Project Title: "Crowdfunding for Agriculture startups and projects"

BSc. in Software Engineering

by

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REFERENCES

List of Acronyms/Abbreviations

GDP	Gross Domestic Product
GSS	Ghana Statistical Service
GAPL	Ghana Agricultural Lending Platform
IPR	Intellectual Property Rights
MTN	Mobile Telecommunication Network
NDA	Non-Disclosure Agreement
SDG	Sustainable Development Goal

CHAPTER ONE: INTRODUCTION

1.1 Introduction and Background

Agriculture plays a vital role in Ghana, both economically and socially, contributing about 19.0% to its GDP in 2024 (Ghana Statistical Service, 2025, p. 5), it serves as a major source of employment, employing about 39.4% of its workforce and 75% of its rural population (Oxford Business Group, 2024) and also contributing to the country's food needs. This means the agriculture sector plays a crucial role in Ghana's development hence the government, policy makers and investors should have a keen interest in this sector but lack of finance has been a major impediment to the growth of Ghana's agriculture sector with banks being reluctant to lend to agriculture projects due to existential risk like diseases, pest and climate change factors, the sector not considered a strategically important sector to banks and many others reasons (Adam et al., 2018).

As much as the agriculture sector of Ghana is portrayed to be doing well in its employment and GDP rate contributions at the moment, more could be done to improve its productivity and impact. It would also reduce the amount of food imported into the country, according to the Ghana Statistical Service (GSS), grains, animals or vegetables, fats and oils, cereals, meat, sugar products and fish collectively constituted over half (53.6%) of all food product imports into Ghana, reflecting a significant portion of the country's food imports in 2024 (Ghana Statistical Service, 2025), which is bad for a country which is known to have about 20.7% of arable land (TheGlobalEconomy.com, n.d.).

Current State of the Agriculture Sector and Its Financial Problems:

Several factors, such as climate change, deforestation, land degradation, and water pollution, have impeded the growth of the agriculture sector in Ghana, but finance also plays a major role in it, reporting that the agriculture sector only receives 3.2% of bank loans (Lisakahuthu, 2025). Some of the interventions made in providing financial support to the agriculture sector in Ghana suffer from shortcomings:

- *Bank Loans and Credit:* Financial institutions impose high interest rates and require substantial loan collateral. There is a notable scarcity of affordable credit, accompanied by delays in accessing funds, and a lack of medium- and long-term credit options. The prevailing high interest rates and short repayment periods further exacerbate the situation, alongside insufficient insurance facilities. Financial structures designed to provide credit to smallholder irrigation farmers and those involved in agricultural value chains are quite limited (African Development Bank, 2023). Additionally, financial institutions often view smallholder farmers as high-risk borrowers due to climate variability and insufficient collateral (African Development Bank, 2025).

- *Government grants:* Government delays in implementing Agriculture projects and investments. Projects take too long to be implemented because of paperwork and bureaucracy, and there is also slow disbursement of funds to farmers when finally approved, which can take months (Adam et al., 2018). And government projects like the Planting for Food and Jobs took 5 years before full execution (Ministry of Food and Agriculture, 2023).

Software Approaches

1.2 Problem statement

Despite the agricultural sector's impact and the vital role it plays in Ghana's economy, farmers and startups' access to financial funding has been a huge problem. But the positive aspect is that progress has been made to curb this issue, but funding, and these solutions also come with their gaps and challenges:

Top closest solutions:

- *MTN Grow For Me:* is a crowdfunding platform, a collaborative innovation between MTN Ghana and GrowForMe that allows Ghanaian MTN Mobile Money (MoMo) users to invest quarterly in an agricultural farm, earning between a range of 4% to 35%, depending on the crop performance, amount invested and market conditions (Aduah, 2025).

  Gaps or challenges of MTN Grow for me

  1. Do not grant access or opportunities to startups. This is just a centralised partnership between MTN Ghana and GrowForMe, hence it does not grant access and opportunities to agri-startups. Because new registrars require an existing farm with a GPS location to be added to the signup form, this prevents new entries or early-stage entrepreneurs. This prevents agri-startups from accessing MTN Momo investors.

