of the payback period for the capital invested, particularly the producers' chain link.

Notwithstanding, the Pearson test (*p*-value = 0.000 and r = 0.995) showed a highly elevated correlation between the net present values and the discounted initial investments of the eight groups of agents in the coffee sector. This test did indeed answer the main question of our study. Furthermore, given that NPV depends on initial investment, we compared the agents according to the profitability index, which reflects the efficiency of NPV. To this end, the agents were classified as follows: green coffee collector > green coffee trader > roasted coffee trader > processor > hull coffee collector, and finally, the producer. The actualized B/C ratio shows that all agents receive a return on investment of more than 1. To this end, agents have been classified as follows: green coffee trader > producer > green coffee collector > roasted coffee trader > the processor, and finally, hull coffee collector. From the above, it is reasonable to focus on the green coffee trader's chain link. For one constant CDF invested, the green coffee trader 0.99 CDF, the producer receives 0.38 CDF, the roasted coffee trader receives 0.35 CDF, the processor receives 0.25 CDF, and the hull coffee collector receives 0.16 CDF. The Kruskal–Wallis test (*p*-value: 0.4159 > 0.05) shows that there is no median difference in NPV efficiency between the different groups of coffee chain agents in Tshopo. Low investment also produces low income and low NPV efficiency for all coffee chain agents in Tshopo province. Low investment also produces low income and low NPV efficiency for all agents in the Tshopo province coffee sector. In this study, NPV is not only positive but also correlated with initial investment. These results confirm that high initial investment in the robusta coffee sector translates into higher cash flow returns in the future. These results are similar to those of the comparative analysis of NPV and IRR indicators based on practical applications [40]. They postulate that improved investment in the robusta coffee sector in Tshopo can contribute to the revival of the sector. The positive NPV and the RBC greater than one indicate that investments in the various chain links of the robusta coffee sector in the Tshopo are profitable. However, Table 1 also shows that the increase in the cost of capital invested from 9% to 25% affects the NPV of all agents, especially that of the producer who becomes negative even when the price of goods increases by 11%. The same applies to the actualized BC ration.

The IRR (19.9 to 32.9%) does not seem to depend on the size of the investment. The IRR indicates the project's capacity to bear risk, at discount rate. Thus, the green coffee collector chain link (32.9%) can bear the risk better than the producer link (19.9%). It also indicates the project's ability to repay the investment. Commercial bank lending rates in the DRC of 15.3 to 21.5% [41] are lower than the IRRs found of 19.9 to 32.9%. This means that the Robusta coffee chain in Tshopo is economically profitable from the point of view of capital investment. Indeed, an agent in any chain link of the robusta coffee who takes out a loan at an interest rate of between 15.3% and 21.5% will be able to pay the interest from the income generated by his coffee activities.

In principle, IRR is used when making investment decisions. For an investment to be selected, its IRR must be positive and, for two exclusive projects, the project with a high IRR is preferred to the one with a low IRR. In the case of the robusta coffee sector in Tshopo, IRRs are positive for all agents. They range from 19.9% for the producer to 32.9% for the green coffee collector. These positive IRRs postulate that the investment in each link of the coffee chain is profitable even if the preference for the present were to increase more

and more, i.e., the activity generates revenues capable of repaying the initial investment. Following the IRR value in Table 1, preference can be ranked in descending order from green coffee collector > green coffee trader > roasted coffee trader > processor > hull coffee collector, and finally, the producer. This ranking assumes that the most advantageous chain link is that of green coffee collector and the riskiest chain link is that of Robusta coffee producer in the Tshopo region. The producer will not be able to repay at a rate of 21.5%. Nevertheless, the Kruskal–Wallis test (*p*-value: 0.4159 > 0.05) showed that there was no difference between the different groups in terms of IRR. The payback period ranged from 7 to 8 years. The break-even point is 7 years for the roasted and processed coffee trader. With the increase in the cost of capital, the payback time has varied beyond 20 years for all actors.

5. Discussion

The low incidence of entrepreneurship in the Tshopo coffee sector can be explained by the opportunity cost, which is the highest rate of return foregone [42]. Indeed, coffee is known as an export crop. Tshopo's isolation from export ports and fiscal constraints, both in Tshopo Province and in other neighboring provinces, could explain the low incidence of firms interested in the coffee sector operating in Tshopo.

