University of Yaounde 1

Faculty of sciences

Computer science department

INF 4178 - Software Engineering 1

Project report

AGRILAB

TOPIC

Creation of a platform linking agricultural investors and African farmers. In addition to that, we offer a library where articles on modern agricultural techniques will be published by an expert.

2. Research Problem

Smallholder farmers in Africa are still among the poorest in the world. It's hard for

them to maximize their potential without modern agricultural technologies, sufficient

investment and a distribution structure that remains ill-suited for accessing markets.

Farmers also lack proper education into modern farming techniques (Source: World

Economic Forum).

3. General objective

> Give farmers greater visibility by putting them in contact with investors and facilitating their understanding of agriculture.

> a. Specific objectives

4. System requirements

> **a. Functional requirements**

> > ❖ **Famer**
> > > ➢ Sign up / Sign in
> > > ➢ Post a project
> > > ➢ Update a project
> > > ➢ Delete a project
> > > ➢ Get a project
> > > ➢ Download a document
> > > ➢ Read a document

➢ Search a document
➢ Seek investments

❖ **Investor**

➢ Sign up / Sign in
➢ Get all farmer's project
➢ Invest a project by sending email to farmers
➢ Download a document
➢ Read a document
➢ Search a document
➢ Suggest project

❖ **Admin**

➢ Sign in
➢ Upload a document

b. Non-functional requirements

★ Security: The system should ensure secure user authentication, data privacy, and protection against unauthorized access or data breaches.

★ Scalability: The system should be designed to handle increasing user demands and be scalable to accommodate future growth in terms of users, articles and investments.

★ Reliability: The system should be highly reliable, minimizing downtime and ensuring that critical functionalities such as publishing articles and creating investments are available consistently.

★ Compatibility: The platform should be compatible with different web browsers and accessible across various devices, including desktops, laptops, tablets and smartphones.

★ Performance: the platform should be able to handle a large number of concurrent users and provide responsive performance, ensuring quick loading times for web pages and smooth user interactions.

5. Application of Scrum

a. Presentation of scrum team

Members		Roles	Participation
MIESSOK Eric Cedric Junior	18T2419	**Scrum master**	**20%**
TCHINDE WAFFO Cyrille-Junior	19M2064	**Product owner**	**20%**
NDANG ESSI Pierre Junior	19M2392	**Frontend**	**20%**
KONGNE MBOUHOM Anderson Luther	18X2309	**Backend**	**20%**
KENGNE TAMHO Judith Gaëlle	18T2523	**Frontend**	**20%**

b. Description of how you applied scrum to your specific project

i. Explanation of how Sprints were carried out

In the scrum methodology, sprints are time-boxed iterations during which the development team works to complete a set of prioritized user stories. Here's how we have carried out sprints:

● Sprint planning: At the beginning of each sprint, the product owner and the development team collaborate to define the goals and select the backlog items that will be addressed in the sprint. We determine how many user stories we can commit to completing based on our velocity and capacity.

- Sprint backlog: The selected user stories are moved from the product backlog to the sprint backlog. We break down the user stories into smaller, actionable tasks and estimate the effort required to complete each task.
- Daily scrum meeting: Throughout the sprint, we hold daily scrum meetings. The short meetings provide an opportunity to synchronize our work, discuss progress, identify any impediments and plan activities for the day.
- Development: The development team works on implementing the tasks identified in the sprint backlog. We collaborate closely, continuously integrating our work and ensuring transparency within the team.
- Sprint review: At the end of the sprint, a sprint review is conducted. The development team presents the completed work to the stakeholder and receives feedback. The product owner determines whether the goals for the sprint have been achieved.
- Sprint retrospective: Following the sprint review, we hold a sprint review to reflect on the sprint process. We discuss what went well, what could be improved, and identify actionable items to enhance effectiveness and efficiency in future sprints.
- Increment delivery: If the work completed during the sprint meets the predefined criteria, it is potentially releasable. We decide if we release the increment or integrate it into a larger release.

ii. Team organization and roles

- Team: 2-pizza size team that delivers software
- Scrum master: Team member who acts as buffer between the team and external distractions, keeps team focused on task at hand, enforces team rules, removes impediments and prevents team from making progress.
- Product owner: A team member who represents the voice of the customer and prioritizes user stories.

