



EXPLORING THE INTEGRATION OF MODERN PORTFOLIO THEORY AND PLANNING THEORY TO OPTIMIZE ALTERNATIVE FINANCING FOR AGRIBUSINESS TECHNOLOGICAL PROJECTS IN THE TUBAH MUNICIPALITY, NORTHWEST REGION, CAMEROON

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ABSTRACT

This paper explores the integration of Modern Portfolio Theory (MPT) and Planning Theory to optimize alternative financing for agribusiness technological projects in the Tubah Municipality, Northwest Region, Cameroon. This study adopts a qualitative multisite case study methodology to explore how entrepreneurs navigate these challenges through the nexus of MPT and Planning Theory. The combination of MPT and Planning Theory offers a robust framework for addressing the financing challenges in Tubah Municipality. It encourages a proactive approach to financing, where entrepreneurs are equipped with the tools and knowledge to navigate the complexities of the financial landscape. Using purposive sampling and semi-structured interviews with 20 key informants, data were analyzed using reflexive thematic analysis to identify patterns in risk perception and financial strategy. The analysis reveals that although local entrepreneurs do not utilize formal mathematical models, they intuitively apply diversification principles through "social diversification" leveraging solidarity finance networks like njangis to buffer against market and environmental shocks. However, the study also highlights a "constrained environment" where planning is frequently disrupted by external shocks, necessitating a transition from subsistence-based models to "business agriculture" supported by robust capital-raising frameworks. The findings suggest that policymakers should calibrate regulations to formalize links between informal njangis and institutional credit to foster sustainable technological adoption. The study recommends a pressing need for capacity building and training programs aimed at enhancing the financial literacy of agribusiness entrepreneurs.

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1.0 INTRODUCTION

The agribusiness sector in Cameroon plays a pivotal role in the national economy, contributing significantly to employment, food security, and export revenues. However, this sector faces substantial financing challenges, particularly in the realm of technological advancements. The need for modern agricultural practices and innovations is critical, as they can enhance productivity, sustainability, and competitiveness, (Ullah et al., 2024; Wu, 2025). Despite the potential benefits, access to financing remains a significant barrier for many agribusinesses in Tubah Municipality and beyond.

Technological advancements in agriculture encompass a wide range of innovations, including precision farming, biotechnology, and sustainable practices. These technologies are essential for improving crop yields, reducing resource consumption, and enhancing the overall efficiency of agricultural operations, (Keenan et al., 2022). In Tubah Municipality, where agriculture is a primary source of livelihood, the adoption of such technologies can lead to increased productivity and profitability. However, the implementation of these advancements often requires significant financial investment, which many agribusinesses struggle to secure.

This study examines the synergistic integration of Modern Portfolio Theory and Planning Theory to enhance alternative financing strategies for agribusiness technological projects in Tubah Municipality, Northwest Region, Cameroon. The integration of Modern Portfolio Theory and Planning Theory presents a unique opportunity to enhance financing strategies for agribusiness projects in Tubah Municipality. By combining the risk management principles of MPT with the

strategic insights of Planning Theory, agribusinesses can develop a holistic approach to financing that addresses both immediate funding needs and long-term sustainability, (Kaya, 2024; Lavelle & Yamamoto, 2024).

In the Tubah Municipality context, amalgamating Planning Theory with MPT enables holistic assessment of heterogeneous agricultural investments according to their risk-return profiles (Chen et al., 2022). Rather than appraising assets in isolation, this composite portfolio approach delineates the efficient frontier, a locus of optimal asset combinations delivering maximal returns at predetermined risk levels (DeLlano-Paz et al., 2023; Eaton et al., 2021).

1.1 Statement of the Problem.

Agribusiness projects in under-served and volatile economies, such as those in Cameroon, face significant barriers to accessing adequate and timely capital (Otunba et al., 2025). These challenges are rooted in structural limitations including financial informality, a lack of collateral, and weak credit histories and are exacerbated by contextual risks such as climate shocks, currency volatility, and political instability (Otunba et al., 2025). Traditional static cropping and investment systems often fail to address these dynamic market and weather fluctuations (Huang et al., 2025).

Furthermore, while MPT offers a theoretical solution for risk management, its practical application in the agricultural sector has been limited by the unique volatility and liquidity constraints of agricultural projects (Arango-Vasquez, 2025; Vilani et al., 2024). Many farmers and investors in emerging markets still rely on deterministic models that do not account for the high correlation between crop prices or the complexities of agri-food logistics (Gheddar, 2023;

Rodríguez et al., 2025). Consequently, there is a critical need for a framework that bridges the gap between financial theory and the practical realities of agri-technological entrepreneurship in the Tubah Municipality to reduce vulnerability and enhance adaptive capacity (Mahabadi, 2024; Nahvi et al., 2021).