- *Ghana Agricultural Lending Platform (GALP): GALP* was created by Ghana Incentive-Based Risk Sharing System for Agricultural Lending (GIRSAL) and is fully owned by the Bank of Ghana (BoG) to de-risk agricultural funding and also increase lending to the agricultural sector in Ghana by financial institutions in Ghana. So the platform partners with other financial institutions like the Agricultural Development Bank (ADB), Absa Bank, Ghana Commercial Bank (GCB), and several other banks (currently a total of 22 banks) in Ghana to achieve its goal (GIRSAL Ltd., 2025)

  Gaps or challenges of GAPL

  1. No option for crowdfunding, but only traditional loans are available, which take a while to complete procedures and a while to be disbursed

1.3 Project's main objective

Design a robust crowdfunding platform for farmers, agricultural startups and investors to bridge the gap between agripreneurs and investors and also to reduce the time it takes to disburse funds to agripreneurs and to provide a platform for first-time agripreneurs or startups a platform to market their ideas for funds.

1.3.1 List of the specific objectives

1. Identify the gaps within the existing crowdfunding and lending platforms, regarding transparency between investors and farmers, inclusivity and the time of funds disbursements.
2. Build a prototype of a crowdfunding system using React, Django, GPT-powered chatbot and other inbuilt libraries in these frameworks to disable screenshots, watermark documents to prevent theft of ideas, and open a boarded space for investors to easily interact with farmers without a middleman. (Example is GoFundMe in the health sector)
3. Measure the metrics of functionality and performance (speed, security vulnerabilities, user experiences for farmers and investors, accessibility etc), funds disbursement, and interest payment if required by an investor. This evaluation aims to determine

whether the system effectively facilitates the connection between investors and farmers.

1.4 Research questions

- How do you prevent the theft of ideas between farmers and also between farmers and investors?

- What functional components and features are essential in an agriculture crowdfunding system to ensure transparency between farmers and investors, and also maintain privacy and security?

- How can the agriculture platform lessen fraud and also handle poor crop production and market losses, or volatility?

1.5 Project scope

The goal of this research is to test the potency of an agricultural crowdfunding platform within a particular community. The testing of the system or platform will be conducted with a pilot group of 10 (5 farmers and 5 investors) at Bumbogo to prove the system's efficiency and ability to bridge the gap between farmers and investors.

The functionalities of the system:

- *Security and Agreement:* Investors must sign a Non-Disclosure Agreement (NDA), screenshots are disabled, and PDFs will be watermarked to prevent theft of ideas. Also, other farmers do not have permission to view the projects/proposals of other farmers. This will ensure that the projects or ideas of farmers are in safe hands, and legal actions can be taken against any investor who uses the idea of any farmer without their permission.
- *Authenticity:* Proposals will be screened and approved to ensure authenticity and prevent fraud and stolen projects, investors, and farmers can receive random calls to prove identity.
- *Feasibility study:* An evaluation will be done for a pilot of 10, consisting of 5 investors and 5 farmers or agripreneurs, who will test the system for 2 months to ensure the system solves the problem and is also user-friendly.

