

Sustainability Awareness Results for AgriAssist

System: Currently Agriculture is the backbone of Ethiopia's economy. Agriculture sector employs 66.63% of Ethiopian on 2021, and therefore contribute to 80% of exports and 40% from whole Ethiopia's GDP. Therefore, with huge labor forces and water resource, Ethiopia has marvelous opportunities for the commercialization their agriculture product. However, Ethiopia's current fruit, vegetable, and animal production for export are low values because of fragmented cultivation and lack of quality products. AgriAssist system is a project to optimise agriculture system in Ethiopia. Our team integrated the supply chain management of farming necessities, spreading farming information, and disease control practices with the goal of provide better support for the Ethiopian farmers.

AgriAssist's perceptions of the sustainability effects in the beginning of the workshop

- Supply chain management (Economic)
- Employment and training, and Easier access for farmers (Social)
- Utensils Investment, Forecasting, and Disease Control (Technical)
- Enhancing the lifespan of plants, and Preserving the lands material (Environment)

Expected outcome

Product or Service Vision

Providing farmers proper knowledge about farming and access to modern farming equipment/infrastructures to increase productivity while following sustainable practices.

Known sustainability effects

- Wise placement of irrigation, will decrease land erosion
- Increase income of smallholder farmers by increasing crop yields leading to overall economic development.
- The increase of agricultural output will decrease the price of food, thus ensuring food security and nutrition for all.
- Employment opportunities for literate people through our application.
- Technology will decrease the load of menial work, which will open the same job scope for males and females.

The results of the project are grouped by the following key themes that emerged during the analysis: **Harvest Recommendation and Training, Pest and disease control, Investment, Employment, and Supply chain market.**

In the next sections, we will highlight a number of important findings that may have an impact on sustainability.

Highlights

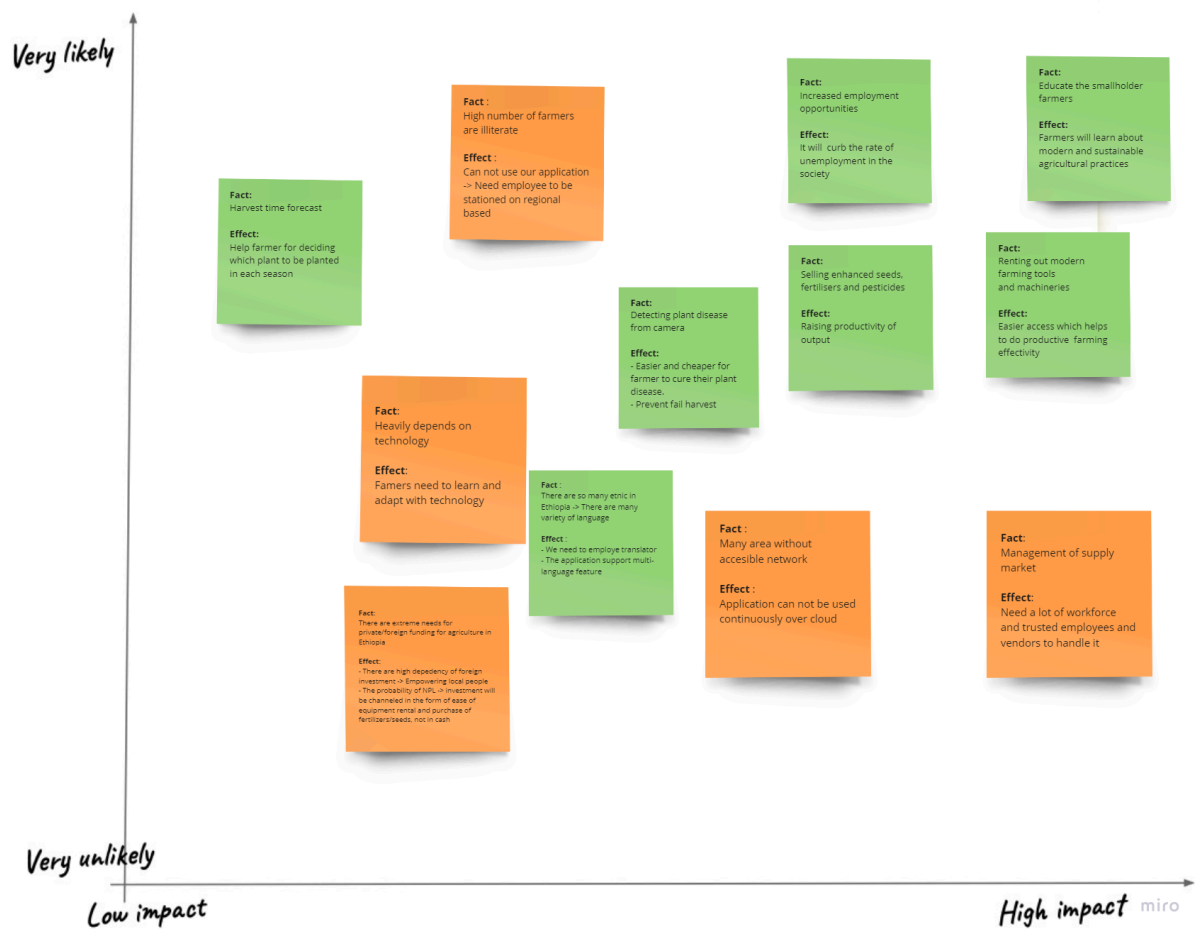
Harvest Recommendation and Training: The key objective of the AgriAssist system is to give harvest recommendation and training to the farmer, it gives harvest forecasting, recommendation on seed types, articles on farming tips, as well as material for sustainable farming instruction.