iii. Daily scrum Agenda

The daily scrum is a short focused meeting held by the scrum team every day during a sprint. Here is our daily scrum agenda:

- Start on time: The meeting should start promptly at the designated time to respect everyone's schedules. It is usually time boxed to a maximum of 15 minutes.
- Attendance: Ensure that all relevant team members are present, including scrum master, product owner and development team members.
- What have you accomplished?: Each team member provides a brief update on the work they completed since the last daily scrum meeting. They mention the taste they worked on, highlighting any completed work.
- What will you work on today?: Each team member shares their plan for the day, specifying the tasks they intend to focus on. This provides visibility into the team's progress and helps to identify any potential dependencies or conflicts.
- Are there any obstacles or impediments?: Team members highlight any challenges, obstacles or impediments they are facing that could affect their progress or overall sprint. These can include technical issues, resource constraint or dependencies on other team members or external factors.
- Discussion and collaboration: If any issues or concerns are raised during the update, the team engages in a brief discussion to address them. They collaborate to find solutions, provide support or identify any needed adjustments to the sprint plan.

iv. Scrum conflict Resolution

In scrum, conflicts can arise within the team or between team members, and it's important to address them promptly to maintain a healthy and productive work environment. Our approach of scrum conflict resolution:

- Open communication: Encourage open and transparent communication within the team. Create a safe space where team members can express their concerns, ideas and perspectives. Foster a culture of active listening and mutual respect.
- Problem solving techniques: we have techniques such as brainstorming, root cause analysis, or the five whys to identify the underlying causes of conflicts. By understanding the root causes, the team can work together to find appropriate solutions.
- Compromise and collaboration: Encourage team members to find common ground and seek win-win solutions.
- Mediation: In cases where conflicts persist or escalate, it may be helpful to involve a neutral third party to facilitate the resolution process.
- Retrospective discussion: Discuss the impact of conflicts on team dynamics and identify actions to prevent similar conflicts in the future.

v. Product Backlog

ID	User Stories	Acceptance criteria	Priority	Initial estimate	factor adjustment	Initial estimate
1	As a farmer, I should be able to create an account in order to share my projects	By going on the system, fill the form and clicking on the submit button, the account is created	1	2	1	2
2	As an investor, I should be able to create an	By going on the system, fill the form and clicking on the	1	2	1	2

	account in order to seek farmer's projects	submit button, the account is created				
3	As a user, I should be able to post a project on the system so that investors can access it.	By going into the project section, filling all information about a project and clicking on the create button, a project is created.	3	2	1	2
4	As a farmer, I should be able to update a project in order to correct a project..	By going on project section, by clicking on the edit button, make any changes and clicking on the update button, the project is updated	3	2	1	2
5	As a farmer, I should be able to delete a project in order to	Going on project section, selecting the project and clicking on delete,	3	2	1	2

	remove it from the system.	the project is deleted				
6	As an investor, I should be able to post an investment offer on the system so that farmers can suggest their projects.	By going into the investment section, filling all information about an investment and clicking on the create button, an investment offer is created.	2	2	1	2
7	As an investor, I should be able to update an investment in order to inform farmers I've changed my mind.	By going on investment section, by clicking on the edit button, make any changes and clicking on the update button, the investment is updated	2	2	1	2
8	As an investor, I should be able to delete an investment offer in	Going on investment section, selecting the investment offer and	2	2	1	2

	order to remove it from the system.	clicking on delete, the investment is deleted				
9	As a farmer or investor, I should be able to manage my profile in order to update my information.	By going on profile section, by clicking on the edit button, make any changes and clicking on the update button, the profile is updated	2	2	1	2
10	As a farmer, I should be able to access articles posted on the system.	By going to the article section, using the filter functionality, certain types of articles will be proposed.	1	2	1	2

vii. Sprint Backlog

Release	Sprint	User stories	Period (days)
Release 1: Rest API Gateway	Sprint 1	1, 2, 3, 4, 5	12th May - 12th July

