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SSP3021 Master Thesis

Enabling participation of smallholder farmers in voluntary carbon markets through investment strategies by banks and financial institutions

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Abstract

Voluntary Carbon Markets (VCMs) offer companies in the Global North a mechanism to use carbon credits to offset some of their greenhouse gas emissions caused by their operations. Many such carbon credits are produced by smallholder farmers in the Global South, providing both another income stream and intangible benefits such as soil health, biodiversity, and improvements in social structures. However, smallholder farmers face barriers to entry into these markets.

This study employed qualitative analysis of scientific literature, interviews, project reports and related documents to examine barriers to entry and understand how banks in the role of an intermediary in the VCM could help alleviate them. Additionally, the study investigated the risks banks face when acting in this role and the extrinsic and intrinsic motivations behind their participation.

Using data from different types of nature-based solution projects and interviews with experts on agroforestry-related carbon projects, findings indicate 3 clusters of barriers to entry faced by smallholder farmers: information uncertainty, financial concerns and administrative challenges. Several bank risks were also identified, such as default risk, market risk, performance risk and reputational risk, with the latter as the most relevant concern for the experts. The study suggests that banks were able to effectively mitigate risk and address barriers to entry for farmers more when employing more direct financing options, with high degrees of involvement. However, assuming this intermediary role appears to require intrinsic motivations—such as philanthropic or empathetic goals—rather than purely extrinsic, profit-driven incentives due to the low profitability and high risk profile of such projects.

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List of abbreviations

ARCPs	Agroforestry-Related Carbon Projects
CO2	Carbon Dioxide
CRUs	Carbon Removal Units
EU	European Union
EU CSRD	European Union Corporate Sustainability Reporting Directive
ICVCM	Integrity Council for the Voluntary Carbon Market
IFC	International Finance Corporation
KfW	Kreditanstalt für Wiederaufbau
MIGA	Multilateral Investment Guarantee Agency
NGOs	Non-Governmental Organizations
ONFI	French National Forest Office
SAF	Smallholder Agroforestry Finance
TAF	Technical Assistance Facility
US	United States
USAID	U.S. Agency for International Development
VCMs	Voluntary Carbon Markets

1 Introduction

1.1 Setting

Since the Industrial Revolution, human activities have led to a high accumulation of carbon dioxide (CO₂) in the atmosphere, especially through the burning of fossil fuels. The result of the exponential increase in carbon emissions is what is now called climate change, with many adverse effects for humans both in the short and long term. To counteract these changes, international climate goals like those set in the Paris Climate Agreement call for not only a reduction in carbon emissions but also the capture of carbon from the atmosphere. Several strategies and technologies have been developed for the goal of carbon offsetting, among which agricultural carbon offset projects have the potential to play a major role (Dutta et al., 2021). Companies and individuals interested in offsetting their carbon-emitting activities have also started engaging in the so-called Voluntary Carbon Markets (VCMs) (Balderas et al., 2024). Carbon credits are permits that allow the purchaser to emit a specified amount of CO₂ into the atmosphere and which can be traded on special markets if the full allowance is not used. In voluntary markets, carbon credits are generally provided through projects focused on sustainable transition, for example, agroforestry, though a more elaborate list of potential projects can be found in FSD (2024b).

Next to the VCMs exists the mandatory or compliance carbon market, which includes governments and is created in response to legally binding emissions reduction targets such as the 2015 Paris Climate Agreement. Compliance markets usually function as cap-and-trade schemes. The compliance carbon market is not part of this study.

Voluntary Carbon Markets are markets that exist in addition to the government-mandated emissions reduction schemes. Their purpose is to provide an alternative tool for

companies and other organizations to purchase carbon offsets (FSD, 2024b). Carbon credits offered on these markets are generally provided, as mentioned above, through agroforestry or through other ways of capturing carbon. Such markets are necessary, as even with all current greenhouse gas-reduction schemes, carbon emissions are still too high, and further initiatives are necessary to bring emission levels below the amount necessary for reaching the goals of the Paris Climate Agreement (Miltenberger et al., 2021).

1.2 Problem statement

This study will focus only on carbon sequestration projects centered around smallholder farmers in the Global South. It is necessary to understand which actors are involved in such projects, and what roles they play in removing barriers to entry. Regarding banks, many projects only include them as distant financiers, with little involvement outside of this role. While there are already some reports providing options for business models involving brokers (FSD, 2024b), little insight has yet been gained on the exact ways in which the involvement of banks may alleviate challenges originating from barriers to entry for smallholder farmers.

In general, three different types of actors in these markets can be identified: the carbon credit providers, the carbon credit purchasers, and intermediaries such as banks and financial institutions enabling this exchange FSD (2024b). Smallholder farmers, local partners and administrative teams on site are part of the Carbon Credit Provider group. Purchasers are mostly public and private institutions, many times located in the Global North. Intermediaries are any further actors that are involved in providing assistance (financial, technical or otherwise) or facilitating communication between the other actors, such as Non-

Governmental Organizations (NGOs) and banks, depending on their role. A more in-depth examination of these archetypes can be found in Chapter 2.1.

A majority of farmers engaging in agroforestry are smallholder farmers (Dutta et al., 2021), showing their importance for this area of research. In return for carrying out agroforestry practices, smallholder farmers usually get a part of the carbon credit sale price from the end buyers, thus gaining another income stream to decrease their dependence on singular incomes from farming. Other intangible benefits also exist, such as a higher connection with local communities and nearby farmers, education in accounting and reporting, as well as potential improvements of crop health due to higher biodiversity and mutually beneficial effects between different types of plants (Current et al., 1995a; Rabobank-Acorn, n.d.-a; USDA, n.d.-a).

However, while there are benefits for smallholder farmers, there also exist several barriers to entry, which may lead to reluctance to engage in such projects, for example the lack of access to outside buyers and the high costs of seeds without an immediate payback, due to the growing time of the plants. As such, it is not enough for agroforestry projects to only include the providers and the buyers, but also those that enable the facilitation of the projects, in this case called intermediaries. These are for example NGOs that help farmers communicate with each other and with potential buyers, or financiers that provide funds to start up larger projects and support farmers during the growing phase. This study mainly focuses on banks in the role of an intermediary, and the different aspects of this role that banks can take on.

As agroforestry projects provide an important contribution to the sustainability transition, it becomes necessary to understand how such projects can be supported, and

which reasons there are for reluctance to engage into these projects from the perspective of different actors. Especially financial risks and obstructions can be destructive to the organization and success of agroforestry projects. On the other hand, banks are often well connected to major players on the global markets, including large organizations that may be interested in becoming investors in the VCMs. However, currently very few banks and other financial institutions are involved in agroforestry projects, which some prominent exceptions such as the Dutch Rabobank (Rabobank-Acorn, n.d.-c). As a result, the lack of engagement of organizations that hold a large amount of financial power may have led to an underdevelopment of agroforestry projects, to the detriment of the global sustainability transition. It is thus necessary to try and alleviate these barriers to fully take advantage of the benefits of carbon farming for all stakeholders.

1.3 Research aim and objectives

This study aims to identify the ways that involvement of banks as an intermediary can enable the participation of smallholder farmers in carbon sequestration projects.

By doing so, the study aims to contribute to the global sustainability transition by identifying opportunities for further agroforestry projects, and the stronger inclusion of financiers like banks in these projects, to reduce carbon buildup in the atmosphere. Reducing emissions is of central importance for reaching the goals specified in the Paris Climate Agreements (Mikunda et al., 2021). However, especially these emissions are still on target to be increasing worldwide. Initiatives to reduce greenhouse gas emissions are only somewhat effective, and recent political tensions have led to a decreasing focus on sustainability issues in different parts of the world, including high polluters like the US and the EU (Avlonas, 2024; Cosma et al., 2025; Gill, 2025).

While official emissions reduction schemes are under threat, alternative solutions increase in importance. As such, it is important to investigate how to increase the viability of these VCM-focused projects, such that more carbon can be potentially sequestered from the atmosphere. This study aims to understand how banks can be enablers of this market, and what motivates them to enter such a role.

Through this, the study may provide insight for project leaders on how to attract banks to participate in such efforts, e.g. as credit providers, but also to provide information to banks why they may want to take initiative in joining such projects on their own, for example due to marketing strategies (for sustainability focused banks) or for market opportunities (in case of increasing prices in the VCMs). In the end, the goal is to strengthen projects aiming at carbon sequestration, improving the sustainability strategies of banks, and finally financially supporting smallholder farmers in different regions of the world by providing them with secure additional income from carbon farming projects through decreasing their barrier to entry for these initiatives.

Additionally, the study fills a research gap regarding the involvement of financial institutions as intermediaries. While some papers already examine specific projects and their outcomes, such as FSD (2024b), there is a lack of insight into the specific opportunities banks can provide to smallholder farmers in these projects through their involvement on a broader scale. This study attempts to address that gap by looking into the different ways banks are currently involved in agroforestry projects, and how the effect can be related to existing research.

To do so, the following objectives will be examined:

- understanding and categorizing barriers to entry for smallholder farmers

- understanding and categorizing risks to banks when entering agroforestry projects
- motivations for banks to enter sustainability-related projects such as agroforestry
- finding benefits of different roles for banks depending on the motivations

1.4 Research Questions

To achieve the aim and objectives of this study the following research question is central to this study: *Can banks help smallholder farmers overcome barriers to entering the voluntary carbon market?* To guide the research the following three sub-questions were formulated:

Table 1 *Measurable Outcomes from the Objectives Tree*

Sub Question 1	What barriers are there for smallholder farmers to enter the carbon market and which of these can be addressed by the support of banks?
Sub Question 2	What can banks and other stakeholders do in order to minimize risk to banks due to information asymmetry and market volatility?
Sub Question 3	Can banks use investment strategies or financial products to provide funds to smallholder farmers while mitigating their own risks, and if so, which products would this be?

Sub-question 1 follows the view of the smallholder farmers, who are currently facing several barriers to entry such projects (Kragt et al., 2017; Pan et al., 2022), which can translate to several risks for the farmers in the course of these projects. By finding barriers to entry that can be alleviated by banks playing a part as an intermediary or other role, recommendations for further projects can be found.

Sub-question 2 is concerned with the risks banks face when participating in carbon credit projects. Banks may be reluctant to participate in such projects if risks are too high, due to which it is important to find ways to minimize such risks. This question provides the counterpart to sub-question 1, which already examined the risks faced by smallholder farmers, and thus ensures a complete overview of the reasons for reluctance to engage in agroforestry projects for both actors.

Lastly, sub-question 3 aims to understand the specific role banks can play that other stakeholders would be unable to fulfill. While it is possible to find financing options not related to banks (e.g. through crowdfunding, charity, governmental investment, etc.), due to these institutions' access to financial markets and investment products, financial risk may be mitigated in ways others will struggle to copy.

By answering these 3 sub-questions, it will be possible to find out which barriers there are for smallholder farmers, which can be addressed by banks, and lastly, how banks can be encouraged to engage in these projects in such a role.