1.2 Objectives of the Study

The primary objective of this study is to develop an integrative framework that leverages MPT and Planning Theory to optimize alternative finance for agribusiness projects. Specifically, the study aims to:

- i. Identify the key financing challenges faced by agribusinesses in Tubah Municipality, particularly concerning technological advancements.
- ii. Analyze how Modern Portfolio Theory can be applied to enhance risk management and investment optimization in agribusiness financing.

2.0 LITERATURE REVIEW

2.1 Theoretical Foundations: Modern Portfolio Theory and Planning Theory

The intersection of Modern Portfolio Theory (MPT) and Planning Theory presents a unique framework for understanding the complexities of agribusiness financing, particularly in the context of technological projects within the Tubah Municipality of Cameroon.

2.1.1 Modern Portfolio Theory

Modern Portfolio Theory, developed by Harry Markowitz in the 1950s, revolutionized the field of finance by introducing a systematic approach to investment decision-making. MPT posits

that investors can construct optimal portfolios that maximize expected returns for a given level of risk. The theory emphasizes the importance of diversification, suggesting that a well-structured portfolio can mitigate risks associated with individual assets. This section reviews the foundational principles of MPT, its mathematical underpinnings, and its implications for investment strategies.

Risk management is a critical component of financial decision-making, particularly in volatile sectors such as agribusiness. MPT provides a framework for assessing and managing risk through the lens of portfolio diversification. By analyzing the correlation between different assets, investors can create portfolios that minimize risk while maximizing returns. This section explores various risk management techniques derived from MPT, including the efficient frontier, capital asset pricing model (CAPM), and the Sharpe ratio. The application of these techniques in agribusiness financing will be discussed, highlighting their relevance to local entrepreneurs in Tubah Municipality.

Investment strategies informed by MPT have been widely adopted across various sectors, including agriculture. The theory's emphasis on diversification and risk-return optimization has led to the development of several investment strategies tailored to the unique challenges of agribusiness. This section examines specific investment strategies that leverage MPT principles, such as asset allocation, sector rotation, and the use of financial derivatives. The implications of these strategies for agribusiness financing in Tubah Municipality will be analyzed, with a focus on how they can enhance the financial viability of technological projects.

2.1.2 Planning Theory

Planning Theory encompasses a range of frameworks and methodologies aimed at guiding the development and implementation of projects across various sectors, including agriculture. This section provides an overview of the key concepts and principles of Planning Theory, emphasizing its relevance to agricultural development. The role of planning in addressing socio-economic challenges, resource allocation, and stakeholder engagement will be discussed, highlighting its significance in the context of agribusiness financing.

Agricultural development is a multifaceted process that requires careful planning and coordination among various stakeholders. Planning Theory offers valuable insights into the complexities of agricultural project planning, including the identification of goals, resource management, and risk assessment. This section explores the application of Planning Theory in agricultural development, focusing on case studies that illustrate successful planning initiatives. The relevance of these principles to the financing of technological projects in Tubah Municipality will be emphasized, particularly in terms of fostering sustainable agribusiness practices.

Effective project planning and implementation are crucial for the success of agribusiness initiatives. This section delves into the methodologies and tools used in project planning, including logical framework analysis, stakeholder mapping, and monitoring and evaluation techniques. The integration of Planning Theory into the project planning process can enhance the likelihood of successful outcomes, particularly in the context of technological projects. The challenges faced by local entrepreneurs in Tubah Municipality will be examined, with a focus on how effective

planning can mitigate these challenges and optimize financing strategies.

Modern Portfolio Theory, originally conceptualized by Markowitz in 1952, "While Markowitz's MPT provides the mathematical blueprint for diversification (Kaya, 2024), for a farmer in Tubah, this theory translates into the practical survival strategy of balancing high-tech agribusiness with traditional staple crops" (Paut et al., 2019). Complementing this, Planning Theory in Cameroon has transitioned from colonial "modernization" models to more decentralized approaches, although strategic agricultural planning often still struggles to account for environmental and market complexity (Fold & Prowse, 2013; Mbarga, 2021).

2.2 Conceptual Review

2.2.1 Financing Challenges in Agribusiness

The financing landscape for agribusiness in Cameroon is characterized by several challenges. Firstly, traditional financial institutions often perceive agribusiness as a high-risk sector, leading to stringent lending criteria and high-interest rates. This perception is exacerbated by factors such as climate variability, market volatility, and the lack of collateral among smallholder farmers. Additionally, the limited availability of tailored financial products for agribusiness further complicates access to funding. As a result, many agribusinesses are unable to invest in the necessary technologies that could enhance their operations and competitiveness.

