COMSATS University Islamabad (CUI)

Project Proposal

for

AgroTech

Version 1.0

By

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Supervisor

Ms. Saira Beg

Bachelor of Science in Software Engineering (2021-2025)

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Project Category:

☐ **A-**Web Application/Web Application based Information System
☐ **B-**Problem Solving and Artificial Intelligence
☐ **C-**Image Processing

Abstract

AgroTech will address the inefficiencies and challenges faced by farmers in the agriculture sector particularly in crop management, monitoring and marketing. Currently, farmers rely on traditional methods and fragmented tools for crop management, which results in more time consumption, suboptimal yields, resource wastage, and limited market access. AgroTech aims to resolve these challenges by providing an end-to-end solution encompassing crop recommendation, monitoring, harvesting, and marketing. Traditional ways are the cause of low efficiency and effectiveness which results in reduced sales conversions rate. Moreover, there is a lack of comprehensive, integrated solutions that connect crop management with market access. AgroTech allows streamlining soil and crop management processes, optimizing resource utilization, improving yield prediction accuracy, reducing post-harvest losses and facilitates online market access for farmers. It will try to facilitate farmers to increase their profit by increasing their marketing. AgroTech will save time, effort and cost by revolutionizing agriculture practices and empower farmers with advanced tools. The system will benefit farmers and customers on a large scale.

1. Introduction

This document will be describing the planning information about "AgroTech". It will contain guidance about (AgroTech) scope including the actors its major functionalities along with tools and technologies, constraints, and mockup details. AgroTech will be a web application. It will provide its users with an efficient crop recommendations, management, and marketing platform. The software includes four types of users Admin, Farmers, Customers, Sellers. The system uses the concept of artificial intelligence, machine learning and image processing to facilitate its users. The system will be helpful in the crop recommendations, management and marketing. The proposed is a great solution designed to optimize resource utilization, improve yield prediction accuracy, and facilitate market linkage for farmers, ultimately contributing to food security and economic development. The system aims to enhance agricultural productivity, sustainability, and profitability.

2. Problem Statement

Currently farmers are facing many challenges in crop production, management, monitoring and marketing which results in suboptimal yield production, resource wastage and limited market access. Traditional crop management methods require manual labor and rely on outdated tools and equipment which are inefficient and labor intensive. The agricultural sector and farmers face many challenges in making decisions about crop selection, planting schedule and agronomic practices because of lack of access to data and predictive analytics. Traditional monitoring processes cause delays in detecting diseases, pests or nutrient deficiency which results in lower yield production and increased costs. In physical markets, farmers face different challenges in selling their produce as well as customers finding their needs according to their budget.

3. Problem Solution/Objectives of the Proposed System

AgroTech will be a web application that will address all the problems and challenges mentioned in the problem statement. It will aim to revolutionize crop recommendations, management, monitoring, and marketing through streamlining the whole production lifecycle of crops using advanced technologies and data driven decision-making. It will provide recommendation about optimal crops based on soil and climate data monitoring crop health periodically, detect diseases and pests and recommend pesticides and insecticides, optimizing resource allocation, streamline harvest operations, facilitating access to market and pricing decisions. It will provide decision and recommendation support along with training for farmers to continuously improve to meet ever growing agricultural needs. By achieving these goals, the software aims to empower farmers, enhance productivity of crops, and facilitate comprehensive market linkage for both farmers and customers.

3.1 Objectives

BO-1: Improve farmer decision-making by providing accurate crop recommendations by checking soil attributes and previous history.
BO-2: Increase crop yield through optimized resource allocation and disease prevention.
BO-3: Reduce post-harvest losses through improved harvest planning and quality control measures.
BO-4: Increase farmer adoption and satisfaction with the software by providing user-friendly interfaces and comprehensive training materials, enhancing user engagement.
BO-5: Enhance market access and profitability for farmers by facilitating sales at competitive prices, resulting in a great increase in revenue.
BO-6: Reducing the effort of farmers by providing automated software to manage and control crop production.

4. Related System Analysis/Literature Review

Following are the top-rated systems related to AgroTech. Below table also shows limitations of those systems and advantages of AgroTech

Table 1 Related System Analysis with AgroTech

Application Name	Weakness	Proposed Project Solution
• CropIn (Web and Mobile) https://www.cropin.com/	• Integration of comprehensive market access for farmers.	• AgroTech will facilitate farmers with comprehensive market access like selling crops, pesticides and other agriculture products.
• Folio3 AgTech (Desktop and Mobile) https://agtech.folio3.com/	• It gives a general purpose approach for recommendation of crops.	• AgroTech will recommend suitable crops keeping in view soil type and history, climate conditions and budget.
• Kheti buddy https://khetibuddy.com/ca/	• It gives limited information on record keeping and crop/soil monitoring.	• AgroTech will provide crop and soil monitoring using image processing and keeps detailed record of it for in-future analysis.

5. Vision Statement

For farmers **who** want to optimize their agricultural practices, maximize yields sustainably and enhance their market access, **the** AgroTech **is** a web application **that** offers smart crop recommendation, monitoring, and marketing capabilities. **Unlike** traditional methods and outdated tools, **our product** revolutionizes crop recommendations, monitoring, and marketing by optimizing resource utilization, improving yield prediction accuracy, and facilitating market linkage. AgroTech aims to enhance agricultural productivity, sustainability, and profitability, contributing to food security and economic development.