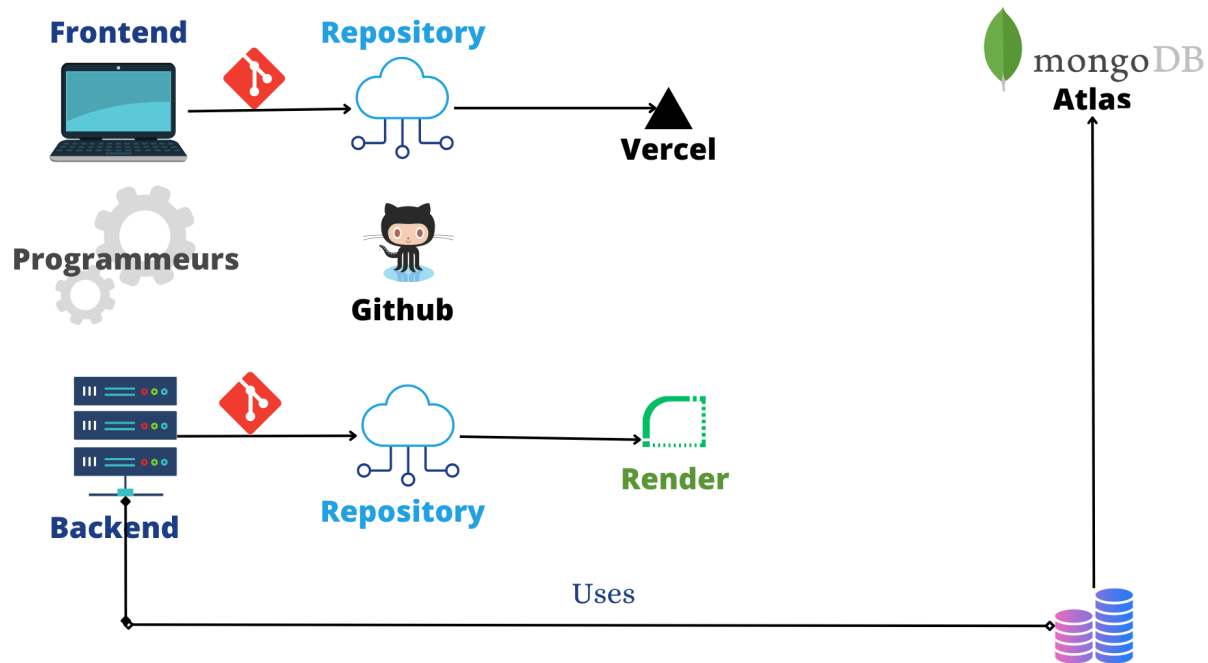|	Sprint 2	6, 7, 8, 9, 10	12th May - 12th July
Release 2: Client app	Sprint 3	1, 2, 3, 4, 5	12th May - 12th July
	Sprint 4	6, 7, 8, 9, 10	12th May - 12th July

6. Methodology

a. Architecture of your system

i. Architectural Diagram

- Software architecture
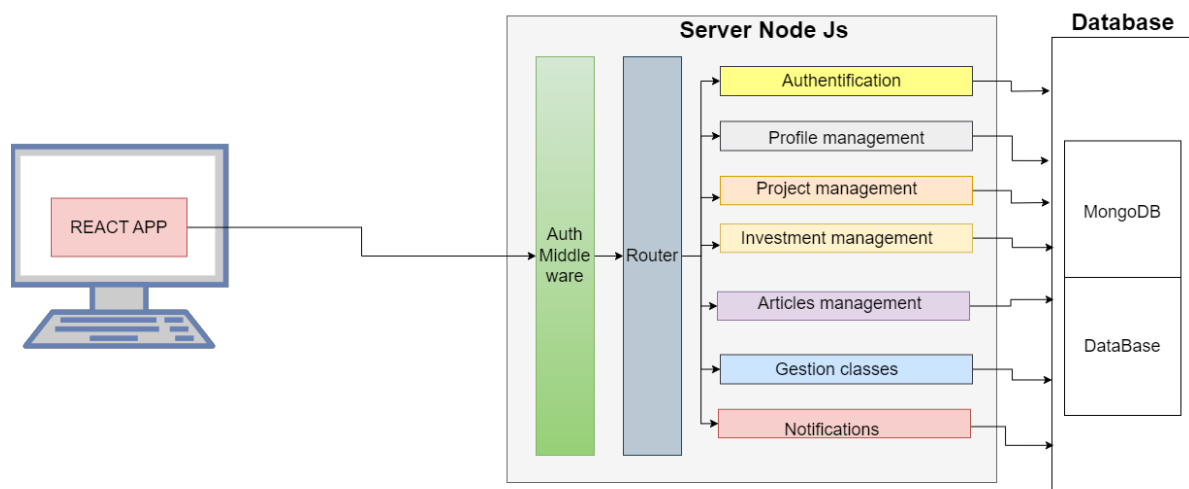
- Deployment architecture