1.5 Outline of the thesis

This thesis first examines the currently existing research on the topic in chapter 2. This focuses on what VCMs are, what role smallholder farmers and banks play in such projects, and what barriers to entry and risks these actors face respectively. In addition, the chapter aims to identify different motivations for banks to enter sustainable projects and relates this to carbon sequestration projects by developing a framework using the existing research described before. Chapter 3 then explains the methodology of this thesis. This includes the research approach, methods for data collection and analysis, as well as any limitations encountered during the data collection and study process. The results are then presented in

chapter 4, which includes the information gained from document analysis and interviews conducted during the research. These results are then compared with the framework and theoretical knowledge gained from chapter 2 to relate the new insights to existing information. Lastly, chapter 6 provides the conclusion to the thesis, answering the research question and providing suggestions for further research on the topic, as well as limitation of this thesis.

2 Theory and Analytical Framework

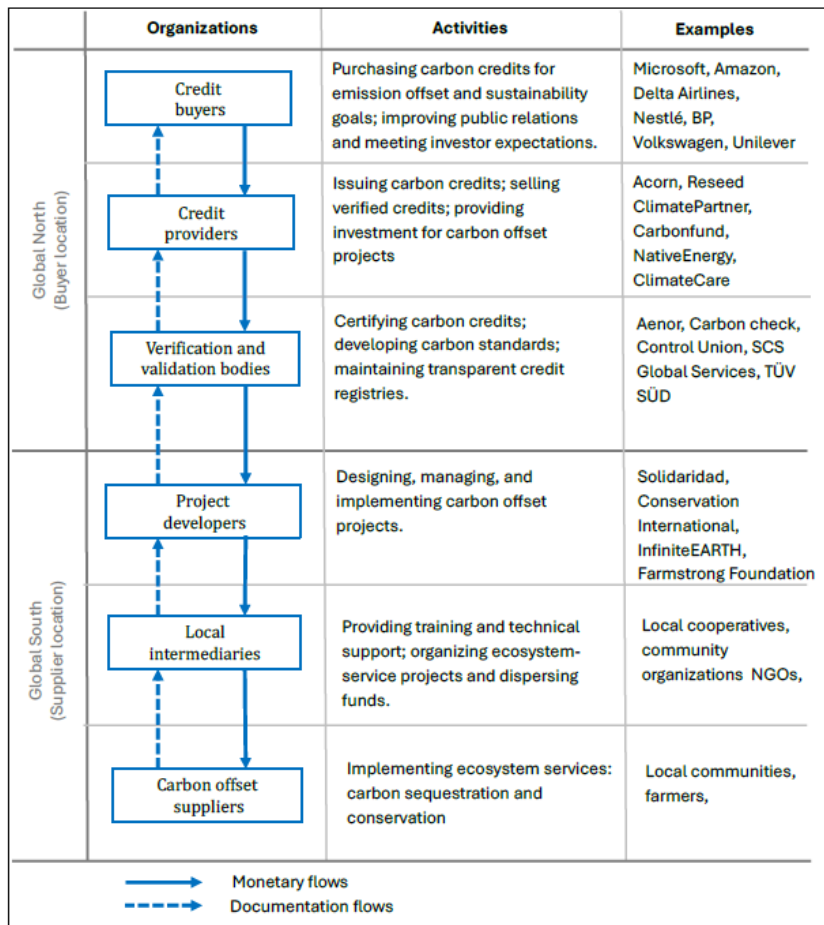
This chapter first defines VCMs and their roles the three actor groups. It then explores the barriers smallholder farmers face in accessing VCMs and examines why banks engage in VCMs, and which risk they may face. Finally, it presents a framework linking these elements to explore how banks can help overcome entry barriers for smallholders.

2.1 VCM and carbon farming through agroforestry projects

VCMs are alternative market tools to allocate carbon credits to buyers wishing to additionally offset their carbon emissions. Prices are set through an over-the-counter exchange of these credits between the different actors in these markets and are not part of any governmental schemes for emissions reductions, though regulations may still apply to these markets, especially regarding the quality and eligibility of the credits produced and purchased (FSD, 2024b).

While some parts may differ for other types of carbon sequestration projects, the general stakeholder structure of VCMs consists of farmers implementing carbon offsetting practices, project leaders and certifiers making sure the sequestered carbon units are correctly accounted for, brokers enabling the exchange of carbon credits through access to private markets, purchasers buying these credits, and lastly, intermediaries involved by giving financial aid to the projects, ensuring quality and certification standards, providing oversight or other activities (FSD, 2024b). An example of such a structure is shown in the figure below.

Figure 1 Typical organizations and activities in the VCM value chains



Note: From Smallholder Farmers and the Voluntary Carbon Market: A Balancing Act: Navigating Pricing, Co-Benefits, and Challenges (Lema et al., 2025)
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VCMs may have different business models, as explained in FSD (2024b), dividing between ways in which the VCMs are included in sustainability transition models, different options for distribution channels and sources of funds, as well as different pricing models. This leads to a strongly heterogeneous environment for these markets.

There are also several criticisms aimed at these VCMs, especially regarding the quality of the carbon credits (e.g. double counting or double claiming) or through incorrectly applied “carbon-neutrality” claims by companies buying carbon credits to market their products as

“green” or environmentally friendly (Aarnio, 2024; Carbon Market Watch, 2020; European Parliament, 2024; Symon, 2024).

While the second issue can only be regulated by strong standards by the regulators, the first point can be addressed by carbon credit projects having strong oversight, and quality control. Some VCM projects put a lot of focus on guaranteeing the quality of the carbon credits provided, such as Rabobank Acorn (Rabobank-Acorn, n.d). However, some issues of double claiming may still occur, especially when the carbon credits are considered for meeting climate goals of the countries in which these farms are located.

Notwithstanding these limitations, carbon credits transacted on VCMs are indeed a way to not only decrease the amount of carbon in the atmosphere (even on a smaller scale), but also to potentially provide stable income to farmers in the Global South that may face strong repercussions from climate change and related environmental events. (Dutta et al., 2021; Schilling et al., 2023; Shames, 2013)

This study distinguishes between 3 types of actors in the VCM: carbon credit providers, carbon credit purchasers, and institutions acting as intermediaries. This study will focus on focus will be on smallholder farmers as providers, while the intermediary archetype will only consider banks and financial institutions to keep to the focus of the study.

2.1.1 Carbon Credit Providers

Smallholder farmers are disproportionately affected by climate change and its effects (Donatti et al., 2019), bringing engagement in different activities that may decrease the risks associated with climate change and instead engage in more reliable activities where payment is less directly associated with crop yields. Studies have shown that farmers with relatively lower farm sizes are more likely to adopt conservational agriculture practices, such as

agroforestry, than those with larger farming areas (Dutta et al., 2021), possibly due to lower opportunity costs for changing farming practices and higher risk exposure to crop yield volatility.

Consequently, engaging in VCMs has become an alternative for smallholder farmers to reduce their risk and exposure to climate change effects, while also providing an important contribution to these markets (Current et al., 1995b; De Pinto et al., 2010).

However, several barriers to entry to the VCM exist for smallholder farmers. One such barrier is the structure of financial compensation, which in general is delayed compared to the time of the initial investment (FSD, 2024a) and can be volatile due to the trading value of carbon credits on the VCM. Farmers must invest in education and training on conservational farming practices, as well as in buying seeds for starting carbon farming. In addition, farmers experience transaction costs when trying to enter the VCMs due to the necessary communication and negotiation with intermediaries, as well as certification and auditing requirements (De Pinto et al., 2010). Running costs include opportunity costs for engaging in traditional agriculture, as well as the operational costs of caring for the plants and farmland. In return, brokers pay the farmers per unit of carbon sequestered, depending on the price of carbon credits on the market. This may be delayed for up to 3-4 years after the initial investment (due to the necessity for plants to grow before yielding carbon sequestration results), which is a large financial burden to carry for smallholder farmers. In response, some carbon farming projects have set up funds to reduce the time lag between the project launch and the financial compensation received by the farmer (FSD, 2024a). However, this requires these project leaders to be able to source the funding required to manage payment before the credits can be marketed on the VCMs. Additionally, both the farmers and project leaders

face risk due to volatile prices of carbon credits on the market (Dong et al., 2022), as well as low remuneration in many projects (Tamba et al., 2021).

2.1.2 Carbon Credit Purchasers

Purchasers of carbon credits play an important role in the VCM by representing the demand side. Their intentions generally focus on framing private companies or products as more sustainable (FSD, 2024b; Trouwloon et al., 2023). “Green” activities are more and more in demand by consumers, who change their consumption patterns partially also due to how sustainable a company is being perceived as (Günther et al., 2020; O'Rourke & Ringer, 2016). Carbon credits can offer an option to offset some of the carbon-emitting activities (Günther et al., 2020). Research has shown that many companies, led by large corporations, have included carbon credits into their corporate strategies. (Afridi, 2024). However, information asymmetry on the carbon markets as well as volatile carbon pricing provide challenges for companies willing to enter the market on the purchaser side (Battocletti et al., 2024; Kreibich, 2024; Spilker & Nugent, 2022). This necessitates the involvement of intermediaries and standard setters, e.g. through the use of financial tools like derivatives (Spilker & Nugent, 2022).

2.1.3 Banks and Financial Institutions as Intermediaries

While Climate Finance plays a large role in supporting the sustainability transition, it has historically been underrepresented within the agriculture sector (World Bank Group, 2016), due to barriers such as low profitability, lack of information, difficulty of connection between financiers and recipients, and other issues defined in the report by the World Bank Group (2016). This report also dives into different ways in which Climate Finance, and actors

like public and private finance providers, can contribute to the adaptation of the agricultural sector to climate change.

One example can be banks acting as brokers for carbon markets, guaranteeing the quality and security of the credits purchased, while receiving a small fee for their services in return (FSD, 2024a). This benefits these institutions not only financially but can also result in strengthening their brand and reputation. Banks, especially originally agricultural and development banks such as the Dutch Rabobank and the German KfW, are in a unique position as private actors that can engage in projects directly and thus gain greater insight into carbon farming efforts. This may address some of the risks incurred within the carbon credits market, as greater involvement of these institutions can provide services as guarantors and brokers (FSD, 2024b; Spilker & Nugent, 2022).

Contrary to both the individual smallholder farmers, banks acting as intermediaries have direct access to the carbon markets, as well as the option to use financial products to regulate the risk of investment (FSD, 2024b; Tjon Akon, 2023). As a result, banks are in a better position to carry the burden of compensating farmers for their upfront investments, while also gaining financial compensation later due to, for example, brokerage fees. However, this transfers part of the risk to banks, who have less information on the status of carbon farming than the farmers themselves, leading to information asymmetries and moral questions (De Pinto et al., 2010), which can decrease the willingness of banks to act in this role.

2.2 Smallholder farmers and barriers to VCM

Several papers have conducted research on which barriers there are for smallholder farmers to entering carbon markets (De Pinto et al., 2010; Dutta et al., 2021; FSD, 2024a; Kragt

et al., 2017; Lema et al., 2025; Pan et al., 2022; Schilling et al., 2023; Shames, 2013; Tamba et al., 2021). The barriers can generally be divided into three different categories: (1) information uncertainty, (2) monetary concerns, and (3) administrative barriers. The exact concerns that farmers have can vary depending on the location, their level of involvement in this kind of projects, education and access to information, and whether they have already adopted similar projects or not (Kragt et al., 2017).