2.2.2 Alternative Finance for Technological Project

Agri-entrepreneurs in the Northwest Region face significant barriers to institutional credit, and often resort to "solidarity finance" (Benard & Olsen, 2022). In this

region, informal networks such as *njangis* (rotating savings and credit associations), cooperatives, and village-centric development associations are critical, providing essential financial and human resources that are often more flexible than formal institutions (Fonchingong & Mbah, 2021; Khan & Kim, 2025). While external programs like the PEA-Youth Program have attempted to support agribusiness, many businesses in Cameroon still have a low life expectancy, often not exceeding five years due to a lack of start-up and expansion capital (Folefack et al., 2020; Wansi & Burrell, 2023).

2.3 Empirical Review

Wardrop et al. (2015) identified trust and regulation as the major barriers, notably in the area of alternative finance. In summary, Wardrop et al. (2015) emphasize the immaturity of the alternative finance industry. In order to further the alternative finance market, regulators must first be institutionalized by governments, which in turn results in the protection of investors and other stakeholders. Pinotti (2012) claims that regulations are an equilibrium outcome and are primarily the consequence of opportunistic markets that were headed for collapse. Therefore, the trust relationship between the lender and the investor should be analyzed. The necessity of trust between banks and SMEs has been established by prior research (Hernández-Cánovas and Martínez-Solano, 2010; Watson, 2005). Moreover, Wardrop et al. (2015) claim that there are between hundreds and thousands of alternative finance platforms. This occurrence, in addition to being evidence of its popularity, may be seen as an uncontrolled expansion that could have harmful effects. Therefore, there is another justification for regulating this nascent industry.

Despite the fact that alternative financial sources are expanding at a rapid rate, scientific literature on the subject seems to be lagging behind (Wardrop et al., 2015; Bruton et al., 2015). The research by Allen et al. (2012), who argues that alternative finance becomes especially appealing during times of economic hardship, may provide a partial explanation for this conclusion.

3.0 ETHODOLOGY

3.1 Research Design

This study adopts a qualitative multisite case study methodology to explore the lived experiences of agri-entrepreneurs (Zogning et al., 2023). This design is chosen because it allows for an in-depth, contextual analysis of the relationship between Modern Portfolio Theory principles such as risk and diversification and the planning strategies used by local farmers in the Tubah Municipality (Amadhila & Ikhide, 2016).

3.2 Population and Sampling

The study population consists of agri-entrepreneurs, leaders of local "solidarity finance" groups (*njangis*), and agricultural extension officers in the Northwest Region. Purposive (judgmental) sampling is used to select participants who possess significant experience in managing technological agricultural projects and accessing alternative finance. The sample size is determined by data saturation, typically involving 15 to 20 key informant interviews. In this study, 20 seasoned agri-entrepreneurs was used.

3.3 Data Collection Techniques

Data collection is a fundamental aspect of the research process, as it directly influences the quality and reliability of the findings. In this study, a combination of interviews, focus groups, and document analysis is employed to gather comprehensive data on the financing challenges and strategies of local agribusiness entrepreneurs.

3.3.1 Interviews

Semi-structured interviews are conducted with a purposive sample of agribusiness entrepreneurs in Tubah Municipality. This method allows for flexibility in questioning while ensuring that key topics related to financing challenges are addressed. The interviews are designed to elicit detailed responses regarding the entrepreneurs' experiences with securing financing, their perceptions of available options, and the strategies they employ to navigate the financing landscape. Each interview lasts approximately 60 to 90 minutes and is recorded with the participants' consent for subsequent transcription and analysis.

3.3.2 Focus Groups

In addition to individual interviews, focus group discussions are organized to facilitate collective dialogue among entrepreneurs. These discussions provide an opportunity for participants to share their experiences, challenges, and strategies in a group setting, fostering a dynamic exchange of ideas. Focus groups are particularly useful for exploring shared experiences and identifying common themes related to financing challenges. Each focus group consists of 6 to 8 participants and lasts approximately 90 minutes.

3.3.4 Document Analysis

Document analysis is employed to complement the primary data collected through interviews and focus groups. Relevant documents, such as business plans, funding proposals, and local government reports, are analyzed to gain insights into the formal financing processes and requirements faced by agribusiness entrepreneurs. This method provides a contextual understanding of the regulatory and institutional frameworks that influence financing decisions.