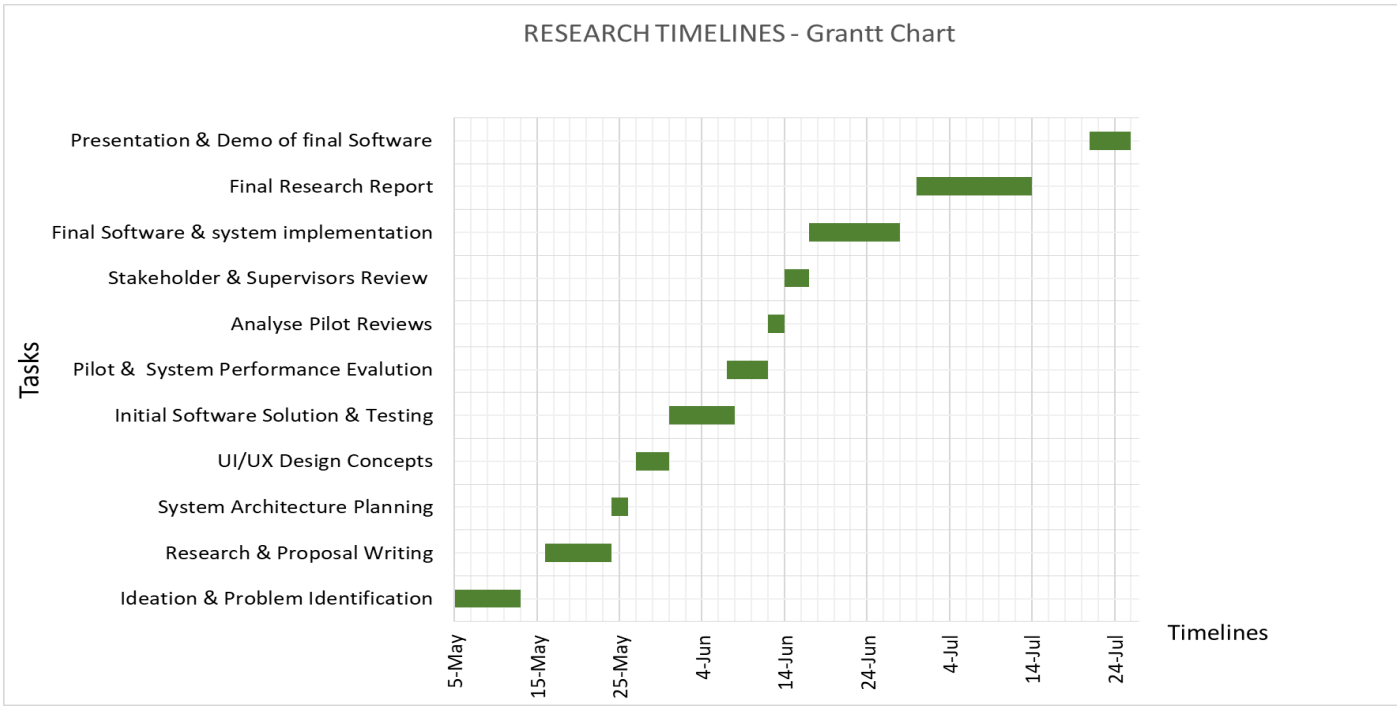
1.6 Significance and Justification

The suggested solution, when implemented, will greatly impact a couple of Sustainable Development Goals (SDGs), notably SDG 1—No Poverty, SDG 2—Zero Hunger, SDG 8—Decent Work and Economic Growth, and SDG 13—Climate Action. This initiative aims to empower farmers and agripreneurs to be more financially independent by drawing investments into their projects, hence reducing poverty. When they are financially stable, they are also able to provide the basic needs such

as food for families, and an increase in agricultural productivity will increase food security within the country. Investments in farmers' projects will not only create jobs for the farmer, but as they expand, will create more jobs for other individuals, thereby impacting the achievement of SDG 8. An increase in farming activities will reduce illegal mining, popularly known as “Galamsey” in Ghana, and land degradation, and also lower the emission of greenhouse gases, hence contributing to the accomplishment of SDG 13.

Making investment opportunities open for everyone and also preventing intellectual theft. This proposed solution aims to dissolve the old traditional methods and difficulties in accessing funds, this will make accessing funds easier and available for a larger group of farmers. Disabling screenshots, watermarking proposals, and implementing the signing of NDAs will reduce intellectual theft and also increase trust.

1.8 Research Timeline



CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

This chapter aims to reveal solutions that have been implemented to bridge the gap between investors and farmers and to provide a platform for crowdfunding.