Regarding the very limited access to credit, we felt that this could be related to the existence of credit market frictions in the Tshopo robusta coffee sector [43,44]. Indeed, investors, especially commercial banks, are likely to be interested in finding entrepreneurs who are also looking for credit to carry out their activities. In addition, banks take into account the current interest rate preference and the probability that the credit relationship will not break down. Indeed, apart from the level of wealth characterized by the possession of valuable assets, studies by [45–47] found that the age and educational level of the customer has a strong impact on access to credit. In the case of our study, we believe that these determinants, especially age and low educational level, also explain the low access to credit by coffee farmers in Tshopo. Access to financial markets can be improved by combining the reduction of market frictions, financial education, the simplification of financial products, and the creation of a business climate that attracts young graduates to coffee sector activities. Reducing financial market frictions requires a coordinated set of reforms and initiatives aimed at improving infrastructure, transparency, regulation, and access to financial products. This not only makes financial services more accessible, but also increases market competitiveness, which benefits both consumers and businesses. These measures also contribute to financial inclusion, particularly for groups underserved or excluded from the traditional financial system. By adopting these strategies in a way that is inclusive and tailored to the specific needs of target populations, it is possible to broaden access to financial services and foster economic and social inclusion in an environment characterized by market frictions and low levels of financial literacy.

The results of this study show that NPV is not only positive but is also correlated with initial investment. The study of coffee yield and its socioeconomic impact in the territory of Idjwi, South Kivu province in DR Congo show the relation between initial investment in the coffee sector and cash flow return in the future [48]. This study confirms that a high initial investment in the robusta coffee sector translates into a higher cash flow return in the future. These results are similar to those of the comparative analysis of NPV and IRR indicators based on practical applications [49]. Similar discounted values were found in a study of social return on investment in the Coffee sector in DRC [50]. These results postulate that improved investment in the robusta coffee sector in Tshopo can contribute to the revitalization of the sector. The positive NPV indicates that investing in the different activities of the robusta coffee chain in Tshopo is profitable. The sensitivity analysis of

the NPV showed that the change in the cost of capital is mainly affecting the profitability of the agents in the production chain. The producer has gone from a positive NPV to a negative NPV, even with the increase in the price of goods. This analysis showed that the variation in the cost of capital influences the viability of all chain links in the robusta coffee sector with regard to the payback and BCR, more particularly in the chain link of producers. The payback period beyond the 20 years (project duration) can be a major risk due to the weakness of the local currency and political risk. The agent BC ratio decreased from 1.99 to 1.17 for the green coffee trader, a gap of 0.82 and from 1.38 to 0.96, a value below one for the producer. The study in Kenya came to the same conclusion as the capital cost volatility hurts coffee market [51]. The high risk in the producer links is explained by the fact that it does not have the negotiating capacity. The need for liquidity to satisfy family needs makes producers "price takers". Like in the spectral analysis and the death of value investing and in the risk and return of value stocks studies, we estimate that chain links that receive less value are associated with higher levels of uncertainty about future cash flow generation capacity [52,53]. Organizing these actors in cooperatives can improve both the constraints related to production, including land, technical, and financial issues. The cooperative also makes it possible to decouple the coffee economy, while preserving the large-scale operation, whose colonial remains could well still provide the model [54]. In addition, the use of fiscal policy instead of monetary policy to curb inflation can protect vulnerable businesses. The IRR (19.9 to 32.9%) efficiency values do not seem to depend on the size of the investment. The IRR indicates the risk-bearing capacity of the project. For example, the green coffee collector activity can bear the risk better than the producer activity. The IRR also indicates the project's ability to repay the investment. The study in the beekeeping sector in the DRC found an IRR of 87% [55]. Soybean producers in Benin have an IRR that varies between 45% ± 21% and 73% ± 35%, depending on whether the producer is self-financing or obtaining external financing [56]. In addition, producers of cashew nuts and the marketing of cashews in Northern Benin achieve an IRR of 13.26% and 33%, respectively [57,58]. Commercial bank lending rates in the DRC of 15.3 to 21.5% are lower than the IRRs found of 19.9 to 32.9%. This means that the robusta coffee chain in Tshopo is economically viable in terms of capital investment. In fact, an agent in any activity of the robusta coffee chain who takes out a loan at an interest rate between 15.3% and 21.5% will be able to pay the interest out of the income generated by his or her business. However, the producer will not be able to access a loan greater than or equal to 20% of the interest rate.