Pest and Disease control: The new system helps detect disease and recommend pesticides or fertilizers to be used.

Investment: The system provides investment through modern farming instruments renting and vehicle and transportation renting.

Employment Opportunities: The success in the use of this system provides job opportunities, and allows employees to educate the users, and it also provides the translation of different Ethiopia languages.

BRAINSTORMING



SOCIAL

Sense of community means the feeling of belonging to an organization, to an area or to a group of like-minded people.

How can the product or service affect a person's sense of belonging to these groups?

Ans: The system can connect like minded people who are following the same practices and thus enhancing their sense of belonging. On the other hand if a group does not follow, it can weaken their sense of belonging.

Trust means having a firm belief in the reliability, truth, or ability of someone or something.

How can the product or service change the trust between the users and the business that owns the system?

Ans: The presence of a market with clear upfront price gives farmers knowledge and power of leveraging their agricultural output against current black-market practice.

Inclusiveness and diversity refers to the inclusion of people who might otherwise be excluded or marginalized.

How can the product or service impact on how people perceive others? What effects can it have on users with different backgrounds, age groups, education levels, or other differences?

Ans: This app is targeted for the farmers with low literacy rate, only farmers will get positive impacts. Equity means the quality of being fair and impartial.

How can the system make people be treated differently from each other? (think data analytics or decision support?)

Ans: The system is designed with fairness and impartiality in mind to prevent inequalities.

Participation and communication refers to imparting or interchanging thoughts, opinions or information by speech, writing, or signs.

How can the product or service change the way people: create networks? participate in group work? support, criticize or argue with others?

Ans: The system helps to facilitate communication among farmers and trainers, which could lead to a creation of new networks, more effective group work, and more productive discussion or criticism among one another.

INDIVIDUAL

Health means the state of a person's mental or physical condition.

How can the product or service improve or worsen a person's physical, mental, and/or emotional health?

(For example, can it make a person feel anything good or bad - e.g. (under)valued, (dis)respected, (in)dependent, or coerced?)

Ans: The system can improve their mental and emotional well-being by reducing stress related to financial instability and improving their overall quality of life.

Lifelong learning means the use of learning opportunities throughout people's lives for continuous development.

How can the product or service affect people's competencies?

Ans: Our system includes a training feature, where in there farmers are taught how to efficiently farm. Moreover, the system has the feature of disease detection, so they can independently and fastly perceive their plants' condition.

Privacy means being free from intrusion or disturbance in one's private life.