2.3 Overview of Existing System

- ***Theft of intellectual property and security**:* vulnerable to impersonation, unauthorized access, and the creation of fraudulent investor accounts. This undermines trust in the platform and jeopardizes sensitive transactions and documents. Furthermore, most current platforms fail to incorporate adequate security features to safeguard the intellectual property of farmers and agricultural innovators. Sensitive proposal documents, such as business plans and financial forecasts, are frequently shared as downloadable PDFs, which exposes them to potential theft or misuse by unauthorized users, including prospective investors. Research has been made to emphasize the need to implement IPR policies to protect innovations (Datta et al., 2016).

- ***Lack of advertisement of grants and other opportunities:*** While most platforms like GrowForMe focus on private investment, they do not include opportunities boards or alerts for public-sector grants, government subsidies, or NGO-funded opportunities. This limits access to blended financing options that could benefit smallholder farmers and social impact projects.

2.4 Review of Related Work

This section reveals three (3) software solutions implemented to tackle the issue of crowdfunding. This will explain the aim, gap, and methodologies of each solution and study that was done.

2.4.1 Summary of Reviewed Literature

- **GrowForMe** - (Grow For Me, n.d.), (Space in Africa, 2020)

GrowForMe is an agricultural crowdfunding web application that funds farmers to scale and grow more crops, using the income received from interested sponsors. Funders would make a fair profit when crops are sold to our accredited offtaker partners or on the Ghana Commodity Exchange. GrowForMe aims to enable farmers to raise the funds they need to innovate and expand. GrowForMe partners with MTN Ghana to get investors.

GrowForMe inculcates the MTN Momo USSD (Dial *170# and select option 5) for investors and also uses satellite-based monitoring to track farm work for transparency.

The gap with this model is the profit sharing, where the farmer only takes 35% of the profit after hard labour, the investor 50%, and the platform takes 15% with no other negotiations, also the platform is bias to first timer agripreneurs because the require farmers who already have lands with a minimum of 3years experience.

- **FarmFundr -** (FarmFundr, n.d.)

FarmFundr is a farmer-owned, equity crowdfunding platform focused on specialty crop operations in the United States. They offer fractional farmland ownership opportunities to their members.

Some of the gaps in FarmFundr are that they allow only accredited investors, and the requirements to be one are outrageous, requiring one to earn an annual income of $200,000 and can invest a minimum of $10,000. And FarmFundr is not open to other farmers to join the community to also raise funds and investments

- **GoFundme -** (GoFundMe, 2024)

GoFundMe is a crowdfunding platform that aims to provide an easy and accessible platform for individuals, organisations to raise money for various causes, including personal emergencies, charitable initiatives, and creative projects. GoFundMe has a large donor network, making it easier to raise funds in a short period and with a user-friendly interface, leading to its adoption by a large number of people.

The GoFundMe platform is tailored towards health and disasters and is not adopted for agricultural purposes; hence, farmers and agricultural investors cannot use the platform. The platform also does not screen or verify the authenticity of cases that are uploaded on the platform, which may lead to scams and fraud cases (Westhoff, 2023).

2.5 Strengths and Weaknesses of the Existing System(s)

Strengths:

- The systems have user-friendly features and interface making it easy for users to all level of users to use the platforms.
- The transparency of the GrowForMe and FarmFundr platforms makes investors feel safe enough to invest

Weaknesses:

- Platforms do not accommodate or provide opportunities for people with ideas but no startup capital; instead, they require agripreneurs with several years of experience
- On some of the platforms, do you have opportunities to display other grants or opportunities to broaden the probability of them reaching their targeted budget
- Platforms do not protect the ideas or intellectual property of their users

2.6 General Comment and Conclusion

Society has made notable strides in providing funding for agricultural projects, but these systems come with their challenges, such as lack of inclusivity for all agripreneurs, transparency, middlemen causing delays, non-negotiable profit sharing between the triangle of the farmer, investor, and the platform, fraud and intellectual theft and other security issues. But the good news is that these problems or loopholes can be addressed if robust systems are kept in place. This research aims to solve these existing problems and create a more inclusive system, and enhance intellectual property protection.