6. Conclusions

International economics and finance have made cost-benefit analysis, based on discounted cash flows, an essential component of strategic investment decisions by businesses. The analysis conducted in this study for actors in the robusta coffee sector in Tshopo shows that all activities in the chain are profitable. The analysis carried out in this study for agents involved in the coffee robusta sector in Tshopo showed that all links of the sector are profitable in terms of NPV, BCR, IRR, and PP. However, when the cost of capital increases as a result of the inflation containment effort, smallholder farmers are vulnerable to the NPV becoming negative and the PP becoming longer. This would explain the low occurrence of enterprises that undertake in the robusta coffee sector in Tshopo. To this must also be added the distance of Tshopo from the ports of export. Credit market frictions, the age of coffee farmers, and their level of education could explain the very limited access of coffee farmers to credit.

References

1. Lebailly, P.; Michel, B.; Ntoto, M.A.R. Quel développement agricole pour la RDC? In *Conjonctures Congolaises 2014—Politiques, Territoires et Ressources Naturelles: Changements et Continuités*; Omasombo, T.J., Marysse, S., Eds.; Editions L'Harmattan: Paris, France, 2015; pp. 45–63. Available online: https://orbi.uliege.be/handle/2268/180428 (accessed on 14 May 2023).
2. FAO. *République Démocratique du Congo | Moyens d'Existence Agricoles et Sécurité Alimentaire dans le Cadre de la COVID-19*; Rapport de Suivi, mai 2021; FAO: Rome, Italy, 2021. [CrossRef]
3. IPC. Analyse de L'Insécurité Alimentaire Aiguë et de la Malnutrition Aiguë de L'IPC 2022. Available online: https://www.ipcinfo.org/ipc-country-analysis/details-map/en/c/1155972/?iso3=COD (accessed on 8 May 2023).
4. Mulume, B.S.; Dontsop, N.P.M.; Nyamugira, B.A.; Mulumeoderhwa, S.J.-J.; Manyong, V.; Bamba, Z. Farmers' credit access in the Democratic Republic of Congo: Empirical evidence from youth tomato farmers in Ruzizi plain in South Kivu. *Cogent Econ. Financ.* **2022**, *10*, 2071386. [CrossRef]
5. Mulumeoderhwa, F.; Maniriho, A.; Manirakiza, D.; Furaha, G.; Mastaki, J.-L.; Lebailly, P. Risk Analysis in the peasan framework: Empirical Analysis of farmers in South Kivu, Democratic Republic of Congo. *J. Agric. For.* **2019**, *65*, 35–45. [CrossRef]
6. Ali, A.; Xia, C.; Jia, C.; Faisal, M. Investment profitability and economic efficiency of the drip irrigation system: Evidence from Egypt. *Irrig. Drain.* **2020**, *69*, 1033–1050. [CrossRef]
7. Dalton, J.T.; Keith, F. Costs, Benefits, and Welfare Implications of USAID Investment in Agricultural Research through U.S. Universities. *J. Agric. Appl. Econ.* **2022**, *54*, 461–479. [CrossRef]
8. Issoufou, A.; Semassou, C.G.; Tossa, K.A.; Saley, A.H. Étude de faisabilité technico-économique d'installation d'une filière de régénération de batteries stationnaires solaires au plomb acide au Bénin. *Afr. Sci.* **2024**, *24*, 122–131.
9. Awo, S.J.M.; Ollabode, N.; Yaï, D.E.; Yabi, A.J. Déterminants de l'accès aux crédits agricoles par les producteurs du maïs à la CLCAM et a Sian' son microfinance au Nord Benin. *Agron. Afr.* **2021**, *33*, 343–356.
10. Eber, N. Chapitre 5. Le biais pour le présent. In *La Psychologie Économique & Financière. Comment la Psychologie Impacte nos Décisions*; Hors Collection Économie/Gestion; De Boeck Supérieur: Louvain-la-Neuve, Belgium, 2020; pp. 89–106. Available online: https://www.cairn.info/la-psychologie-economique-et-financiere--9782807326378-page-89.htm (accessed on 21 June 2023).
11. Fabre, P. *Manuel Analyse Financière et Économique des Projets de Développement*; Série méthodes et Instruments pour la Gestion du Cycle de Projet; Office des Publications de L'Union Européenne: Luxembourg, 1997.
12. Florio, M.; Morretta, V.; Willak, W. Cost-Benefit Analysis and European Union Cohesion Policy: Economic Versus Financial Returns in Investment Project Appraisal. *J. Benefit Cost Anal.* **2018**, *9*, 147–180. [CrossRef]
13. Gosselin, M.; Costa, S.; Paillet, Y.; Chevalier, H. Actualisation en forêt: Pour quelles raisons et à quel taux? *Rev. For. Française* **2011**, *63*, 445–455. [CrossRef]
14. Sauner-Leroy, B. Incertitude environnementale, aversion au risque du dirigeant et investissement productif des petites et moyennes entreprises. *Rev. Int. P.M.E.* **1999**, *12*, 33–57. [CrossRef]
15. Patault, E.; Soulignac, A.; Landemaine, V.; Ledun, J.; Allard, E.; Fournier, M.; Ouvry, J.-F.; Cerdan, O.; Laignel, B. Analyse coût-bénéfice du programme d'actions visant à réduire les impacts du ruissellement et de l'érosion en Haute-Normandie: Évaluation des actions passées et projections futures sur le bassin versant de la Lézarde. *LHB* **2021**, *107*, 1–10. [CrossRef]
16. El Amami, H.; Kompany, J.R.; Muanda, C. Rabattement des nappes et équité d'accès aux eaux souterraines: Analyse comparative des catégories d'exploitations agricoles dans le centre de la Tunisie. *Cah. Agric.* **2024**, *33*, 13. [CrossRef]