3.4 Technique of data analysis

The analysis of qualitative data requires systematic and rigorous techniques to ensure the validity and reliability of the findings. In this study, thematic analysis is employed to identify, analyze, and report patterns (themes) within the data.

3.4.1 Triangulation

To enhance the validity and reliability of the findings, triangulation is employed as a strategy to cross-verify data from multiple sources. By comparing insights obtained from interviews, focus groups, and document analysis, the study aims to corroborate findings and provide a more comprehensive understanding of the financing landscape for agribusiness entrepreneurs in Tubah Municipality. Triangulation not only strengthens the credibility of the results but also allows for a more nuanced interpretation of the data.

4.0 RESULTS AND DISCUSSION

4.1 Results

4.1.1 Challenges Faced by Entrepreneurs

4.1.1.1 Limited Access to Traditional Financing

One of the most significant challenges identified in the study is the limited access to traditional financing options for agribusiness entrepreneurs in Tubah Municipality. Many local entrepreneurs reported difficulties in obtaining loans from banks and financial institutions due to stringent requirements, such as collateral and credit history. The lack of financial literacy among some entrepreneurs further exacerbates this issue, as they may not fully understand the application process or the financial products available to them.

Moreover, the perception of agribusiness as a high-risk sector contributes to the

reluctance of financial institutions to extend credit. Entrepreneurs expressed frustration over the lack of tailored financial products that consider the unique risks associated with agricultural ventures, such as fluctuating market prices and climate variability. This limited access to financing not only hampers the growth of existing businesses but also discourages potential entrepreneurs from entering the agribusiness sector.

4.1.1.2 High-Risk Perceptions

The high-risk perception associated with agribusiness financing is another critical challenge highlighted by the study. Entrepreneurs reported that both financial institutions and potential investors often view agribusiness as a volatile sector, influenced by factors such as weather conditions, pest infestations, and market demand fluctuations. This perception leads to a conservative approach to investment, where stakeholders are hesitant to commit resources to agribusiness projects.

The interviews revealed that many entrepreneurs feel marginalized by the financial system, which tends to favor more stable and predictable industries. This marginalization creates a cycle of under investment in agribusiness, further entrenching the challenges faced by local entrepreneurs. The high-risk perception not only affects access to financing but also limits the potential for innovation and technological advancement within the sector.

4.1.1.3 Insufficient Knowledge of Financing Options

Another challenge identified is the insufficient knowledge of available financing options among local entrepreneurs. Many entrepreneurs are unaware of alternative financing

mechanisms, such as microfinance, crowdfunding, and venture capital, which could provide them with the necessary capital to grow their businesses. The lack of awareness is compounded by a limited network of support services that could educate entrepreneurs about these options.

Focus group discussions revealed that many entrepreneurs rely on informal financing sources, such as family and friends, which may not be sustainable in the long term. This reliance on informal networks can lead to financial instability, as entrepreneurs may not have access to the necessary funds when needed. The study highlights the need for targeted educational programs that inform entrepreneurs about diverse financing options and equip them with the skills to navigate the financial landscape effectively.

4.1.2 Integration of Planning Theory

4.1.2.1 Aligning Projects with Local Needs

The integration of Planning Theory into the financing strategies of agribusiness projects was found to facilitate better alignment with local needs and resources. The study revealed that entrepreneurs who engaged in participatory planning processes were more successful in securing financing and achieving project goals. By involving local stakeholders in the planning process, entrepreneurs were able to identify community needs and tailor their projects accordingly.

For example, one entrepreneur who sought financing for a sustainable farming initiative conducted community consultations to understand the specific challenges faced by local farmers. This participatory approach not only enhanced the project's relevance but also built trust and support within the community, making it easier to attract financing from local investors.

4.1.2.2 Enhancing Project Viability

The application of Planning Theory also contributed to enhancing the viability of agribusiness projects. Entrepreneurs who utilized planning frameworks to assess project feasibility and potential impacts were better equipped to present their business cases to financial institutions. The study found that a well-structured project plan, which included risk assessments and mitigation strategies, significantly improved the likelihood of securing financing.

4.2 Discussion of Result Findings

4.2.1 Integration of Modern Portfolio Theory and Planning Theory

The findings of this research indicate that the integration of MPT and Planning Theory can significantly enhance the financial viability of agribusiness projects. MPT emphasizes the importance of diversification and risk management in investment portfolios, which is particularly relevant for agribusinesses that often face volatile market conditions and unpredictable environmental factors (Fold & Prowse, 2013; Fonchingong & Mbah, 2021). By adopting a diversified investment approach, entrepreneurs can mitigate risks associated with technological investments, thereby increasing their chances of success (Adefare et al., 2024; Mahabadi, 2024).