CHAPTER THREE: SYSTEM ANALYSIS AND DESIGN

3.1 Introduction

This chapter outlines the design methods, strategies, and research methodologies used. The researcher adopts a User-Centred Design approach to ensure that the design fits the needs of the targeted group. Both qualitative and quantitative research methods, a pilot study and testing will be done to assess the system's effectiveness and user experience.

3.2 Research Design (including the development model used)

This research design will use the Agile Model for Software development. The Agile model has features that will be relevant to this project. The model is highly flexible and adaptable to changes, making it more dynamic and allowing necessary changes or improvements during development. This approach facilitates a continuous learning process. The agile model involves the customers (farmers and investors) in the process, providing valuable feedback and improving work quality.

3.3 Functional and Non-functional Requirements

3.3.1 Functional Requirements

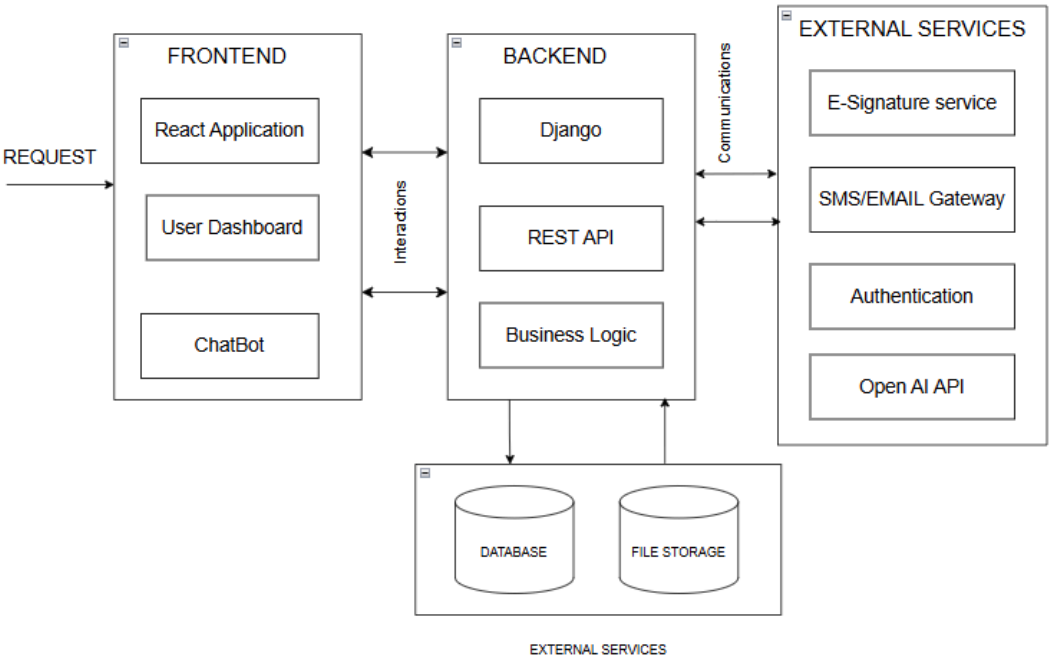
	Functional Requirement	**Description**
1.	User Authentication	Farmers and investors sign up and log in based on their roles. Users will be directed to different dashboards depending on the chosen roles
2.	Proposal Upload	Farmers are required to upload their proposals, and other farmers cannot view their proposals. Proposals will also be watermarked
3.	Grants and other opportunities board	A display of hackathons, grants, sponsorships and agriculture communities they can check out
4.	Farmers and Investors Dashboard	Investors can view farmers' profiles and proposals, but cannot screenshot them. Investors are required to sign NDA's. Farmers can create a profile for themselves and upload their proposals
5.	AI Chatbot Integration	GPT Powered to assist farmers in writing a proposal and any other
6.	Payment	Investors can transact payments using Paystack or Flutterwave