17. Sigue, H.; Labiyi, I.A.; Yabi, J.A.; Biaou, G. Effet des composantes de la technologie microdose sur la performance économique et financière des exploitations agricoles du Kouritenga et du Zondoma au Burkina Faso. *Afr. Crop Sci. J.* **2019**, *27*, 331. [CrossRef]

18. Trabelsi, M. Comment Mesurer la Performance Agroécologique d'une Exploitation Agricole pour l'Accompagner Dans son Processus de Transition? Ph.D. Thesis, Université Paul-Valéry Montpellier 3, Montpellier, France, 2017. Available online: https://theses.hal.science/tel-01735527 (accessed on 19 November 2023).

19. Syed, S.; Miyazako, M. *Promouvoir L'Investissement dans L'Agriculture aux fins de Gains de Production et de Productivité*; FAO: Rome, Italy, 2013.

20. Dai, H.; Li, N.; Wang, Y.; Zhao, X. The Analysis of Three Main Investment Criteria: NPV IRR and Payback Period. *Adv. Econ. Bus. Manag. Res.* **2022**, *648*, 185–189. [CrossRef]

21. Ghiami, Y. An analysis on production and inventory models with discounted cash-flows. *Omega* **2023**, *117*, 102847. [CrossRef]

22. Gasparinetti, P.; Brandão, D.O.; Maningo, E.V.; Khan, A.; Cabanillas, F.; Farfan, J.; Román-Dañobeytia, F.; Bahri, A.D.; Ponlork, D.; Lentini, M.; et al. Economic Feasibility of Tropical Forest Restoration Models Based on Non-Timber Forest Products in Brazil, Cambodia, Indonesia, and Peru. *Forests* **2022**, *13*, 1878. [CrossRef]

23. Godyń, I. Economic Incentives in Stormwater Management: A Study of Practice Gaps in Poland. *Water* **2022**, *14*, 3817. [CrossRef]

24. Knoke, T.; Gosling, E.; Paul, C. Use and misuse of the net present value in environmental studies. *Ecol. Econ.* **2020**, *174*, 106664. [CrossRef]

25. Gottschalg, O.; Phalippou, L. La vérité sur les performances dans le capital-investissement. *Rev. Econ. Financ.* **2008**, *93*, 201–211. [CrossRef]

26. Boardman, M.; Reinhart, W.J.; Celec, S.E. The role of payback period in the theory and application of duration to capital budgeting. *J. Bus. Financ. Acc.* **1982**, *9*, 511–522. [CrossRef]

27. Sinaga, A.S.; Sari, M.M.; Hutasuhut, A.A.; Zahara, S.T.; Amanda, A.; Fitri, A.; Caesario, M.A. Comparison of capital budgeting methods: NPV, IRR, PAYBACK period. *World J. Adv. Res. Rev.* **2023**, *19*, 1078–1081. [CrossRef]

28. Otemikongo, M.J.; Mandefu, J.O.; Stroobant, E.; Rashidi, N.O.; Bolakonga, B.; Shotsha, D.O.N.; Krawczyk, J.; Laghmouch, M. *Tshopo—Laborieuse Construction Politico-Administrative Coloniale Muée en Bastion du Nationalisme Congolais*; Royal Museum for Central Africa/Musée Royal de L'Afrique Centrale: Totnes, UK, 2020. Available online: www.africamuseum.be (accessed on 21 March 2023).