Information uncertainty includes issues such as farmers not having enough information on procedures, requirements, and contacts. In addition, policy uncertainty adds another edge to this barrier, as many farmers have concerns about further developments regarding policy in both the countries where carbon farming projects are implemented, as well as the purchasers' countries. It also includes challenges related to carbon market issues like permanence, additionality, and leakage (De Pinto et al., 2010; Pan et al., 2022). Farmers are also concerned about their long-term perspectives, like productivity and crop yield, especially when moving away from current farming practices (FSD, 2024a; Kragt et al., 2017). Cammarata et al. (2024) shows that the level of knowledge of farmers positively influences their willingness to take part in these projects.

Monetary concerns generally revolve around volatile carbon credit prices, high startup costs, long wait times for remuneration, risk associated with uncertainty about the volume of production, high maintenance costs of agroforestry, and potential lock-in risks when engaging in this type of farming (De Pinto et al., 2010; Kragt et al., 2017; Lema et al., 2025). These concerns are increased in significance especially when access to stable funding is not available. However, the strongest concern is the time lag between the initial investment (seeds, farming

grounds, fertilizer, water, labor) and the payout, as few farmers can offer this money upfront, and financing options are rarely available (FSD, 2024a).

Lastly, administrative challenges include language barriers, access to education and paperwork, system changes and knowledge, contact barriers, power dynamics, project design, as well as societal influences on farmers and their environment (Kragt et al., 2017). These challenges often start at the beginning of projects, but especially issues related to power imbalance may be difficult to solve. Farmers may fear their concerns end up unaddressed due to the interest of more powerful third parties, like intermediaries or carbon credit purchasers (Navarro, 2022). Language and communication barriers can also make it very difficult to start carbon projects, even when involving local contacts if high administrative challenges are included, especially paperwork and written forms (Kragt et al., 2017).

2.3 Banks as intermediaries in the VCM

Literature has identified different motivations for companies to engage in sustainability practices (Santana, 2015; Sengupta et al., 2023; Simões-Coelho & Figueira, 2021; Tiwari et al., 2024; Zimmermann, 2019). Zimmermann (2019) divides them into 2 different categories: intrinsic motives and extrinsic motives. Intrinsic motives generally lead to action due to values, ethics, or altruistic aspirations. Extrinsic values are about increasing the reputation, profitability, compliance with regulation, and social standing of these organizations. The paper specifies different strategies that each of these motivations is associated with, though different sources also argue in favor of a mixing of these motivations (Santana, 2015).

Following these categories, one can find characteristics of all different motivations when examining VCMs. In terms of intrinsic motives, VCMs play, a vital role in providing

incentives for carbon sequestration projects (Montagnini & Nair, 2004; Streck, 2021). Secondly, by providing an alternative source of income for smallholder farmers, as well as further benefits to productivity, education, and organization, supporting VCMs also has a strong social pillar (Mukhlis et al., 2022). Due to this, intrinsic motivations of improving the environment, providing social opportunities, and helping others can be fulfilled when interacting with VCMs as a bank.

Extrinsic motivations may concern Profitability and Risk, Reputation, and Compliance. VCMs provide a new area of profit for banks. Rabobank for example sees their project Acorn and their investment in carbon farming as a new area for improving their performance and profitability (FSD, 2025), due to expected increases in the carbon price on the markets. Secondly, reputational advantages of engaging in sustainable projects play a big role in corporate decision-making around “green” initiatives. Many companies nowadays use these initiatives for reputational risk management (Bebbington et al., 2008; De Leaniz & Del Bosque, 2013; Fombrun et al., 2000) as well as marketing opportunities. Some companies even choose sustainability as their main marketing tool (Kumar et al., 2012), branding their organization around their environmental or social goals. In Germany and the Netherlands, large banks like Rabobank and KfW, but also smaller banks like Umweltbank and Pax Bank are examples for this. In addition, climate change and related effects also pose a potential risk for different economic actors. This leads to some banks engaging into different lending and investing practices in order to avoid some of this associated risk (Alexander & Fisher, 2018; Mueller & Sfrappini, 2022).

Lastly, increasing climate regulations pose a large risk for many banks, especially in the EU market (European Central Bank, 2019). While initiatives like Omnibus (Directorate-General

for Financial Stability, 2025) aim to decrease regulatory burdens in recent times, the last years of increasing regulation around the European Union Corporate Sustainability Reporting Directive (EU CSRD) and similar have led to many companies considering their sustainability strategies (Odobáša & Marošević, 2023), even when not inclined to this due to intrinsic motivations. Emissions are part of every company, and emission reductions play a large role in regulatory frameworks, though carbon credits purchased through VCMs are not currently part of regulator-enforced emission reduction schemes (Corbera et al., 2009).

2.4 Risks for banks in the VCM

Chapter 2.3 shows the opportunities VCMs can provide for banks. On the side of risks, however, so far there is not much research available on specific risks for banks and intermediaries in VCMs and related projects. Much of current literature focuses on risks to smallholder farmers, risks to ecological transformations or risks for regulators.

While few literature is available, the current state of research suggests that, on the one hand, market participants are concerned about the quality of the carbon credits and the carbon projects (Battocletti et al., 2024; Espenan, 2023; Kreibich & Hermwille, 2021), as transparency is low on these issues. There is a general lack of trust and transparency in the VCMs due to proprietary methodologies, different validation and production schemes and lack of oversight (Espenan, 2023). This makes it difficult for banks to assess which carbon sequestration methods are trustworthy and can even lead to issues related to double counting of carbon credits. Additionally, especially in the volatile political climate of recent years, regulations are expected to keep changing for some time. Future regulations have the chance of changing the structures of the VCM strongly, with several regulator actions potentially

causing detriment to the market participants (Battocletti et al., 2024). These risks can be summarized under risks of uncertainty.

Secondly, similarly to smallholder farmers, other market participants including banks are concerned about volatile carbon credit prices on the markets (Hamrick & Gallant, 2017; Zhang & Li, 2018), as fluctuating prices have an impact on returns on the profitability of engaging in VCMs. This can be attributed to market risk.

2.5 Analytical framework

Based on the information shown in sections 2.1-2.4, a framework has been developed to form a lens to investigate the research question further. This framework includes the barriers to entry for smallholder farmers into the VCM, the risks banks experience, and lastly the motivations for banks to act in a situation.

Table 2 *Analytical Framework*

Type of criteria	Specifics	Actor
Barrier to entry	Information uncertainty	Smallholder farmer
	Monetary concerns	Smallholder farmer
	Administrative barriers	Smallholder farmer
Bank risks	Information uncertainty	Bank / Financial institution
	Market risk	Bank / Financial institution
Types of bank motivations	Extrinsic	Bank / Financial institution
	Intrinsic	Bank / Financial institution

In the following, this study will focus on the barriers to entry that smallholder farmers face and how banks can act in such a way that it minimizes both these barriers, as well as the risk these banks are experiencing through the example of specific projects with high involvements of financial institutions. It will also be examined whether the type of motivation a bank has to engage in this role has an influence on the success of this endeavor.

The specific program that will be examined in this study is the Rabobank-Acorn program, which the Dutch agricultural bank Rabobank established in cooperation with locally operating NGOs to sponsor and support agroforestry-related carbon projects (ARCPs) (Rabobank-Acorn, n.d.-b). Rabobank uses its connections as one of the largest agricultural and food financing banks in the world to empower smallholder farmers through ARCPs and enhance their resilience to climate effects, while supporting ecosystems by promoting biodiversity and removal of carbon from the air via sequestration (Plan Vivo, n.d.; Rabobank-Acorn, n.d.-a; Rabobank-Acorn Expert 1, 2025). Rabobank works together with different partners and has set the engagement and cooperation with smallholder farmers in the Global South as one of its most important goals (Rabobank-Acorn Expert 1, 2025). To ensure high quality ARCPs and the Carbon Removal Units (CRUs) produced, Rabobank developed special technology such as its remote sensing capabilities (Rabobank-Acorn, n.d.-d) to be able to appropriately measure and evaluate the progress of agroforestry efforts. Rabobank-Acorn is also certified by the independent certification agency Plan Vivo (Plan Vivo, n.d.). Projects are usually started with support from local partners, such as NGOs or farmer associations (Rabobank-Acorn, n.d.-b). Rabobank-Acorn provides funding for such projects through different setups and scenarios, supported by its dedicated Smallholder Agroforestry Finance (SAF) facility (Rabobank-Acorn Expert 1, 2025). This facility was set up to provide funds for projects under the Rabobank-Acorn program, while operating with less restrictions than

placed on commercial banks through regulations (Rabobank-Acorn Expert 1, 2025). The business model of Rabobank Acorn is based on pre-financing of ARCPs provided by the program, and then subsequent repayment of the initial investment through the revenue of CRUs produced (Rabobank-Acorn Expert 2, 2025). Rabobank-Acorn is a relevant program to examine in this study due to the strong involvement of a bank in an ARCP framework, which can bring important insights into the connections between banks and the barriers to entry for smallholder farmers.

3 Methodology

This chapter details the research methodology used in this study, beginning with the research approach. The later sections expand on the methods for data collection as well as for analysis and lastly provide some reflections on the process of gathering data.

3.1 Research approach

This study uses an inductive approach to answer the research question, building a theory based on the data gained from three different qualitative data collection approaches. As much of the primary and secondary data obtained was based on reports and personal impressions, a constructivist research approach (Moses & Knutsen, 2012) was applied as the most appropriate option for the study, accounting for the specific situations and perspectives of the reports and interviewees.

To approach the research question of this study, a qualitative analysis (Creswell & Creswell, 2017) was conducted, using scientific literature, non-scientific documents such as project reports, as well as semi-structured interviews with respondents from relevant institutions. All three methods were applied, to various degrees, to the three sub questions detailed in chapter 1.4. Sub questions 1 was mainly addressed through literature reviews, as details about barriers to entry into VCMs for smallholder farmers are well documented and have been subject to previous research in the past. However, to answer the second part of the question, document analysis and data gained from interviews were supplemented. Sub questions 2 and 3 relied on information gained from project reports as well as the interviews, while supported by scientific literature on bank risks and tools.

For the literature reviews, systematic literature search has been used to find relevant research on the topic, with specific keyword strings used on both Google Scholar and

LibSearch. The results were then filtered for relevant studies on the topic and analyzed for commonalities and oppositions. In addition to that, the AI tools ChatGPT and Perplexity were supplied with similar keywords and prompted to recommend further related material. The literature search was split into different parts for addressing the topics of different sub questions, as there were few results when combining all relevant keywords. After the initial search, qualitative analysis was used on the content of the identified literature to find relevant sections and gain a holistic understanding of the subject matter. Concluding the literature review, a framework for further research was created using the main criteria found from the analysis.

A list of keywords used can be found in the table in Appendix A. These keywords were combined into different search strings, as well as modulated (e.g. singular and plural) and entered in the search tools. Note that further relevant literature was identified through the references section of the literature found through the systematic search.