ii. Description of Architecture

● technologies:

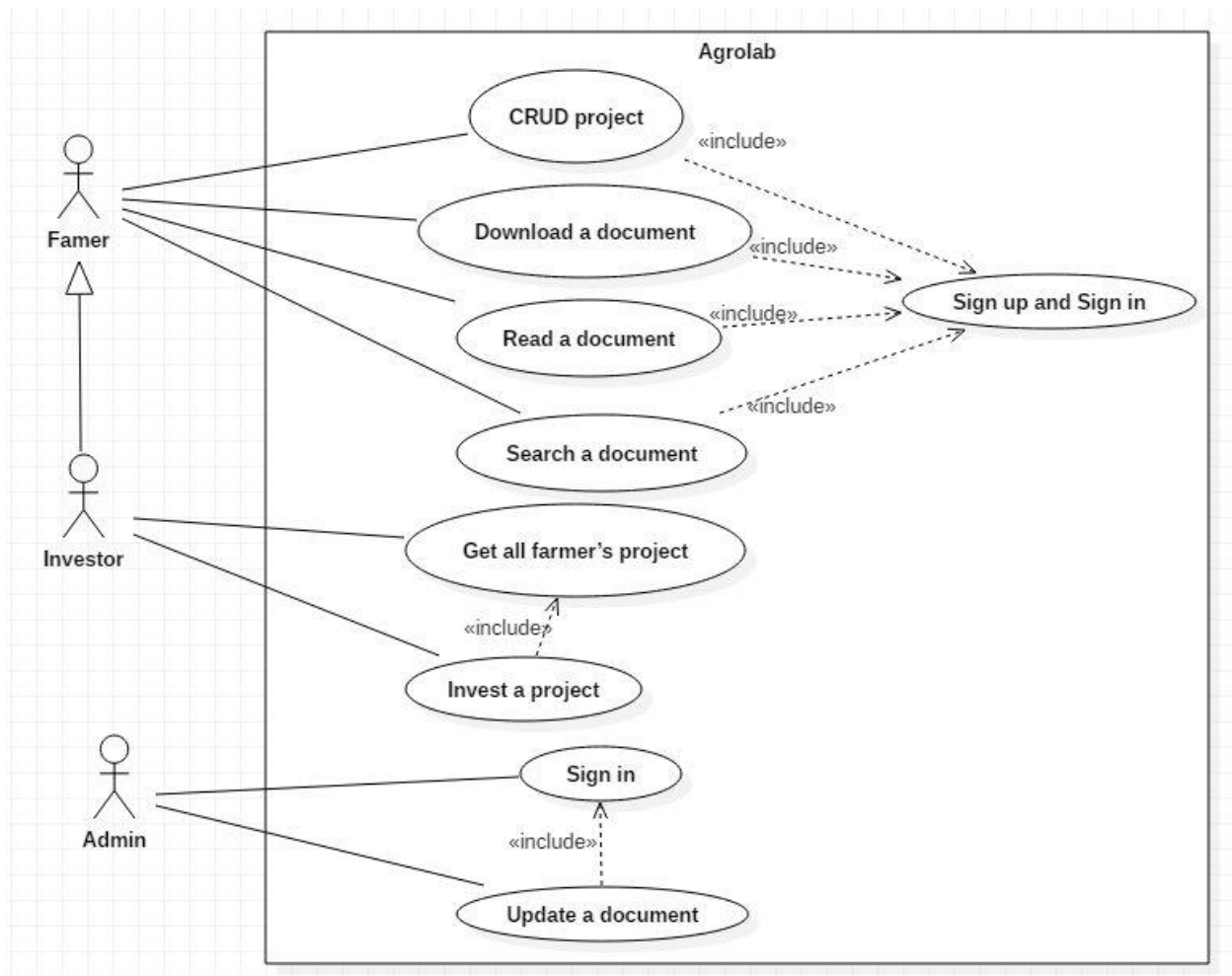| Technology	Name	Description
Frontend	React Js	It is a free and open-source JavaScript library. It allows building user interfaces by combining sections of code (components).
	Material UI	It is an open-source React component library that allows us to better style our application.
	Bootstrap	It is a library that helps to style web pages, we will use it alongside Material UI.
	Emotion	It is a library that allows you to write CSS in JavaScript. It will be useful for us to style specific components.
	Node Js	It is an open-source, cross-platform runtime environment for developing server-side applications.