Conversely, Planning Theory provides a systematic approach to resource allocation and project development. The application of Planning Theory in agribusiness allows for better project management, ensuring that resources are allocated efficiently and effectively. This dual approach not only enhances the financial strategies of agribusinesses but also fosters a more sustainable development model that can adapt to the unique challenges faced by the sector in developing regions.

4.2.2 Financial Viability and Risk Mitigation

The qualitative data collected from agribusiness entrepreneurs in Tubah Municipality revealed that the integration of MPT principles helped them make informed investment decisions. Entrepreneurs reported a greater understanding of their risk exposure and the potential returns on their investments. This understanding is crucial in a sector where financial resources are often limited, and the stakes are high.

Moreover, the application of MPT principles allowed entrepreneurs to identify and pursue alternative financing sources, such as microfinance and crowdfunding. These alternative sources not only provide the necessary capital for technological advancements but also reduce the financial burden on individual entrepreneurs (Ambomo, 2013; Khan & Kim, 2025). By diversifying their funding sources, agribusinesses can create a more resilient financial structure that is less susceptible to market fluctuations (Mbarga, 2021).

4.2.3 Tailored Financing Solutions

The study emphasizes the need for tailored financing solutions that consider the unique challenges faced by agribusinesses in developing regions. Traditional financing models often fail to address the specific needs of agribusinesses, which can lead to underfunding and missed opportunities for technological advancements. The findings suggest that financial institutions and policymakers should collaborate to develop innovative financing mechanisms that are adaptable to the local context.

For instance, the integration of MPT and Planning Theory can inform the design of financing products that align with the risk profiles of agribusinesses. By understanding

the specific risks associated with agricultural investments, financial institutions can create products that offer flexible repayment terms, lower interest rates, and support for technological adoption. This approach not only enhances the financial viability of agribusiness projects but also contributes to the overall development of the agricultural sector in Tubah Municipality.

5.0 CONCLUSION AND RECOMMENDATIONS

5.1 Conclusion

In conclusion, this research has discussed the significant findings of the research on the integration of Modern Portfolio Theory and Planning Theory in agribusiness financing in Tubah Municipality. The integration of these theoretical frameworks has been shown to enhance the financial viability of agribusiness projects, enabling entrepreneurs to make informed investment decisions and effectively manage risks. The emphasis on tailored financing solutions and alternative funding sources highlights the need for innovative approaches to address the unique challenges faced by agribusinesses in developing regions. As the agribusiness sector continues to evolve, the insights gained from this research will be invaluable for entrepreneurs, financial institutions, and policymakers alike. Future research should continue to explore the implications of these findings and contribute to the ongoing development of effective financing strategies for the agricultural sector.

5.2 Recommendations

5.2.1 Development of Tailored Financial Products

To address the unique challenges faced by agribusiness entrepreneurs in Tubah Municipality, stakeholders should prioritize the development of tailored financial products. These products should be designed

to meet the specific needs of agribusinesses, taking into account their cash flow cycles, risk profiles, and technological requirements.

For instance, financial institutions could offer flexible loan terms that align with the seasonal nature of agricultural production. Additionally, microfinance options could be expanded to provide smaller loans with lower interest rates, making it easier for entrepreneurs to access the capital they need for technological investments.

5.2.2 Capacity Building and Training

In conjunction with the development of tailored financial products, there is a pressing need for capacity building and training programs aimed at enhancing the financial literacy of agribusiness entrepreneurs. By equipping them with the knowledge and skills necessary to navigate the financing landscape, stakeholders can empower entrepreneurs to make informed decisions regarding their investments.

Training programs could cover a range of topics, including financial management, risk assessment, and strategic planning. Such initiatives would not only enhance the entrepreneurs' ability to secure financing but also improve their overall business acumen, contributing to the long-term sustainability of their ventures.

5.2.3 Strengthening Stakeholder Collaboration

The success of any financing strategy hinges on effective collaboration among stakeholders. Therefore, it is essential to establish platforms for dialogue and cooperation among local entrepreneurs, financial institutions, government agencies, and other relevant actors.

Regular stakeholder meetings, workshops, and forums can facilitate knowledge sharing

and foster partnerships that drive innovation in agribusiness financing. By creating a collaborative environment, stakeholders can collectively address the challenges faced by the sector and work towards developing sustainable solutions.

This qualitative inquiry confirms that the nexus between MPT and Planning Theory is vital for the survival of agri-tech projects. Bridging the gap between these informal strategies and formal financial planning is essential for long-term sustainability in the Northwest Region

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