To answer sub questions 2 and 3, a specific case, Rabobank-Acorn, was identified to be used as an example for the high involvement of a bank in agroforestry projects. This case was selected as it was the most high-profile agroforestry-related program with involvement of a German or Dutch bank. This made it possible to gather expansive information about the involvement and effects of the bank during the projects. However, as this only shows one potential option for bank involvement in VCM projects, this case was then compared to other agroforestry projects. Semi-structured interviews and document analysis were used to gain an understanding of the specific case examined, while document analysis was singularly used for other cases. All data gained from this approach was treated through a constructivist worldview, to account for the subjective impressions of the people providing the data. Several

banks based in the Netherlands and Germany were identified for research, in addition to Rabobank, and examined for involvement in agroforestry projects in the recent past. The related table can be found in Appendix B.

However, as few data on such involvement was found during the research, the scope was expanded to also include other options, such as the Moringa (Moringa, n.d.) and Mirova (Mirova, n.d.-b) funds. Both funds focus on regenerative investing, with projects that also include agroforestry and carbon sequestration. While the Moringa fund has been divested in the past, the Mirova fund is still active and launching new flagship initiatives. Using both these examples made it possible to gain a deeper understanding of other agroforestry projects involving financial institutions in other roles, and critically review information gained from the interviews.

3.2 Methods for data-collection

3.2.1 *Document analysis*

For the document analysis (Bowen, 2009), keyword searches using Google and ChatGPT were used to find relevant reports and projects related to agroforestry involving smallholder farmers in the global south. In addition, the banks selected in chapter 3.1 were screened for mentions of agroforestry, voluntary carbon markets and carbon sequestration in their ESG and financial reports. Similar keywords were used on the websites of these companies. Any documents containing information pertaining to bank or intermediary involvement in agroforestry projects were then selected and screened for relevance.

In addition to the document searches using search tools, some documents were also supplied through personal contacts, interviewees, and the university websites.

The theoretical framework developed in Chapter 2.5 helped guide the keyword search, and documents were sorted depending on which of the topics got addressed by the specific document.

3.2.2 Interviews

To find relevant interviewees for the study, several different means of contact were used. For one, personal connections through the university were used to contact interviewees, leading to one interview with a respondent knowledgeable about the Rabobank-Acorn case. The snowballing method was used to find more respondents, leading to one more interview on the same case.

In addition to the interviews on the Rabobank-Acorn case, the banks selected in 3.1 were contacted through different tools (personal connections, website forms, cold email, LinkedIn, phone calls with customer contacts), but ultimately all interview requests were rejected due to lack of availability or knowledge of the subject.

In the end, 2 interviews of 60 and 40 minutes respectively were conducted, depending on the availability of the interviewee, using a semi-structured format. Questions were prepared and adapted depending on the responses of the interviewees and follow-up questions on focus topics were added when time was available. This approach was chosen as it allowed interviewees to fully expand on their area of knowledge, and bring up new important insights. Due to the different focus topics of the interviewees, the interview template was adjusted for each interviewee. Both interview templates can be found in the Appendix C.

Table 3 *List of Interviews*

Interviewee	Length of the Interview	Interview Template
Expert – Rabobank-Acorn program 1	57:15 min	Template A
Expert – Rabobank-Acorn program 2	37:03 min	Template B

The interviews focused mostly on the topic of bank risk and the involvement of banks in such cases, but less so on the specific barriers to entry for smallholder farmers. While the interview questions were designed to still address all 3 areas of the theoretical framework, more emphasis was put on the experience gained from the individuals on the Rabobank-Acorn project to fully reflect the strengths and knowledge of the interviewees.

3.3 Methods for data analysis

3.3.1 *Analysis of relevant documents*

After selecting the relevant documents as described in chapter 3.2, these documents were then examined for the information contained on the applicable keywords. The original intention was to use coding to compare sections and find relevant information in the different texts. However, due to the heterogeneity of the selected documents, and the inclusion of different kinds of projects in some of the reports, this approach led to inaccurate information, as sometimes similar words were used for different meanings and in vastly different contexts. To ensure the correctness of information, relevant sections were instead analyzed for any information pertaining to the sub questions and the theoretical framework, which focus on the criteria (1) barriers to entry for smallholder farmers, (2) risks to banks in agroforestry projects, (3) results of agroforestry projects with bank involvement and (4) reasons for banks

to engage in agroforestry projects. The relevant sections were identified by keyword searches in the indexes and contents of the documents obtained. Information gained from this step was then applied to the framework in order to answer the respective sub questions.

3.3.2 *Analysis of Interviews*

The first step of analysis of the interviews was the transcription of the recordings, done through the goodtape.io tool. Each interview transcript was then read several times, and important sections were highlighted and sorted according to the relevance to the sub questions. Due to the different expertise of the interviewees, and differing interview templates, the contribution to the sub questions of each interview was different. While Interview 1 primarily held information related to sub questions 1 and 2, Interview 2 focused more on sub questions 2 and 3. The information gained from this analysis was then sorted into the analytical framework, compared to the document analysis and ultimately used to answer the 3 sub questions.

3.4 Reflections on data gathering

3.4.1 *Reflections on Document Analysis*

The documents chosen were helpful in gaining a holistic understanding of the selected criteria. However, as availability of data on bank involvement in the Netherlands and Germany was very low, the scope of analysis had to be expanded to include other documents as well. This increased both the effort of analysis and heterogeneity. A result of this was that the developed coding criteria could not be applied successfully, and a less structured approach to the analysis had to be chosen. The increased scope may have led to the results of the information not being fully applicable to banks in the specified region. It may also have caused

some information in the reports to be included where it is not only applicable to agroforestry projects, but rather more general regenerative projects.

3.4.2 Reflections on Interviews

While the information gained from the interviews for the selected Rabobank-Acorn case was highly valuable for the research, some bias may have been introduced due to both interviewees having been involved in the projects themselves in the role of an intermediary. As the interviewees were chosen due to their high expertise on the topics, the insights gained were still helpful to find answers to the research question. Further perspectives on the case from outside sources or other roles in the agroforestry projects may have provided a less biased picture on the outcomes.

In addition, the lack of interviewees from other projects with banks playing a different role led to a bias in the emphasis on the specific Rabobank-Acorn case, and less in-depth information was gained on other cases and projects. However, the availability of interviewees outside of the case was very low, even though several potential interviewees were contacted, but ultimately denied due to lack of interest or lack of time.

4 Results

This study focuses on banks and how they can support smallholder farmers to access the VCMs. ARCPs play an important linking role between different actors in the carbon market. Three sub-questions are central to this research (see Chapter 1), and the analytical framework of this study (see Chapter 2) has been applied to the Rabobank-Acorn program. This chapter is structured around the three sub-questions and whereby the analytical framework guided the categorization of results across the main criteria: barriers, risks, and motivations.

4.1 What barriers are there for smallholder farmers to enter the carbon market and which of these can be addressed by the support of banks?

Starting from the information gained from previous literature, 3 different types of barriers can be distinguished for smallholder farmers to enter the carbon market: information uncertainty, monetary concerns, and administrative barriers. The barriers to entering the Voluntary Carbon Market (VCM) analyzed here correspond to those encountered at the start of a project, rather than when onboarding further participants to an ongoing project.

This study focuses on barriers to starting ARCPs where the involvement of a third-party intermediary with outside knowledge and resources may be helpful to addressing said barriers. This refers mostly to barriers within the initial research for a project, contacting farmers and communities, organizing collaborations and setup of the project. These steps are often handled by local organizations and NGOs who have the expertise and contact with the relevant communities, limiting the need for third parties other than for funding. This study will address this stage mostly under the lens of the required funding and administrative tools for this project stage, rather than going into further detail.

A study by Plan Vivo (Plan Vivo, 2025) found that many ARCPs struggle with a funding gap when assessing the feasibility of new projects, as investors are often only willing to commit funds to a project once it has been proven to be feasible, and a clear project plan is available. However, especially first-time developers often struggle with the skill of financial modeling (Plan Vivo, 2025) and need external expertise such as consultants to improve their results to be fit for investor presentations. Another report also lists financial and carbon modelling as important steps for investor engagement in projects related to Forest & Nature-Based Investments (Xilva, 2024). This issue corresponds to all 3 types of barriers to entry identified in the framework. Smallholder farmers rarely have the education on or access to financial modelling and project design that investors require, thus making it necessary for third parties to take part in this step of the process (Xilva, 2024). It may also be difficult for smallholders to communicate the information on farming that is necessary for creating the models in the first place, for example due to language barriers, lack of access to technology or theoretical knowledge. In many cases (Plan Vivo, 2025), farmers are not directly involved in this stage, while other stakeholders prepare the project concepts. Lastly, when investors require proof of concept, farmers may already have to start their activities, which requires an up-front investment.

Another topic identified by Plan Vivo (Plan Vivo, 2025) is the lack of technical assistance for many agroforestry projects. Many local organizations and project developers have the expertise for applying project planning concepts but lack access to administrative or technological tools to do so. Funding is important here, as small grants may help project teams get started more easily and thus enable the project development more quickly (Plan Vivo, 2025). This is supported by the observation that teams which have developed projects before need less time to start a new one (Plan Vivo, 2025), showing that expertise and access to

technology help speed up timelines for project development, and thus enable farmers to take part in these initiatives more quickly. Another option for addressing this barrier was identified as project bundling by Plan Vivo (2025). By including multiple projects into one platform or program, technology, knowledge and expertise can be shared, thus lowering costs and resource requirements.

Many Nature-Based Solution projects also struggle with finding reliable cash flows or financial remuneration for investors that expect a return on their funds (Climate Policy Initiative, 2024; Plan Vivo, 2025; Rabobank-Acorn Expert 1, 2025). These struggles can be caused by lack of financial experience, insufficient models and lack of information, as well as the high risks involved in such projects (Xilva, 2024). This makes it even more difficult to find long-term buyers or set up reliable relationships for the project. While interest in carbon credits is high among private buyers (Fegelman et al., 2024; Plan Vivo, 2025), the number of credits bought is growing slowly. Potential solutions suggested here are blended finance structures (Plan Vivo, 2025; Rabobank-Acorn Expert 1, 2025; Rabobank-Acorn Expert 2, 2025), or fund constructs such as the Moringa Fund (Climate Policy Initiative, 2024; Proparco Groupe AFD, 2013). Such structures rely on up-front investment through grants or funds, while later repaying these expenses through project revenues. Interviewee 1 highlighted the importance of the ability to onboard long-term buyers, who agree to purchase the carbon credits in the future and thus guarantee remuneration for farmers and project stakeholders (Rabobank-Acorn Expert 1, 2025).

Rabobank and SAF do not only provide funding for ARCPs, but also add expertise, as well as company-owned tools and methodology for these projects (Rabobank-Acorn Expert 1, 2025). One such tool is the Remote Sensing technology that Rabobank has developed to

project and track the CRUs achieved by ARCPs (Rabobank-Acorn, n.d.-d). It enables better tracking and prediction of the carbon credits throughout a project's different stages, increasing transparency both for the smallholders as well as for the investors, which interviewee 1 highlights as allowing Rabobank-Acorn to "know exactly how much carbon [the farmers] have sequestered on their land from just the trees that grew that year" (Rabobank-Acorn Expert 1, 2025). Interviewee 1 stated that Rabobank-Acorn developed its methodology together with Plan Vivo, and received an umbrella certification for all carbon farming under the Acorn program (Rabobank-Acorn Expert 1, 2025). In the interview, it became clear that this allows for a decrease in the administrative burden when setting up new projects, such as certifications, development of technologies and carbon modelling frameworks (Rabobank-Acorn Expert 1, 2025).