3.3.2 Non-functional Requirements

	Non-functional Requirement	**Description**
1.	Performance	Using React and Django frameworks will make the applications faster and more efficient by implementing lazy loading and

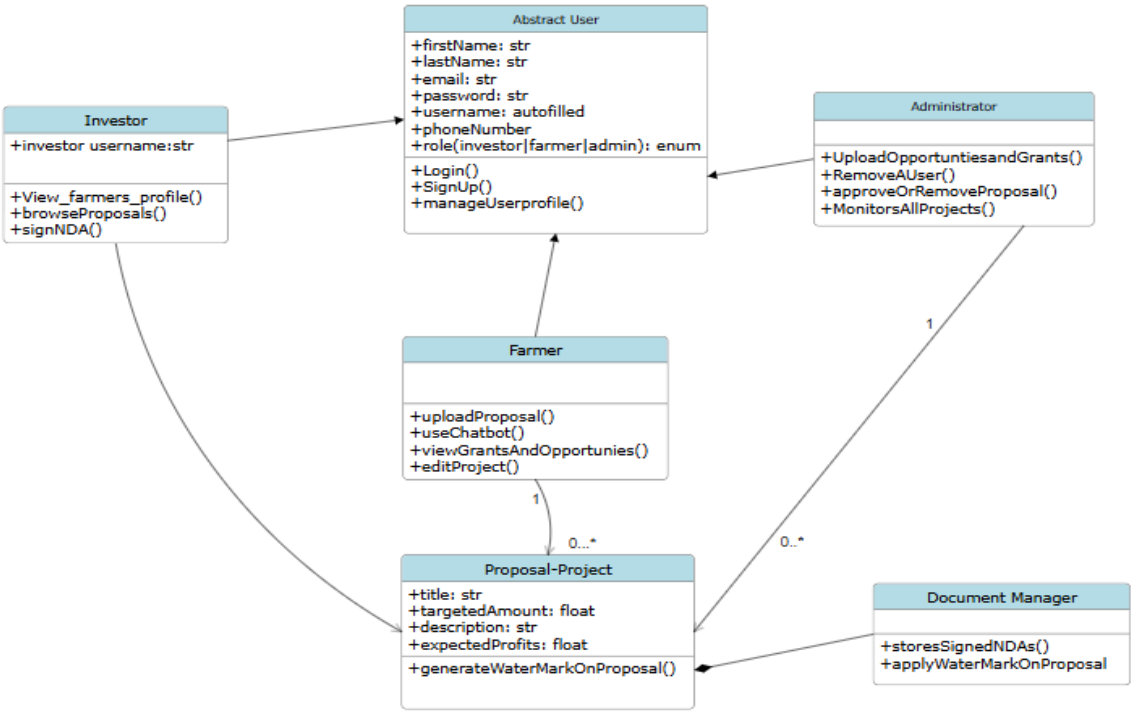
		component splitting in React, caching in Django and several other features
2.	Security	Investors must sign an NDA to protect intellectual property (Proposal of farmers). This will prevent the theft of ideas. Farmers and investors are also advised to use emails and two-factor authentication for security.
3.	Usability	Making the user interface beautiful and easier to navigate through, and also responsive across all screens. This will enhance a good user experience
4.	Maintainability	Using React and Django frameworks will enable code reusability, and writing clear documentation or a readme will make it easier for maintainability and other developers to understand the code
5.	Accessibility	Using scalable fonts for different screen sizes and allowing users to zoom in and out. Also implementing aria labels, alt text for images and keyboard navigation support (enter, space, etc). Allowing screen reader support by using semantic HTML (such as <header>, nav, article tags)