How can the product or service expose (or help to hide) a person's identity, whereabouts or relations?

Ans: Our system does not show the location and name of both farmer and vendor. All of the transactions should be with our presence as mediator.

Safety means being protected from danger, risk, or injury.

How can the product or service expose (or protect) a person from physical harm?

Ans: Renting the hardware tools can expose them towards physical harm if they don't know how to use it properly.

How can it make a person feel more (or less) exposed to harm?

Ans: Learning and getting knowledge about tools from our system can reduce the exposure to harm

What if used in an unintended way?

Ans: Agency means the capacity of an individual to act or make decisions of their free will.

How can the product or service empower (or prevent) a person from taking an action / decision when necessary?

Can those affected by the product or service understand its implications, express concerns or be represented by someone?

Ans: Although the system gives some instructions and recommendations, the individual has the full capacity to decide to follow the instructions or do as they desire. Based on our model there would be employees according to specific region to whom the users can express concerns.

ENVIRONMENTAL

Material and resources includes everything that is needed to produce, deploy, operate, and cease a product or service.

How are materials consumed to produce the product or service?

What about operating the product or service? E.g., requires hardware.

How can it change the way people consume material? E.g., encourage to buy more?

Ans: The system can change the way people consume materials by encouraging the adoption of eco-friendly and sustainable practices in agriculture such as reducing the use of chemical fertilizers and pesticides. It can also encourage people to buy more organic fertilizers and seeds.

The hardware equipment rented through our app is provided by a third party. Waste & pollution means effects the product or service might have on soil, atmospheric, and water pollution.

How can producing parts or supplies generate waste or emissions? How can the use itself produce waste or emissions? How can it influence how much waste or emissions are generated? How can it promote (or impair) recycling?

Ans: The system provides training to the farmers on eco-friendly practices that reduce waste and pollution such as crop rotation, pest management techniques.

Biodiversity includes the effects of a product or service on biodiversity in its operational environment and other affected land.

How can it impact the plants or animals around it? Or elsewhere?

Ans: Farmers may be tempted to grow only plants that have higher prices on the application, as our system puts an upfront price for the open-market quality. Therefore, this may lower the number of biodiversities and this may encourage Shifting Cultivation.

The system provides a service that could have negative impacts on plants or animals in the environment by harming non-targeted species. Additionally, the system provides a service that could help prevent the spread of diseases that could harm crops or plants.

How can it change composition of the soil around it? E.g., occupying / cropland?

What about elsewhere?

Ans: Shifting cultivation practice may results in :

1. reducing forest area
2. forest destruction
3. land becoming barren/critical land
4. soil easily eroded
5. forest fires
6. air pollution
7. flooding

Energy means all energy use that results from producing and using a product or service.

How can the product of service affect the need for production of energy? What about the use of energy? E.g. encourages less energy. Does the hardware run on renewable energy? Is there a way to incentivise that?

Ans: The system encourages sustainable farming practices thus prefers less energy uses. In terms of the hardware which is used for farming can be designed to run on renewable energy.

Logistics means the effects of the product or service on moving people and/or goods.
How can it affect the need (and distance) for moving people or goods? means by which people or goods move?

Ans: The system provides services that could potentially reduce the need for farmers to travel long distances to access markets, supplies or equipment.

ECONOMIC

Value means the worth, or usefulness of something, principles or standards; judgment of what is important in life.

How can the product or service create or destroy monetary value? For whom?

Ans: Local agriculture market : Raising the number of supply, will lower the price of food. However, this does not mean that farmers' income will decrease, as the supply is growing.

Local Black-market : Lowering the number of supply from farmers will halt the business of illegal middle-man

Global agriculture market : Increasing the quality and quantity of Ethiopian agriculture will strengthen Ethiopia's position as agriculture exporter.

Are there any other related types of business value? For whom?

Ans: Customer Relationship Management steers a company's interaction with current and potential customers to improve business relationships (e.g. retention, growth).

How can the product or service affect the relationship between the business and its customers? How can it enable co-creation or co-destruction of value? How can it impact the financial situation of their customers & others?