Interviewee 1 also highlighted the importance of working together with local partners to find farming practices and plants that fit the local ecosystem, with few adjustments needed for the farmers (Rabobank-Acorn Expert 1, 2025). By having many ARCPs using similar methods and tools, Rabobank can communicate lessons learned and experience to their local partners, while relying on the locals to bring local and cultural knowledge to the exchange. This allows for lower barriers regarding education, changes in farming requirements and preparation of the land. By effectively working together, information inequality can be addressed, as farmers can share their insights into what plants are useful for the overall farming setup, which plants may be culturally relevant and where potential issues may occur. On the other hand, farmers can be informed about the expected results from agroforestry initiatives, what is expected from them in the project and where potential pitfalls arise. (Rabobank-Acorn Expert 1, 2025)

4.2 What can banks and other stakeholders do in order to minimize risk to banks due to information asymmetry and market volatility?

Banks and financial institutions experience different risks during agroforestry projects than those already discussed for smallholder farmers. Lack of transparency in agroforestry projects is often cited in the scientific literature as a risk to their success (Minang et al., 2017; Sy et al., 2016). This view is also reflected in a recent study by Xilva (2024) on the most common risks of Forest & Nature-Based Investments, including agroforestry projects. While no clear distinction for only agroforestry projects exists, the highest rated risk for all examined projects in this study is the lack of critical documentation with 90% of projects affected. Other high-ranked issues based on information transparency issues are Incomplete financial planning (70%), carbon model issues (70%) and misaligned project vision (40%). This type of information asymmetry is often a reason for investors to not provide funding for a project, as it may lead to project failure, or expectations cannot be properly communicated. (Xilva, 2024)

Interviewee 1 stated that for banks involved in agroforestry-related carbon-projects, “reputational risk is the biggest” (Rabobank-Acorn Expert 1, 2025), which is also supported by the analysis from Xilva (2024). Reputational risk is mainly focused on negative press coverage or societal views on these projects, such as greenwashing or fraud accusations, fraudulent reporting on amounts of carbon sequestered or abusing subsidy systems with no intention of producing carbon credits (Cantisani & Ricci, 2025; EPPO, 2024; Umweltbundesamt, 2022). Additionally, cooperations with bad actors that employ methods that go against the agreements with the program, such as child labor or use of pesticides as identified by interviewee 2 (Rabobank-Acorn Expert 2, 2025), also fall under this risk category. In response to such fraud cases in the past, over time many certification schemes, oversight bodies and

policies for agroforestry projects were developed, e.g., the Core Carbon Principles by the Integrity Council for the Voluntary Carbon Market (ICVCM) (ICVCM, n.d.). These principles ensure integrity and quality of carbon credits in all projects operating under its rules. However, the risk of negative coverage or breaches of such agreements persists. As an intermediary, insight into the methods and tools used for farming can be hard to come by, unless supported by strong monitoring tools such as Rabobank-Acorn's remote sensing methods (Rabobank-Acorn Expert 1, 2025).

The third risk category identified by both interviewees for stakeholders that invest in ARCPs, especially in the phase of project development, can be summarized as default risk, which is the risk of not recouping the initial investment. Both interviewees refer to "production risk", "price risk", "market risk" or "performance risk" (Rabobank-Acorn Expert 1, 2025; Rabobank-Acorn Expert 2, 2025), all of which contribute to a lack of ability to generate enough revenue to cover the initial investment. These types of risks are also reflected in other documents, such as USDA (n.d.-b) and UCANR (n.d.) and can be caused by multiple issues: lower than expected sale prices for carbon offsets on the VCM, lack of ability to scale the project, low production yields or unexpected issues like weather events. Interviewee 1 explained that generally, banks have tools and budgets allocated to this type of risk for all their investments (Rabobank-Acorn Expert 1, 2025). However, depending on the risk preference of an investor, this can lead to uncertainty in investments if these risks cannot be correctly estimated. Rigorous quality checks, market research and oversight into carbon farming practices are required to understand the exact amount of investment risk any investor is facing.

Another risk affecting markets is the uncertainty around political changes and increasing policy oversight. On the one hand, political changes in the production country in the Global South may limit the output of carbon credits from the projects, as well as the access to the farmed carbon credits, as stated by Interviewee 1 (Rabobank-Acorn Expert 1, 2025). On the other hand, increased oversight and certification requirements may cause some ARCPs to become ineligible over time or be less preferred by buyers compared to newer projects (Procton, 2024; Rabobank-Acorn Expert 1, 2025).

The collaboration with local partners and SAF allows Rabobank-Acorn to decrease its exposure to price and production risk, as stated by Interviewee 1 (Rabobank-Acorn Expert 1, 2025). As price risk occurs due to uncertainty about how carbon prices will develop, Interviewee 2 stated that for the Rabobank-Acorn project, this is mostly handled “through long-term off-take agreements” (Rabobank-Acorn Expert 2, 2025). These offtake agreements ensure that certain prices will be paid for carbon credits produced in the future, for a stable price that can be set in the present, allowing the project to rely on the income stream once plants are mature (Rabobank-Acorn Expert 1, 2025; Rabobank-Acorn Expert 2, 2025). Production risks depend on selecting the correct trees and plants for agroforestry and carbon farming, and their fit with the local communities and practices. As stated by Interviewee 1, a main objective of the Rabobank-Acorn program is the right selection of agroforestry systems for the selected project (Rabobank-Acorn Expert 1, 2025). However, other parts of production risk, such as weather events like droughts or storms, cannot be fully mitigated.

Political risk is also something that many projects in the Global South are facing, not only ARCPs (Kagan, 2023; Marston, 2019; Sargeant & Shang, 2012). Both interviewees also identified this type of risk (Rabobank-Acorn Expert 1, 2025; Rabobank-Acorn Expert 2, 2025).

Due to the prevalence of these issues, insurances have been developed against this type of risk, such as the guarantees hosted by the Multilateral Investment Guarantee Agency (MIGA) organization (MIGA, n.d.-a). Through the World Bank Group Guarantee Platform, financial guarantee products, experts and risk mitigation tools are provided by the International Finance Corporation (IFC), MIGA, and the World Bank, in order to support both public and private sectors to reduce their political and commercial risk when investing in emerging markets and developmental projects (MIGA, n.d.-b). Rabobank-Acorn is using the MIGA insurance structures to mitigate political risks within its ARCPs, according to Interviewee 1 (Rabobank-Acorn Expert 1, 2025). Additionally, as stated by Interviewee 2, dedicated personnel are in charge of engaging with governments and organizations in the production countries in the Global South to make sure the ARCPs are supported by the local governments (Rabobank-Acorn Expert 2, 2025).

Risks created by information asymmetry are also a well-known issue for Rabobank-Acorn. Each project must undergo rigorous quality checks and due diligence to ensure the quality of the carbon credit units as stated by Interviewee 1 (Rabobank-Acorn Expert 1, 2025). The remote sensing technology allows for better estimates and ensures the feasibility of the projects from the beginning (Rabobank-Acorn, n.d.-d). This lowers the risks experienced from information asymmetry due to a lack of knowledge. Further, collaboration and communication are improved with local partners due to the experience Rabobank has as an agricultural bank. Interviewee 1 stated that due to Rabobank's background in agricultural projects, it can capitalize on a large network of partners and organizations operating in the relevant regions (Rabobank-Acorn Expert 1, 2025). This allows the bank to minimize risk from failed communications or a lack of cultural adjustments.

Lastly, information asymmetry may also cause bad actors to affect the outcome of agroforestry-related carbon projects. However, the revenue structure of the Rabobank-Acorn program incentivizes every stakeholder to ensure the success of the project to maximize their own interests. As explained by both interviewees, the Rabobank-Acorn projects use an 80-10-10 split for the revenue generated from carbon credits. 80% of the revenue is allocated to the smallholder farmers, which can then be used to pay back loans granted by SAF to enable the start of the project, e.g. for buying trees, seeds and tools. 10% of the revenue goes to the local partners to cover administrative expenses. And lastly 10% is received by Rabobank-Acorn to cover certification, data management, brokerage and verification of carbon credits (Rabobank-Acorn Expert 1, 2025; Rabobank-Acorn Expert 2, 2025). As each actor is rewarded according to the revenue generated, all stakeholders are accountable for their own success. On the other hand, maximizing financial interests is not the main objective for stakeholders in the Rabobank-Acorn program. As emphasized by Interviewee 1, empathy and trust are the main reasons for the success of the Rabobank-Acorn projects so far (Rabobank-Acorn Expert 1, 2025). Interviewee 1 also highlighted that by putting the focus on the needs of the farmers and communicating this approach to the buyers of the carbon units, a high amount of loyalty is created between all stakeholders. The loyalty created by this approach not only allows Rabobank-Acorn to build a large network of partners and farmers but also attracts buyers who are willing to pay higher prices for carbon credits, as their goal is enabling the farmers to become more climate resilient.

4.3 Can banks use investment strategies or financial products to provide funds to smallholder farmers while mitigating their own risks, and if so, which products would this be?

Two main ways have been identified in which banks can take on the role of an intermediary in the carbon market, to different degrees. The first is direct program financing, like in the Rabobank-Acorn program. This is a very direct approach that is suited to Rabobank due to its background as an agricultural bank, as well as its status as a cooperative, instead of a commercial bank, as stated by Interviewee 1 (Rabobank-Acorn Expert 1, 2025). In the Rabobank-Acorn program, Rabobank is involved in setting up projects and providing pre-financing through the SAF facility with their local partners. This facility enables Rabobank to get involved in projects before other investors, especially those with low-risk profiles, typically show interest in these types of projects (Rabobank-Acorn Expert 2, 2025). Commercial banks are under many regulations which limit their risk exposure to protect the investments and savings of their clients (Rabobank-Acorn Expert 1, 2025). This can make it difficult for banks to take an active role in agroforestry projects, especially at the early stages of project development, as Interviewee 1 emphasized. SAF allows Rabobank to be involved in this pre-financing phase of projects and enables smallholder farmers to fund their agroforestry trees and farming practices. One main advantage of this financial setup is the blended finance structure that has been developed by SAF to provide loans to ARCPs, which later get repaid through carbon credit revenues. This structure was explained by Interviewee 2, and similar structures can also be found in other documentation of green financing. It uses a three-trench system: junior, mezzanine and senior. The junior trench is generally funded by philanthropic organizations and takes the risk for the first loss of the project. These investors will be repaid

last and are mostly there to cover the risk for other investors. The senior trench is for more commercially oriented investors, with shorter investment horizons and lower risk preferences. They are repaid first and carry the lowest risk in case of default or losses within the project. The mezzanine trench sits between junior and senior trenches and has some characteristics of both. Through this vehicle, SAF can bundle different types of investors at the early stages of the project, while also being able to protect low-risk investors from potential losses. (Clubb & Ivory, 2024; FMO, n.d.; OECD, 2018; Rabobank-Acorn Expert 1, 2025; Rabobank-Acorn Expert 2, 2025; USAID, 2020). Interviewee 2 also stated that SAF has a Technical Assistance Facility (TAF) to give grants to projects in their development phase so they can become eligible for funding from the main facility, for example for starting training programs, running pilot projects or hiring more staff. This facility uses funds that are provided mostly through donations but are separate from the main funds of SAF (Rabobank-Acorn Expert 2, 2025).