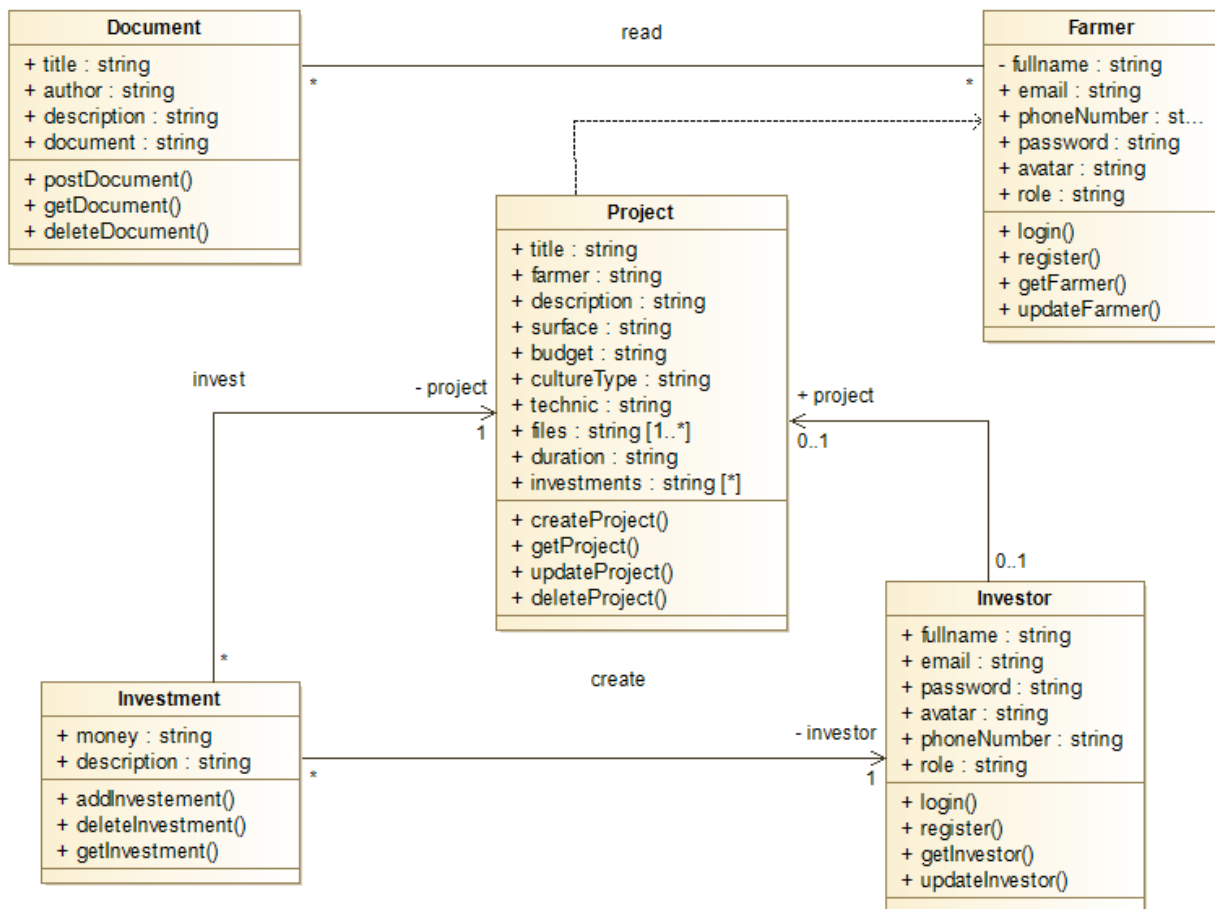|		
Backend	Express Js	It is a server-side JavaScript framework for creating fast, robust and flexible APIs
BD	Mongodb	It is a NoSQL database management system. This type of BD is flexible, it perfectly suits the agility of our solution.