Ans: The system has a help service from our employee which is free for farmers that will help to establish better customer relationships.

Supply Chain means a system of organizations, people, activities, information, and resources involved in moving a product or service from supplier to customer.

How can the product or service affect the supply chain of the business who owns it?

Ans: The number of supplies will be increased and there is easier access for transportation, therefore there will be a rise of agricultural output in the market.

How can these changes in the supply chain impact the financial situation?

Ans: The rise of supply will decrease the price, and make food more accessible for common people. But, this decrease would not lower the income of farmers, as by the sense of multiplication their income will be increased instead.

How can it impact the financial situation of their customers & others?

Ans: The farmers will get higher income with the increase of their products.

Governance means the processes of interaction and decision-making among the actors involved in a system through the laws, norms, power or language of an organized society.

*How can the product or service affect how and by whom such decisions are made?
the communication channels by which the relationships takes place?*

Ans: All the decisions about the system are made from higher authority of the company through the common understanding of everyone.

How can these changes impact the financial situation of the business and partners?

Ans: Innovation refers to something new or to a change made to an existing product, idea, or field.

Do (parts of) the product or service affect the investment on research & development?

Ans: Yes, our product was designed after intensive research, so the investment might get less on researching.

How can changes in innovation and R&D impact the financial situation?

Ans: It helps to increase the production level thus the income of people and GDP

Can it also impact the financial situation of their customers & others?

Ans: Customers will get proper value of the yields and increase the income level.

TECHNICAL

Maintainability means the degree to which an application is understood, repaired, or enhanced.

How are the operating system and runtime environment expected to change what does that required from maintainers of this system?

Ans: The operating system will not change but if there is any update in the OS , maintainers need to update the app.

How can the correctness of the system be affected by other systems or affect the correctness of others?

Ans: Some of the data are coming from 3rd party APIs, so those data need to be accurate and customers need to provide valid data to get better results.

Usability means the ability of users to productively use the system for the intended purpose.

What kind of knowledge or physical properties are required to use the system and how can this affect different types of users? For example, is good eyesight and small, sensitive hands required to operate a system on a small handheld device?

Ans: Our apps can be translated into local language but it needs a guideline to start with the apps. Once customers are familiar, anyone can use it. it is not sensitive to

use.

Adaptability means the ability of a system to adapt itself to fit its behavior according to changes in its environment or in parts of the system itself.

How could someone want to use the system in another context? What can make that easier/more difficult? What can make that easier/more difficult for the system to adapt itself to fit new usage scenarios?

Ans: The system is designed only for mobile platforms, it can adapt to any mobile device or platforms without any extra effort on users end.

Security means freedom from, or resilience against, potential harm (or other unwanted coercive change) caused by external or internal attacks.

Which assets controlled by this system would be desirable to an attacker? financial information, people's whereabouts or preferences, etc. What are the risks associated with these assets? What are other likely vulnerabilities of the system?

Ans: The system does not save real time location information of its users. In order to use the app every user has to be authenticated and also verified by our representative to avoid any misuse of the app. The vulnerabilities could be insecure network and data storage.

Scalability means the system's ability to handle growing amounts of work in a graceful manner or to be enlarged horizontally or vertically and will continue to function with comparable response times.

How can the system support changes in workload? The system was designed to support scalability, using scalable technologies, and can handle increased demand as the users grow. What can make that easier/more difficult?

Ans: This could be difficult to achieve if the system is developed with a limited budget/resources.

SUSTAINABILITY AWARENESS FRAMEWORK

In this report, **sustainability** is the “capacity of a socio-technical system to endure”. More specifically, it refers to how systems that emerge from the interaction of a technical solution with humans and their environment can endure within the current economic, environmental, social, technical and individual settings. These are commonly referred to as the five dimensions of sustainability.

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The **Sustainability Awareness Framework** (SusAF) is a tool that supports stakeholders with different viewpoints to start a conversation on the possible effects of a socio-technical system on sustainability. It aims to raise awareness on the relationship between software and sustainability; a comprehensive sustainability impact analysis requires further work.