Rabobank also uses insurance against political risk. This can be seen as a guarantee-type of instrument and is more related to indirect financing. According to Interviewee 1, other tools for risk hedging or financial products are not currently employed by Rabobank for the Acorn program and are also not currently planned (Rabobank-Acorn Expert 1, 2025).

The other intermediary role banks and other financial institutions can fulfil in the carbon market is through different types of indirect financing of agroforestry-related carbon projects. Examples for this include impact investment funds such as Moringa and Mirova, and debt instruments like Green bonds (Forest, n.d.; ICMA, 2021) or guarantees (Ryatt & Thorne, 2022). Impact investment funds are funds that are set up by private sector investment companies specifically to create a measurable and meaningful benefit to society through financing, while still creating a financial return for the investors (UNDP, n.d.). In this example,

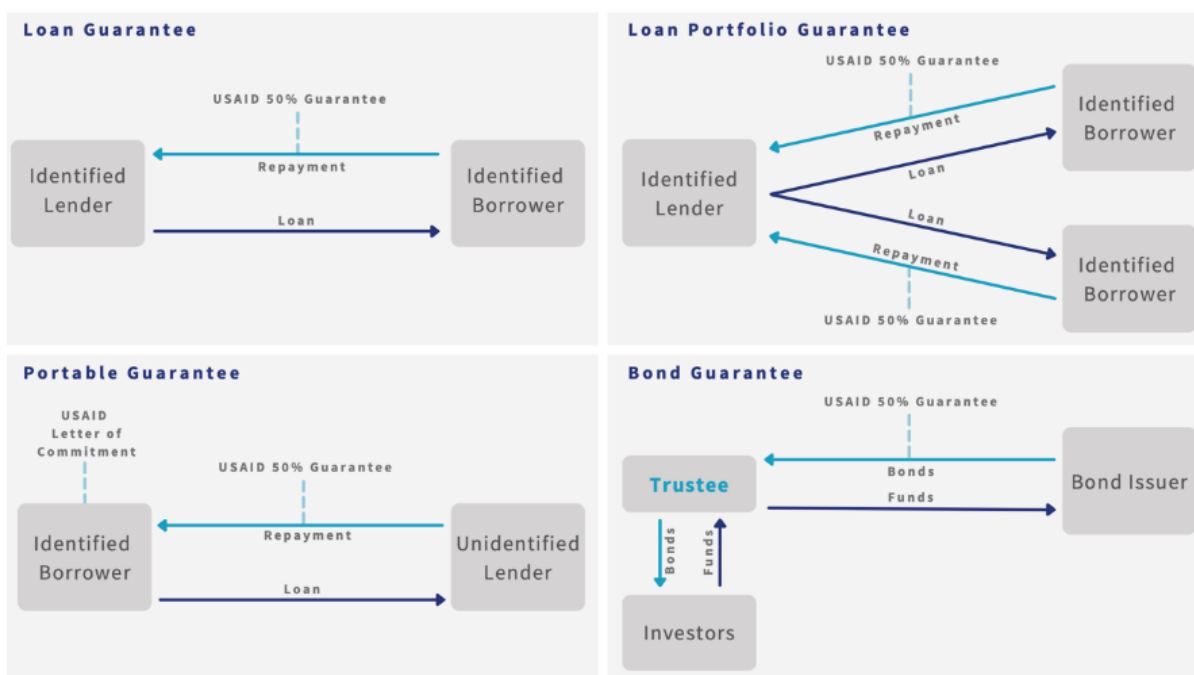
the Moringa fund was a fund jointly created by a subsidiary of the French National Forest Office (ONFI) and the private equity firm Edmond de Rothschild with the intention of funding agroforestry projects located in Latin America and Sub-Saharan Africa. According to a report by the Climate Policy Initiative (2024), the fund had a two-pillared structure, with an equity fund for financing agroforestry companies, and a TAF similar to what Rabobank-Acorn uses to give assistance for training, development and research to the local partners and smallholder farmers. Returns from the agroforestry activities would get paid out as returns to the investors. However, at the current time the fund has been divested, following mismatched expectations and challenges to the success of the financed projects (Climate Policy Initiative, 2024). On the other hand, Mirova is an investment company with the stated goal to combine “financial performance with environmental and social impact” (Mirova, n.d.-a). It currently offers two funds supporting sustainable land use, and uses a strategic partnership with the Rainforest Alliance to fund Nature-Based Solutions, with a focus on agroforestry related projects (Mirova, 2024, 2025). The second-generation fund by Mirova, the “MIROVA SUSTAINABLE LAND FUND 2” also uses a blended finance approach, with a mix of public, philanthropic and private funding.

Green bonds are a “fixed-income debt instrument earmarked to raise money for climate and environmental projects” (Segal, 2024). These bonds have a set initial investment, with the principal being paid at maturity and fixed interest payments during the active period, but the investment can only be used for funding sustainable companies and projects.

Lastly, financial guarantees such as those employed by development agencies like USAID can help bring funding to projects with high risks, as investors can recoup parts of their investments from these agencies if the projects default. This allows banks and other financial

institutions to provide funding for high-risk borrowers, while keeping their risks minimal, however it is dependent on the availability of such guarantee initiatives. The exact structures of these guarantees can vary, shown in the figure below on an example from a case study by USAID. (Ryatt & Thorne, 2022)

Figure 2 Types of guarantee structures



Note: From *USAID Development Credit Guarantees* (Ryatt & Thorne, 2022)

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What these different types of structures have in common is the intention to provide financing to underserved borrowers, such as those without access to financial markets, small sized companies or organizations, or high-risk projects. When applied in the context of agroforestry, these tools can be used to allow NGOs and smallholder farmer associations to gain funding for ARCPs. With more traditional debt instruments or less risk mitigation, providing funding for such projects can be unattractive for investors, due to the relatively low

return on investment compared to the high risk. However, when sustainable development is part of the goal of the investment, investors become more willing to accept lower returns (Harasheh et al., 2024), especially when risk-mitigating structures are also employed.

While these instruments can provide financing for ARCPs, access to this funding is still often difficult for new project developers unless certain criteria (like project feasibility) have already been cleared (Plan Vivo, 2025). The indirect approach also does not allow for sharing of insights and tools or support the farmers and local partners in running the project directly. Recent political developments have also decreased the availability of certain types of financing, for example due to the decrease in USAID funds (Plan Vivo, 2025). Some of these financial instruments also use blended finance structures, though without the increased involvement required for direct financing. Many of these instruments share the intentions of decreasing risk for investors in the long term and enable different investor types to bundle funding for sustainable initiatives.

However, success of these financial tools is not guaranteed. In the example of the Moringa fund, strategies for de-risking were focused only on providing technical assistance to the farmers and agroforestry companies involved in the project. It lacked the blended finance aspect and thus created a mismatch between the low risk preferences of the investors, and the longer timeframe and risky nature of ARCPs. Lack of local knowledge, transparency, reliance on one income type and adaptation to changing needs also made it more difficult for returns to be generated by this instrument. In the end, investors did not find the returns sufficient for the inherent risk for the investment, and thus the projects were divested. (Climate Policy Initiative, 2024)

One more financial tool that can be employed to support smallholder farmers in the transition towards ARCPs is Microfinance. Microfinance is defined as banking services provided to low-income individuals, and in regions with low access to traditional banking services. These financing options are also frequently not provided by traditional finance companies like banks but are rather community or startup funded (Kagan, 2024). Microfinance can allow smallholder farmers to use banking services that they would otherwise not have access to, and can provide funding for innovations, new farming technologies and potentially turning towards agroforestry to develop new markets and sources of income (FAO, n.d.). NGOs like Appui au développement autonome (ADA) already provide Microfinance to smallholder farmers and among others have programs aimed at increasing resilience for smallholder farmers through “promoting climate-smart and agroecological farming” (ADA, n.d.). This study could not find any evidence of traditional banks or financial institutions employing such tools for this purpose. This is in line with the expectation of microfinance often not being provided by traditional firms and structures.

5 Discussion

Using the theoretical framework developed in chapter 2 as topics, this chapter now relates the information gained from document analysis and interviews. The goal of the chapter is to understand how each of the topics from the framework can be put into relation to the research question and help answer it.

5.1 Barriers

Through the literature review, it was possible to find 3 general types of barriers to entry into VCMs for smallholder farmers, (1) information uncertainty, (2) monetary concerns, and (3) administrative barriers. Identification of these barriers is the subject of many different types of literature, but these are less often stated explicitly in project reports. Rather, the effects and risks caused by these barriers are the topic of discussion or provide the basis for certain actions taken by the agroforestry-related carbon project groups. Information uncertainty for example can be observed by the need for structural training and information on agroforestry practices before related carbon projects can be started (Cammarata et al., 2024; FSD, 2024a; Kragt et al., 2017). Further, it is also apparent when considering the need for specialized personnel for matters like ensuring political agreement to these projects (Rabobank-Acorn Expert 2, 2025), and the need to adapt practices to local standards. The latter is, for example, shown with the Rabobank-Acorn program choosing appropriate seeds for both the environmental and societal needs in the respective regions (Rabobank-Acorn Expert 1, 2025). Secondly, monetary concerns are highly apparent due to the repeatedly stated need for financing, the many different structures and tools for both private and public funding, and the struggles faced by carbon sequestration projects over financing issues (see

chapter 4). Lastly, administrative barriers can be observed by the need for local partners like Solidaridad for Rabobank-Acorn projects that take care of administrative tasks for the agroforestry-related carbon projects. Additionally, structures in financing instruments like TAFs as used by SAF and Moringa (Climate Policy Initiative, 2024; Rabobank-Acorn Expert 2, 2025) show that administrative concerns are especially impactful before the start of potential projects.

While the documents reviewed and interviews conducted for this study confirm the presence and categorization of barriers to entry for smallholder farmers into the VCM, it also becomes clear that different actors play different roles in addressing the types of barriers. For example, information uncertainty in the Rabobank-Acorn program is often addressed by local partners, such as NGOs like Solidaridad, though the remote sensing capabilities built up by Rabobank can also play a big role in finding out necessary information to relay to these local partners and smallholder farmers (Rabobank-Acorn Expert 1, 2025). While remote sensing is more useful when the project is already underway, it does help build a knowledge base for further projects in similar areas and can contribute to successful information transfers to smallholder farmers newly entering agroforestry-related carbon projects. For monetary concerns, banks and financial institutions can play a large role, though this is still somewhat underdeveloped. Currently, much funding comes from philanthropy and public funding, while private interest in carbon project financing, especially from banks, has somewhat decreased in the 2010s (Faecks, 2024). However, there still is interest, and newly launched instruments like the funds by Mirova show that there is still a market even outside of larger programs like Rabobank-Acorn. Other actors such as startups, NGOs and communities may also provide support for these barriers through microfinancing (FAO, n.d.). In the case of administrative issues, it is once again local partners or consultants who are the driving force in removing this

barrier, as banks and other financial institutions are often more removed from such matters, even though the results of pilot projects, project presentations and financial models are highly relevant to them. However, TAFs can help fund the activity by allowing higher budgets for the local partners or hiring consultants where necessary, showing that bank involvement can also be helpful for addressing this barrier.