29. Coste, R. Les Caféiers et les Cafés dans le Monde; LAROSE., 2, Tome 2. 11, Rue Victoire-Cousin, 11 Paris (Ve), 1961. Available online: https://www.cabidigitallibrary.org/doi/full/10.5555/19610307243 (accessed on 24 April 2023).

30. Jagoret, P.; Bouambi, E.; Abolo, D.; Snoeck, D. Amélioration du système traditionnel de caféiculture au Cameroun par l'introduction de trois innovations techniques. *Biotechnol. Agron. Soc. Environ.* **2006**, *10*, 197–207.

31. Wilkins, K. The Cocoa and Coffee Opportunity in the Democratic Republic of the Congo—A Guide to the Congolese Cocoa and Coffee Market for Businesses, Buyers and Investtors. 2019. Available online: https://thecocoapost.com/wp-content/uploads/2021/06/DRC-Cocoa-and-Coffee-Opportunities.pdf (accessed on 11 January 2023).

32. Moloba, Y.; Mobula, M.V.; Ntoto, M.R.; Mahungu, N.M. Dynamique socio-économique de l'adoption des variétés améliorées du manioc en République Démocratique du Congo (RDC): Cas des provinces de Kongo Central et la Tshopo. *Eur. Sci. J.* **2019**, *15*, 346–362. [CrossRef]

33. Bolakonga, A.B.; Disonama, M.; Michel, B.; Lebailly, P. Influence de l'enclavement sur l'économie rurale en République Démocratique du Congo: Cas du Territoire d'Opala. In *XXVIIIèmes Journées du Développement ATM 2012 "Mobilités Internationales, Déséquilibres et Développement: Vers un Développe-ment Durable et une Mondialisation Décarbonée?* Association Tiers-Monde, CNRS: Orléans, France, 2012; pp. 1–17. Available online: https://orbi.uliege.be/handle/2268/137818 (accessed on 14 June 2022).

34. Kearsley, E.; Verbeeck, H.; Stoffelen, P.; Janssens, S.B.; Yakusu, E.K.; Kosmala, M.; De Mil, T.; Bauters, M.; Kitima, E.R.; Ndiapo, J.M.; et al. Historical tree phenology data reveal the seasonal rhythms of the Congo Basin rainforest. *Plant-Environ. Interact.* **2024**, *5*, e10136. [CrossRef] [PubMed]

35. Mushi, C.A.; Ndomba, P.M.; Trigg, M.A.; Tshimanga, R.M.; Mtalo, F. Assessment of basin-scale soil erosion within the Congo River Basin: A review. *Catena* **2019**, *178*, 64–76. [CrossRef]

36. Bolakonga, A.B. Diagnostic des Filières Agricoles, Inventaire des modèles et Techniques Agricoles et état des Lieux des Cultures Pérennes dans la Province de la Tshopo Kisangani, 2020. Rapport du Programme Intégré de Réduction des émissions dues à la Déforestation et a la Dégradation des Forêts (PIREDD-O). Available online: https://oxfordre.com/environmentalscience/display/10.1093/acrefore/9780199389414.001.0001/acrefore-9780199389414-e-224 (accessed on 24 April 2023).

37. Johnston, G.; Sabin, K. Sampling Hard-to-Reach Populations with Respondent Driven Sampling. *Methodol. Innov. Online* **2010**, *5*, 38–48. [CrossRef]

38. Krishnan, S. Sustainable Coffee Production. *Oxf. Res. Encycl. Environ. Sci.* **2017**, 1–29. [CrossRef]

39. Albouy, M.; Breton, A. Modèles de croissance et taux d'actualisation. *Rev. Econ. Polit.* **1970**, *80*, 258–287.

40. Selmer, C. Outil 28. L'analyse de sensibilité. In *La Boîte à Outils du Responsable Financier*; Dunod: Paris, France, 2018; pp. 102–103.

41. BCC. Rapport Annuel 2021 563, Boulevard Colonel Tshatshi B.P. 2697 Kinshasa I Tél. 2023. Available online: https://www.bcc.cd/bcc/publications-redirect/rapport_annuel (accessed on 11 July 2023).