iii. Architectural Drivers

b. Model of your system

i. Model UML

1. Use case diagram

2. Class diagram

Document

+ title : string
+ author : string
+ description : string
+ document : string

+ postDocument()
+ getDocument()
+ deleteDocument()

read

Farmer

- fullname : string
+ email : string
+ phoneNumber : st...
+ password : string
+ avatar : string
+ role : string

+ login()
+ register()
+ getFarmer()
+ updateFarmer()

Project

+ title : string
+ farmer : string
+ description : string
+ surface : string
+ budget : string
+ cultureType : string
+ technic : string
+ files : string [1..*]
+ duration : string
+ investments : string [*]

+ createProject()
+ getProject()
+ updateProject()
+ deleteProject()

invest   - project   + project

1   0..1

0..1

Investor

+ fullname : string
+ email : string
+ password : string
+ avatar : string
+ phoneNumber : string
+ role : string

+ login()
+ register()
+ getInvestor()
+ updateInvestor()

create

Investment

+ money : string
+ description : string

+ addInvestement()
+ deleteInvestment()
+ getInvestment()

- investor

*   1

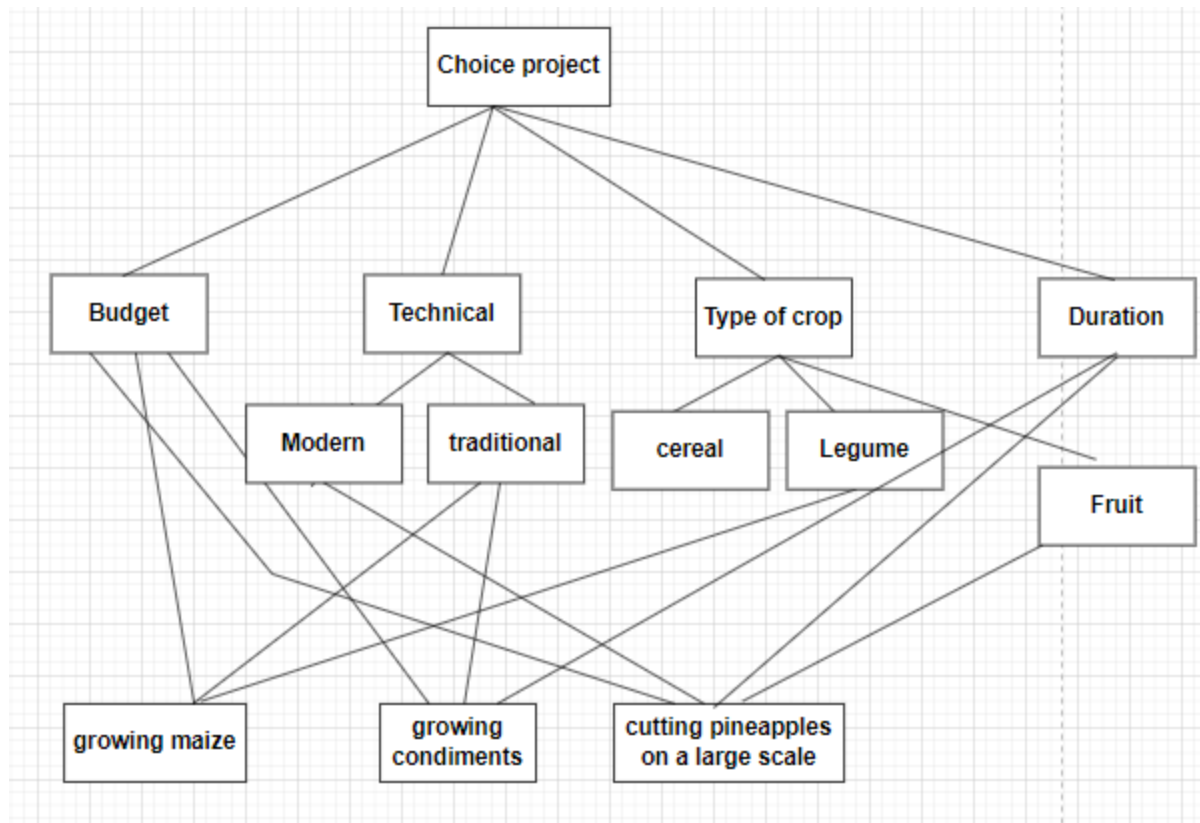## 3. Activity diagram

4. Sequence diagram

c. Analytical Hierarchical process (AHP) algorithm applied to your

project.

Pair wise matrix

	B	T	Tc	D
B	1	5	4	7
T	1/5	1	2	3
Tc	1/4	1/2	1	3
D	1/7	1/3	1/3	1
Sum	1.592	6.833	7.333	14

Normalized the pair wise matrix:

	B	T	Tc	D
B	0.6278	0.73171	0.54545	0.5

T	0.12556	0.14634	0.27273	0.21429
Tc	0.15695	0.07317	0.13636	0.21429
R	0.08969	0.04878	0.04545	0.07143

Calcul criteria weights

	B	T	Tc	R	weighted Criteria
B	1*0.601241138	5*0.189728	4*0.145192	7*0.063837	0.6012411
T	(1/5)*0.601241	1*0.189728	2*0.145192	3*0.063837	0.189728