3.4 System Architecture

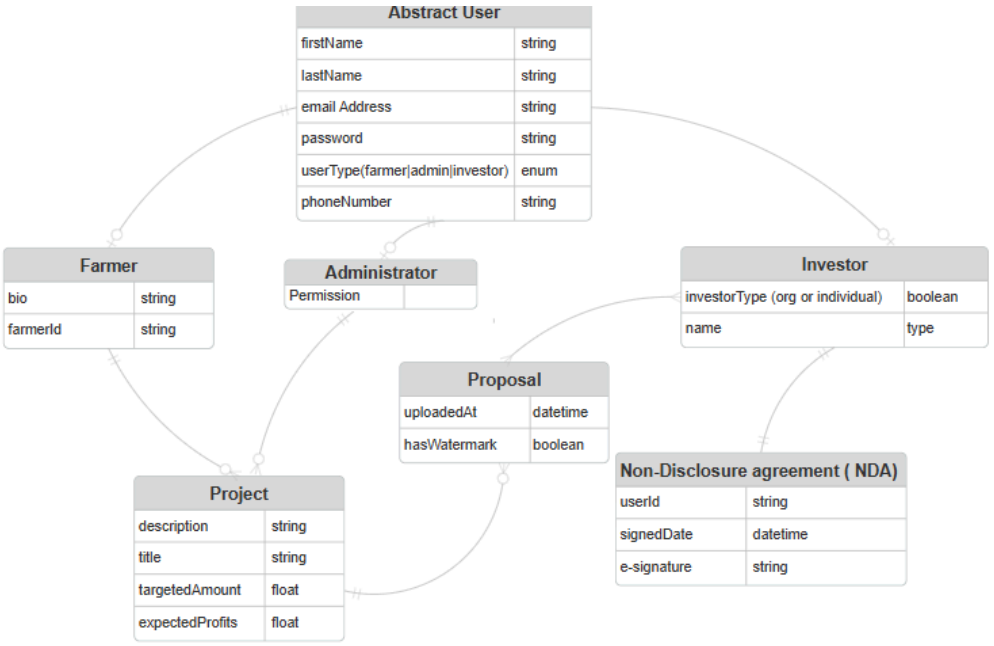


3.5 UML Diagrams

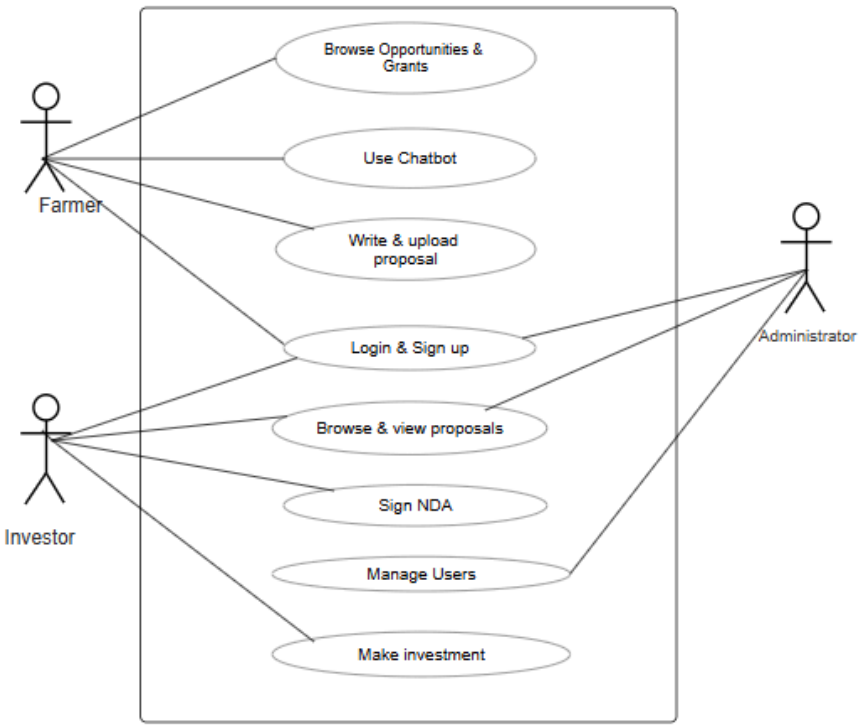
3.5.1 Class Diagram



3.5.2 ERD Diagram



3.5.3 Use Case Diagram



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