The SusAF is concerned with five **dimensions of sustainability** and the three **order of effects**:

Definition of Sustainability Dimensions

Definition of the order effects

<p>Social: covers the relationships between individuals and groups.</p> <p>Individual: covers the individual's' ability to thrive, exercise their rights, and develop freely.</p> <p>Environmental: covers the use and stewardship of natural resources.</p> <p>Economic: covers the financial aspects and business value.</p> <p>Technical: covers the technical system's ability to accommodate changes</p>	<p>Immediate are direct effects of the production, operation, use and disposal of socio-technical systems. This includes the properties and the full lifecycle impacts, such as in the Life-Cycle Assessment (LCA) approach.</p> <p>Enabling of operation and use of a system include any change enabled or induced by the system.</p> <p>Structural represent structural changes caused by the ongoing operation and use of the socio-technical system</p>
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The SusAF **questions sheets** and the **Sustainability Awareness Diagram** (SusAD) for guiding discussion on the potential effects of technical systems and visualizing potential chains of effects.

Topics treated in each questions sheet

Social	(1) Sense of Community; (2) Trust; (3) Inclusiveness and Diversity; (4) Equality; (5) Participation and Communication;
Individual	(1) Health; (2) Lifelong learning; (3) Privacy; (4) Safety; (5) Agency;
Environment	(1) Material and Resources; (2) Soil, Atmospheric and Water Pollution; (3) Energy; (4) Biodiversity and Land Use; (5)Logistics and Transportation;
Economic	(1) Value; (2) Customer Relationship Management (CRM); (3) Supply chain; (4) Governance and Processes; (5)Innovation and R&D;
Technical	(1) Maintainability; (2) Usability; (3) Extensibility and Adaptability; (4) Security; (5) Scalability;

AgriAssist's THREATS and OPPORTUNITIES

Threats	Opportunities
<ul style="list-style-type: none"> • This system heavily depends on technology, while the literate adults in Ethiopia are still around 50%. Therefore, it is quite a challenges for farmers to learn and adapt with technology • There are so many ethnic in Ethiopia, which in turn produces a high number of language diversity in Ethiopia. • Only around one-fourth of Ethiopian people have access to the internet, and there are many areas without accessible networks. Therefore, applications can not be used continuously over cloud. • This project requires a lot of workforce and trusted employees and vendors to handle management of the supply market, especially at the early stages. 	<ul style="list-style-type: none"> • While Ethiopia has great agricultural potency, there are a high number of farmers without knowledge of modern farming. • Plant disease and pests might destroy the chance of good harvest, therefore fast plant disease detection is compulsory. • There is a high fashion of dependence on foreign funding in Ethiopian Agriculture now, which in turn threatens domestic food security. Therefore, this project will empower local people, and use the principle of from people for people. • As there are a high chance of Non-Performing Loan, therefore our investment will be channeled in the form of services (equipment rental and purchase of fertilizers/seeds), and not cash

Threats

Heavily depends on technology. Farmers need to learn and adapt with technology

There are so many ethnic in Ethiopia -> There are many variety of language

Many area without accessible network. Application can not be used continuously over cloud

Management of supply market-> Need a lot of workforce and trusted employees and vendors to handle it

High number of farmers are illiterate

Actions

Increased employment opportunities. It will curb the rate of unemployment in the society

We need to employ translator
- The application support multi-language feature

Opportunities

High number of farmers without knowledge of modern farming

Detecting plant disease from camera

- Easier and cheaper for farmer to cure their plant disease.
- Prevent fall harvest

There are extreme needs for private/foreign funding for agriculture in Ethiopia

- There are high dependency of foreign investment -> Empowering local people
- The probability of NPL -> investment will be channeled in the form of ease of equipment rental and purchase of fertilizers/seeds, not in cash

Actions

Harvest time forecast

Help farmer for deciding which plant to be planted in each season

Renting out modern farming tools and machineries. Easier access which helps to do productive farming effectivity

Educate the smallholder farmers

Farmers will learn about modern and sustainable agricultural practices

Selling enhanced seeds, fertilisers and pesticides. Raising productivity of output

LIST OF POTENTIAL EFFECTS