Tc	(1/4)*0.601241	(1/2)*0.189	1*0.145192	3*0.063837	0.145192
R	(1/7)*0.601241	(1/3)*0.189	(1/3)*0.145	1*0.063837	0.063837

Calcul criteria weighted sum

	B	T	Tc	D	Criteria Weighted sum
B	1*0.601	5*0.189	4*0.145	7*0.063	2.577
T	(1/5)*0.601	1*0.189	2*0.145	3*0.063	0.791
Tc	(1/4)*0.601	(1/2)*0.189	1*0.145	3*0.063	0.581
D	(1/7)*0.601	(1/3)*0.189	(1/3)*0.145	1*0.063	0.261

Calculate λi and λmax

λi = (criteria weighted sum) / weighted Criteria

Criteria	Criteria weighted sum	Weighted criteria	λi

B	2.577	0.601	4.286
T	0.791	0.189	4.173
Tc	0.581	0.145	4.007
D	0.261	0.063	4.094

λmax=(4.286995+4.17372+4.007637+4.094299)/4

= 4.14066

Calculate consistency index(CI)

CI = (λmax − n)/(n-1)

Where n= number of criteria

in our case n=4

CI = (4.14066-4)/3 = 0.046888

Calculate consistency Ratio (CR):

CR (with n=4) = 0.046888/0.9 = 0.052097

CR< 0.10 this implies we are consistent with our decision-making process hence we can conclude to synthesize.

	B	T	Tc	R	total item weight
Agrimax	210434.4	189.7287	0.3049	1.0214	210625.5
Cerelax	165341.31	94.864373	0.46462	1.0214	165437.7
KiriKiri	375000	189.72874	0.39202	0.5107	225656.1

From the synthesis we can see that Agrimaxis the best option because it has an overall item weight.

d. Mathematical modeling

Let G(E,V) be a weighted heterogeneous graph such that:

E is the set of Investors and Projects

V is the set of edges such that:

Let a ∈ V P(a) be the function that calculates the weight of an edge

P(a) = AHP(investor, project) * criteria value

With AHP(investor, project) which is the function that returns the weights of the criteria for an investor after checking the consistency of the criteria.