5.2 Risks

The second criterium of the framework concerns the risks experienced by banks as uncertainties and market risk. From the document analysis and interviews, these categories can broadly be confirmed, though the risks were explained in more detail especially during the interviews. Market risk is the one type of risk that was mentioned with the same name in documentation and interviews, caused for example by factors such as carbon price volatility or lack of demand for carbon credits (Battocletti et al., 2024). To combat this type of risk, the Rabobank-Acorn program uses long-term offtake agreements (Rabobank-Acorn Expert 1, 2025). However, for banks or financial institutions without similar connections to purchasers agreeing to higher prices due to the good relationship and high standards established by the program, market risk continues to be a concern. Many companies are publishing carbon reduction targets for the near future, and interest in carbon credits is increasing as deadlines start to approach, as stated by interviewee 1. This may provide a short-term increase in demand and prices, though with an increasing movement towards net zero emissions and actual reductions in carbon emissions during production processes, the market may contract again in the longer term (Rabobank-Acorn Expert 1, 2025).

Regarding information uncertainty, issues related to this type of risk have been identified by the interviewees as “reputation risk” and “political risk” (Rabobank-Acorn Expert

1, 2025; Rabobank-Acorn Expert 2, 2025). The former relates to news coverage of carbon projects and the quality of credits produced. Especially interviewee 1 sees this risk as the most important one for banks involved in agroforestry-related carbon projects due to the impact it can have on the bank outside of the actual projects (Rabobank-Acorn Expert 1, 2025), for example when customers become unwilling to use the services of the bank if they believe it was involved in amoral actions. Political risk is more directly related to what has been identified in scientific research (Battocletti et al., 2024), with both interviewees referring to this type of risk regarding changing political climates in production countries in the Global South and the need for close management of related requirements and permits. Lastly, power imbalances in information can cause reputational risk as identified by interviewee 1 and can be caused by lack of documentation and administrative skill, which is confirmed as the most widespread risk affecting projects involving Forest & Nature-Based Investments (Xilva, 2024). Rabobank-Acorn addresses this issue through rigorous quality checks, close collaboration with local partners, and using their remote sensing technology to stay informed about the status of the carbon projects. Additionally, the power imbalance favoring banks due to their influence over the distribution of funding may cause bad actors to act against the interest of projects if they feel their remuneration is not sufficient. Depending on the remuneration structures of projects, a large amount of the upside can go to those providing funding, for example if smallholder farmers directly sell all carbon credits produced to the finance providers to repay the funding provided upfront to start the project. As interviewee 2 (2025) explained, the farmers then have a relatively small upside if the price for carbon increases, while the financier will gain the majority of the profits due to the increased prices. This may lead to a lack of motivation for the farmer to produce high quality carbon credits and disadvantages the farmer as their effort does not get sufficiently rewarded. In the Rabobank-

Acorn program, this risk is addressed by basing the repayment of the investment on revenue from carbon credit sales rather than the credits directly (Rabobank-Acorn Expert 2, 2025). This ensures that high quality and quantity of carbon credits also remunerates the smallholder farmers (using an 80-10-10 model with 80% of revenues going to the farmer and 10% only to the repayment of the investment), providing incentives for all actors in the agroforestry-related carbon projects to work towards the success of the project.

Most of the risks, other than the reputational risk, culminate in default risk on the initial investment by the agroforestry project invested in, which means the inability for the bank to recover the investment through repayment via the sale of produced carbon credits. Additionally to the structures already explained to minimize each risk individually, banks also use financial tools to decrease default risk for their investors. This can include blended finance structures to divide risk according to the risk appetite of the respective investor, guarantees to decrease the amount of deficit due to a default, or addressing the debt-instrument explicitly to sustainability focused investors who are willing to take higher risk and lower returns on investment, for example through green bonds or impact investment funds.

5.3 Motivations

Scientific theory distinguishes between two general types of motivations, extrinsic and intrinsic motivations (Zimmermann, 2019). The former refers to more altruistic intentions, while the latter implies profit-seeking intentions, regarding both financial and reputational improvements. While documentation of projects rarely outright state intentions, expectations for returns on investment for example for the Moringa fund were high, and investors expected to generate profit through the impact investment fund. Other projects providing initial financing in return for carbon credit profits as explained in chapter 5.2 also estimate the return

of profits from their investments, with less remuneration going back to the smallholder farmers producing the carbon credits. In general, equity structures for the repayment of the initial investment can be related more strongly to extrinsic motivations, though the support of sustainability-focused projects also shows a partial intrinsic motivation. On the other hand, structures that are more debt-focused, such as green bonds and the specific revenue-split structure of Rabobank-Acorn limit the upside for the investor and focus more on the benefit for the farmer or society overall through supporting sustainability-focused projects, such as agroforestry-related carbon projects in this case. While there is an observable motivation to regain the initial investment, and not experience default on the provided funds (Rabobank-Acorn Expert 2, 2025), profit is not the first interest of such investments. Rather, empathy and societal improvement are the stated goal of Rabobank-Acorns program, as stated also by Interviewee 1 (2025). Both types of debt and equity structures also include the intention to improve or at least not worsen the reputation of the banks involved in agroforestry-related carbon projects, no matter how this involvement takes place. With society becoming increasingly focused on ESG-goals and the sustainability of the companies, products and services they use (Günther et al., 2020; O'Rourke & Ringer, 2016), this motivation can provide a strong incentive for banks other than development or agriculture banks to engage in agroforestry projects. However, if current political trends towards less stringent sustainability goals continue, this motivation may lose value over time, though scandals and negative reporting will still pose a risk to the banks still engaged in agroforestry-related carbon projects.

When comparing a more extrinsically motivated project, such as the Moringa fund with a more intrinsically motivated program, such as Rabobank-Acorn, some differences become clear. Rabobank-Acorn is better able to manage different types of risk due to the more involved structure of the program. By having a more complex financial structure, strong

cooperation with local partners, smallholder farmers and carbon credit purchasers, good oversight and information certainty through remote sensing technology and dedicated personnel to manage projects, structures and risks, not only does Rabobank-Acorn manage to reduce the default risk on its investments, but it also manages to cultivate a strong reputation and trust into the project. This in turn incentivizes investors, carbon credit providers and carbon credit purchasers to engage with its program, as shown by an increased interest in the program reported by the interviewees (Rabobank-Acorn Expert 1, 2025; Rabobank-Acorn Expert 2, 2025). On the other hand, high return on investment expectations, low risk appetites, and lacking risk management shown by the example of the Moringa fund have led to its divestment. As the alignment between the different actors was lacking, the fund could not provide sufficient remuneration to investors to be continued (Climate Policy Initiative, 2024). A stronger involvement by the intermediary, the management of the fund itself, may have been able to mitigate these issues, but this study could not find sufficient data on the specifics around the divestment of the fund, and its management. While one example for each type of motivation is not sufficient evidence to conclude a causal relationship between the type of motivation, the amount of involvement of the intermediary and the success of the project, further research may be helpful to examine this potential connection.

6 Conclusion

6.1 Conclusion to the study

The leading research question for this study was: *Can banks help smallholder farmers overcome barriers to entering the voluntary carbon market?* To find an answer to this question, this study considered established scientific research, project reports and documentation concerning ARCPs, as well as semi-structured interviews with experts on the Rabobank-Acorn program. Using data derived from these sources, an in-depth review was conducted to understand the barriers to entry into VCMs that smallholder farmers face, the risks banks experience when engaging as an intermediary in ARCPs, and the impacts and motivations of such engagements.

The analysis showed that banks are in a strategic position where they can both build risk-absorbing financial tools to allow investors with different risk appetites to take part in VCMs, as well as to enter long term relationships with buyers due to their involvement in larger markets and the lending business. This allows banks to address finance-related risks such as market risk and default risk, while other actors have lower access to tools for similar mitigation. Especially smallholder farmers and local NGOs profit from the connection of commercial banks with potential carbon credit purchasers, as well as the access to financial markets to obtain funding, as these are less well established for those actors. However, for other risks that are not directly related to financial services, such as information uncertainty and power imbalances, banks are less well equipped to provide risk-mitigating measures on their own and instead must rely on other actors such as local partners to provide, for example, administrative support and training to smallholder farmers. Despite this, the example of Rabobank-Acorn has shown that strong collaboration between the different actors can enable

the local partners to mitigate risk much more effectively, for example with Rabobank-Acorn providing technology and knowledge, such as the remote sensing tools it developed, or through umbrella certifications and verifications of ARCPs. In addition, specialized facilities and personnel that act outside of traditional obligations of banks, such as the SAF can help with providing financing even for more risky projects, due to its employment of blended finance structures. When comparing the longevity of ARCPs between Rabobank-Acorn, with its strong partnerships and high trust between the actors, and other financiers such as the Moringa fund, where partnerships were less well established and involvement of the financial institution with the ARCPs was not on the same level as for Rabobank-Acorn, it shows that the additional effort into setting up trustworthy structures and collaborations can decrease risk in the long term. While it may not be attractive to banks to invest this additional time and money in these activities, it helps establish a common understanding and trust between the actors. Ensuring mutually beneficial relationships can also increase the motivation of all actors, which can decrease risk from power imbalances. One thing of note is that banks and financial institutions must realize that while ARCPs can be seen as a new income stream, profits from such projects are generally rather low, especially if the wellbeing of the smallholder farmers is put into the foreground. As such, it is important to realize that ARCPs started with extrinsic motivations may have a disconnect between profit expectations and actual outcomes, which may extrinsic motivations poorly suited for decreasing risk and ensuring long-term success of the project. On the other hand, when entering ARCPs with more intrinsic motivations, actors may be more willing to expand the effort to set up intricate structures with high trust between the actors and providing a benefit to the most vulnerable actors as well as the environment. This in turn can also lead to benefits for the banks, as they may experience reputational

advantages when projects are successful, and customers are willing to have close relationships with the bank in return.

As a conclusion, this study postulates that banks can help smallholder farmers overcome barriers to entry especially regarding financial security through provision of funds. However, it is necessary to establish strong structures and mutual relationships between different actors to ensure that other barriers, such as administrative issues and information security, can also be addressed. Banks can provide a valuable service through their connections with financial markets and investors, though motivations and expectations must be clearly established and communicated to ensure long-term success of projects. For this, it may be necessary for banks to act outside of a more traditional, purely financing-providing role, and instead take a role as coordinator and supporter in other areas of the ARCP. However, as there are only a few projects that can be taken as an example for this conclusion, further study may be necessary to confirm this interpretation.