42. Bouinot, J. Le coût d'Opportunité des Fonds Publics. *Cybergeo Eur. J. Geogr.* **2005**, 1–6. Available online: https://journals.openedition.org/cybergeo/4960 (accessed on 8 July 2023).

43. Tripier, F. Frictions de recherche sur les marchés financiers. *Rev. Française D'écon* **2014**, *XXV*, 15–47. [CrossRef]

44. Wasmer, E. Nobel prize 2010: Markets with frictions. *Rev. Econ. Polit.* **2011**, *121*, 637–666. [CrossRef]

45. Diamoutena, K. Accès au crédit agricole et performance agricole dans la zone office du Niger; cas de la culture du riz. *Ann. De L'université Mar. Ngouabi* **2018**, *18*, 114–125.

46. Dossou, A.A.; Vodouhe, F.G.; Yegbemey, R.N.; Yabi, J.A. Accès au crédit et performance économique et financière des exploitations de l'Union Nationale des Producteurs de Soja au Centre du Bénin. *Ann. L'université Parakou—Ser. Sci. Nat. Agron.* **2019**, *9*, 79–94. [CrossRef]

47. Mayoukou, C.; Kertous, M. Access to individual credit by customers of microfinance institutions in the Congo: An analysis of the determinants of self-exclusion and obtaining loans. *Mondes. Dev.* **2015**, *169*, 121–138. [CrossRef]

48. Nguba, B.; Mundu, K.J. Etude du rendement du café et son impact socioéconomique dans le territoire d'Idjwi, province du Sud Kivu en RD Congo. *Int. J. Innov. Appl. Stud.* **2022**, *38*, 366–407.

49. Zhang, K. Comparative Analysis of NPV and IRR Indicators Based on Practical Applications. *Highlights Bus. Econ. Manag.* **2023**, *7*, 22–28. [CrossRef]

50. Nyembo, G.; Rushunda, A. Etude du Retour Social sur Investissement dans la Filière Café en République Démocratique du Congo (RDC) Jan. 2021. Rapport Rikolto, p. 1–28. Available online: https://assets.rikolto.org/paragraph/attachments/drc_sroi_coffee.pdf (accessed on 15 December 2024).

51. Wanzala, R.W.; Marwa, N.; Nanziri, L.E. Impact of exchange rate volatility on coffee export in Kenya. *Cogent Econ. Financ.* **2024**, *12*, 2330447. [CrossRef]

52. Bezuidenhout, J.-M.; van Vuuren, G. Spectral analysis and the death of value investing. *Cogent Econ. Financ.* **2021**, *91*, 1988380. [CrossRef]

53. Chen, N.; Zhang, F. Risk and Return of Value Stocks. *J. Bus.* **1998**, *71*, 501–535. [CrossRef]

54. Florida, D.; Redon, M. L'espace rural haïtien en mutation: Du déclin de la caféiculture au développement de l'économie informelle dans la Chaîne des Cahos. *Cah. D'outre-Mer* **2019**, *279*, 115–141. [CrossRef]

55. Nshembe, C.E.N.; Michel, B.; Useni, S.Y.; Katya, K.J. Analyse VCA4D de la Filière du Miel Autour de la Réserve de Biosphère de Luki," *Parcours et Initiatives: Revue Interdisciplinaire du Graben (PIRIG)*, No. 28, December 2024. Available online: https://www.crigpug-ucg.org/index.php/pirig/issue/view/27 (accessed on 27 January 2025).

56. Assouma, T.K.S.; Adédédji, L.I.; Yabi, J.A. Effet des sources de financement sur la performance économique des producteurs de soja (*Glycine max* (L.) Merr.) dans le Pôle de Développement Agricole (PDA-4) au Bénin. *Rev. Afr. D'environ. D'agric.* **2024**, *6*, 56–66.

57. Mere, S.; Yabi, A.J. Déterminants de la rentabilité économique des activités de l'artisanat du bois au Nord-Est du Bénin. *Afr. Sci.* **2024**, *24*, 87–105.

58. Saka, S.C.; Yabi, J.A. Effet des facteurs de variations du prix sur la rentabilité économique et financière de la commercialisation des noix de Cajou au Nord-Bénin. *Int. J. Account. Financ. Audit. Manag. Econ.—IJAFAME* **2024**, *5*, 500–515. [CrossRef]