6.2 Recommendations to practitioners/policymakers

Banks should consider which motivations they have when approaching engagement in ARCPs and appropriately assess the risk levels in comparison to the returns on investment the projects may yield. Depending on the outcomes of the assessment, it should also be clear to banks what steps may be necessary for ensuring lower risks in the managed ARCPs, with the leading example of Rabobank-Acorn. In contrast, NGOs operating locally looking for funding may also consider the low risk appetite of banks and suggest appropriate structures and oversight. While access to financial markets and connections with potential purchasers can be strong upsides for ARCPs, risk restrictions of banks and financial institutions due to regulations

may increase reporting pressures, and potential partners should be approached with this in mind.

Policymakers for banks in the corresponding regions may want to consider how to enable bank cooperation with higher risk ARCPs in order to increase the overall carbon sequestration per year, as current regulations make it difficult for banks with different setups than the cooperative structure of Rabobank to take steps toward more risky engagements outside of strict philanthropy through grants and foundations.

6.3 Limitations

There were several limiting factors to the data collection process, mainly due to the availability of data on relevant ARCPs. For one, while banks have shown some interest in carbon markets in the early 2000s, this interest declined around during the 2010s, likely due to a mixture of high risks, low commodity prices and a changing political landscape (e.g. the end of the Kyoto protocol) (Faecks, 2024; Nelson & Berg, 2021). Additionally, many banks still have high exposure to fossil fuel industries, and sectors linked to deforestation (Cavallito, 2021; Euronews Green, 2025). This declining interest and retraction on carbon emission reductions is a likely cause why not many banks in Germany and the Netherlands have any current involvement in agroforestry, especially in the Global South. A result of this was the low availability of data on bank involvement in such projects aside from the Rabobank-Acorn program, which led to a lack of comparison to confirm or deny the observations from these projects. As expansion into more international financial institutions was necessary, this also increased the number of documents to evaluate and analyze. Additionally, it increased the heterogeneity of these documents, as instead of company or project reports, other sources,

such as general reports on regenerative projects, had to be used, which increased complexity during the analysis phase. It may also have introduced a bias.

A second limitation was the availability of interviewees, as the original intention was to use interviewees for both the specific Rabobank-Acorn case, as well as other projects. However, due to the lack of involvement of other banks, finding respondents from other banks was made much more difficult. While personal contacts ensured some initial interest in cooperation, the specific topic led to declined interview inquiries, as it was not relevant to the contacts, or expertise on the subject was not available.

Resulting from the low availability of applicable projects and documents, the study used very few cases for comparison, and in-depth analysis of some cases was not possible, for example the Moringa fund whose website currently is inaccessible and information can only be gained by using third party tools like web.archive.org. This made results from the study somewhat unreliable, as a causal connection could not be established and instead only inferred.

6.3 Academic implications and recommendations for further research

This thesis added to the current research by examining the risks banks face when engaging in VCMs as intermediaries, as academic literature on this topic has been scarce so far. In addition, it added information on how banks can act in this role in order to support smallholder farmers overcome barriers to entry to VCMs and examined the motivations of banks for taking these actions. Further research can be done on more projects with either more or less bank involvement to add to the data identified in this study. Complimentary projects to Rabobank-Acorn in the rest of the world may exist that can be used as a comparison to see how barriers to entry for farmers may be addressed. A comprehensive

study comparing ARCPs with and without banks acting as intermediary may also be interesting to see if the role of banks can indeed lead to an improvement. Research should also consider how smallholder farmers experience the involvement of banks, and which improvements or disadvantages the farmers and local partners can observe.

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Appendix

Appendix A

Table 4 *List of keywords in systematic literature search*

Category	Keyword
Agriculture	Agroecology, Agroforestry, Carbon Farming, Carbon Sequestration, Developing Country, Farmer, Farming, Farms, Global South, Regenerative Farming, Regenerative Land Management, Smallholder Farmer, Sustainable Land Management
VCMS	Carbon Buyers, Carbon Credits, Carbon Markets, Carbon Permits, Carbon Sellers, Carbon Trading, VCMS, Voluntary Carbon Markets
Agroforestry Projects	Acorn, Agroecology Projects, Agroforestry Projects, Carbon Farming Projects, Carbon Sequestration Projects
Bank Involvement	Bank Motivations, Bank Risk, Bank Sustainability, Business Engagement, Business Motivations, Financial Institution Risk

Appendix B

Table 5 *Relevant Banks identified for the research*

Bank Type	Bank Name
Commercial Banks	Commerzbank, Deutsche Bank, ING Group, Volksbanken & Raiffeisenbanken
Sustainability-focused Banks	FMO, GLS Bank, KfW, Pax Bank, Tomorrow Bank, Triodos Bank, Umweltbank
State Banks	Bayrische Landesbank, DekaBank, Landesbank Baden-Württemberg, Landesbank Hessen-Thüringen (Helaba)

Appendix C

Interview Template 1

Hello ___ and thank you for giving me the opportunity to interview you about Rabobank's perspective on supporting projects in the field of sustainability, especially in regard to agroforestry. I expect this interview to take about 45-60 minutes and will be asking you ca. 15 questions. Feel free to take the time you need to answer them.

Introduction

1. Could you briefly introduce yourself and your role at Rabobank?
2. Can you briefly explain Rabobank's Acorn programme? For example, why did Rabobank start Acorn? What is the ultimate goal, and what does the business model look like? How does this initiative align with Rabobank's broader sustainability strategy or mission?

Acorn Projects

3. What is Rabobank's role and contribution to these projects?
4. Is there a reason to expand/change Rabobank's role or contribution? If yes/no: why (not)?
5. Rabobank cooperates in these projects with farmers and other stakeholders. How do the various stakeholders work together in these projects?
6. What are the main benefits to the various stakeholders of participating in these projects?
7. Are there any risks associated with these projects? If yes, what kind of risks, and for whom? How will these risks be dealt with by the partners?
8. Can you give a summary of the main learnings of the Acorn approach so far?

Voluntary Carbon Markets

9. What is your view/opinion about the Voluntary Carbon Market?
10. Is there any need for further development of the Voluntary Carbon Market?
11. Can you describe Rabobank's approach to the Voluntary Carbon Market if you compare it to competitors/other banks/financial institutions?
12. Other than altruistic intentions, are there any competitive or marketing opportunities you see from engaging in Voluntary Carbon Market projects with smallholder farmers?
13. Is Rabobank considering integrating carbon credits or related sustainability metrics into its mainstream financial products or services in the future?
14. Is Rabobank interested in using financial tools and products to secure some of the aforementioned risks?
15. Is scaling important, or can competitors be issue?

Outro

Thank you very much for your time and the answers you gave to those questions. It was very helpful to hear from your perspective and will be an important part of my Master Thesis. Of course, the specific answers will be kept confidential, according to the form you signed. If you are interested, I can send you the thesis and its results when finished to read for yourself. If there are any other questions or concerns you can always reach out to me.

Interview Template 2

Hello ___ and thank you for giving me the opportunity to interview you about SAF's perspective on supporting projects in the field of sustainability, especially in regard to agroforestry. I expect this interview to take about 45 minutes and will be asking you ca. 13 questions. Feel free to take the time you need to answer them.

Introduction

1. Could you briefly introduce yourself and your role at SAF?
2. Can you briefly explain SAF's purpose? For example, how did it come to be? What is the ultimate goal, and what does the business model look like?

Acorn Projects

3. What is SAF's role and contribution to these projects?
4. Is there a reason to expand/change SAF's role or contribution? If yes/no: why (not)? (Also expand outside of Acorn)
5. SAF cooperates in these projects with farmers and other stakeholders. How do the various stakeholders work together in these projects?
6. What risks does SAF and its financiers specifically experience in these projects? What are your ways of dealing with the risk associated?
7. Can you give a summary of the main learnings of SAF since its founding so far?

Financial Tools

8. How and why did you come to the idea of using blended finance tools for financing such projects? Can you elaborate on the concept of blended finance and how it is used by SAF in this case?
9. Are there any other financial tools at use currently, other than blended finance trenches? What are advantages / disadvantages?
10. You are working together with many partners outside of Rabobank, such as USAID, to secure financing. What makes SAF so attractive as a partner for these agencies?
11. Has SAF considered using other financing options, such as open market loans, or financial products built upon carbon credits to increase their available funds?
12. How does the future of SAF look like? Is the interest to scale and increase its role?

Outro

Thank you very much for your time and the answers you gave to those questions. It was very helpful to hear from your perspective and will be an important part of my Master Thesis. Of course, the specific answers will be kept confidential, according to the form you signed. If you are interested, I can send you the thesis and its results when finished to read for yourself. If there are any other questions or concerns you can always reach out to me.

Declaration of Originality Master's thesis

Official statement of original thesis

By signing this statement, I hereby acknowledge the submitted thesis (hereafter mentioned as "product"), titled:

Enabling participation of smallholder farmers in voluntary carbon markets through investment strategies by banks and financial institutions to be produced independently by me, without external help.

Wherever I paraphrase or cite literally, a reference to the original source (journal, book, report, internet, etc.) is given.

By signing this statement, I explicitly declare that I am aware of the fraud sanctions as stated in the Education and Examination Regulations (EERs) of the SBE.

Place: Maastricht
Date: 20-06-2025
First and last name: Laura Becker
Study programme: Sustainability Science, Policy, and Society
Course/skill: SSP3021 Master Thesis
ID number: 6408277

Signature: 

Sustainable Development Goals (SDG) Statement

Name Laura Becker
ID 6408277
Supervisor Ron Cörvers
Date 20.06.2025

Through the research conducted for this master's thesis, I seek to contribute to one or more of the 17 SDG(s) set forth by the United Nations (<https://www.undp.org/sustainable-development-goals>). Specifically:



SDG Code(s): 1, 10, 12, 13, 15

Explanation (max. 300 words):

This thesis has focused on agroforestry-related carbon projects (ARCPs) and how barriers to entry for smallholder farmers can be alleviated through the assistance of banks in the role as intermediaries. ARCPs aim to decrease carbon concentration in the air, as well as increasing biodiversity and improving farming yields through the use of complimentary plants and trees on existing farms, and thus affecting SDGs 12, 13 and 15. Additionally, by providing another income source for smallholder farmers in the Global South, poverty and inequality of these population groups can be alleviated, which falls under SDGs 1 and 10.

Statement on the use of Generative AI (GenAI) in the master thesis

I hereby certify that I adhered to the SBE guidelines on the use of GenAI tools such as ChatGPT in the master thesis. In the box below, I document how and for what purposes I used GenAI.

During the preparation of this work, I used GenAI for the following purposes:

- Search engine: ChatGPT & Perplexity, used for searching scientific literature according to a list of keywords and for specific topics additionally to systematic literature search
- Ideation helper: ChatGPT, used for brainstorming during the drafting phase and coming up with the research questions
- Transcription tool: Goodtape.io, used to transcribe the interviews

After using any tool, I reviewed, quality-checked, and edited the content as needed and take full responsibility for the content of the thesis.

By signing this statement, I explicitly declare that I am aware of the fraud sanctions as stated in the Education and Examination Regulations (EERs) of the SBE.

Place: Maastricht
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