6. Scope

AgroTech is a web-based application. It revolutionizes agricultural practices by empowering farmers with advanced tools and data driven decision making capabilities along with streamlining soil and crop monitoring process, utilization of resources and market place availability. AgroTech includes crop recommendation, monitoring, and marketing. It uses artificial intelligence, machine learning, and image processing to provide efficient crop recommendations based on soil and climate data. The system facilitates crop health monitoring, disease detection, and pest prevention to optimize resource allocation and prevent yield loss. AgroTech includes four main users, Admin, Farmers, Sellers and Customers. **Admin** holds the highest level of authority and access and can easily add, remove and view anything at any time. **Farmers** can access the recommendation and monitoring functionalities along with option to buy and sell crops. **Customers** only have access to marketplace for buying agricultural products and reviewing them. They can also participate in bidding. However, they have to register for Seller profile to provide services. **Sellers** have access to marketplace to sell their products/services. They can bid their products. Moreover, they can view reviews and reports.

7. Modules

The modules of AgroTech are as follows:

7.1 Module 1: User Profiling

FE-1: Sign-up (Select User Type (Ecommerce Admin, Farmer and customer)).
FE-2: Sign-in.
FE-3: Manage Profile (Edit, View, Deactivate Account, Change Password).
FE-4: Recover Account.
FE-5: Social Sign-in (Gmail etc.).

7.2 Module 2: Soil Analysis

FE-1: Analyzes Nitrogen, Phosphorus. Potassium content in soil.
FE-2: Analyzes previous soil record.
FE-3: Farmers can give input according to specific needs to analyze the soil.

7.3 Module 3: Climate Analysis

FE-1: Analyzes seasonal weather.
FE-2: Analyzes climate according to specific location.

7.4 Module 4: Crop Recommendation

FE-1: Using the reports of soil and climate analysis to recommend crops.
FE-2: Provides different options according to budget.
FE-3: provides pros and cons of different crops on that soil.
FE-4: Provides tutorials for the methods for planting crops.

7.5 Module 5: AgroTech Chatbot (AI Powered Helping Assistant)

FE-1: Provides assistance according to user queries.
FE-2: Provides educational content, tutorials to help user learn about the system.
FE-3: Provides facility of different channels like email and phone support.

7.6 Module 6: Crop Health Monitoring

FE-1: Identify stresses in crops including water, nutrient and pest infestations stress etc.
FE-2: Identify visual symptoms of diseases in crops and classify them against databases.
FE-3: Provides information about crop health periodically using images for timely intervention to minimize damage.

7.7 Module 7: Yield Estimation and Prediction

FE-1: Utilizes ML models on factors such as temperature, rainfall, soil moisture, and nutrient availability to estimate crop yield.
FE-2: Provides accurate yield prediction for planning and resource allocation.
FE-3: Assesses yield risk factors such as drought, disease outbreaks, and pest infestations, allowing farmers to implement risk mitigation measures

7.8 Module 8: Crop Maturity Assessment

FE-1: Using image recognition (IR) to assess crop maturity and readiness for harvesting.
FE-2: Determines optimal time for harvesting based on crop growth and maturity indicators.
FE-3: Provides feedback to farmers on crop readiness to optimize harvest scheduling.
FE-4: Assess the Quality of crops based on factors such as sugar content, starch levels, size, color, and overall visual appearance.

7.9 Module 9: Harvesting Assist

FE-1: Provides a scheduling tool to plan and manage harvesting activities, specifying crop types, quantities and preferred dates.
FE-2: Recommends tools and techniques for harvesting
FE-3: Provides an access of a catalog of harvesting equipment for rent and purchasing.
FE-4: Provides detailed guidelines for proper handling of tools and freshly harvested crops, helping farmers maintain quality of crops.

7.10 Module 10: Transportation module

FE-1: Provides a facility of transportation to farmer directly from platform, specifying pickup and delivery locations.
FE-2: Provides option of different recycle and biodegradable packaging material for sustainable transportation practices.
FE-3: Provide shortest route to desired location for fuel efficient transportation, minimizing emissions and transportation costs.
FE-4: Provides facility of logistic planning for scheduling time and routes to deliver.
FE-5: Provides facility of different delivery options based on types and quantity of crops
FE-6: Provides facility of guide lining to farmer for packaging crops securely for better transportation.

7.11 Module 11: Storage Assist

FE-1: Provides facility to reserve climate-controlled storage facilities through this platform.
FE-2: Provides option to assess crop quality and assign grades providing buyers an accurate information.
FE-3: Provides different training suggestions to improve farmer's grading skills.
FE-4: Provides guidelines for complete process of storage and handling techniques for each quality grade.

7.12 Module 12: Online Marketplace

FE-1: Provides facility to list item with their name, description, price, quality grade and image.
FE-2: Provides facility to manage inventory, track orders through single dashboard.
FE-3: Provides facility to perform digital marketing campaigns directly through platform.
FE-4: Provides description of farming practices used to harvest these crops to highlight their eco-friendly processes.
FE-5: Provides facility to customer to directly buy crops at listed prices.
FE-6: Provides facility to customer to participate in bidding process.
FE-7: Provides facility to farmers to manage inventory levels.
FE-8: Provides secure online payment gateways.

7.13 Module 13: Reports and Analytics

FE-1: System will provide comparative reports and analytics about user engagement (before and after using our tool)
FE-2: System will provide reports containing various terms of webpage (visits, web pages visited at max etc.)
FE-3: System will provide reports about sales and revenues. (total crop sale, total pesticides and fertilizers sale, total renting equipment).
FE-4: System will provide user with various filters for user to filter out required data.

8. System Limitations/Constraints

LI-1: Limited Access to Technology: Some farmers may lack access to smartphones or computers, limiting their ability to use the software.
LI-2: Connectivity Issues: Rural areas may suffer from poor internet connectivity, affecting the crop monitoring and updating features of the software.
LI-3: Lack of familiarity with Technology: Farmers with limited literacy and familiarity with technology can significantly restrict their usage of software.

9. Data Gathering Approach

Interviews/Surveys: It will be done to get thoughts of farmers, agricultural experts and stakeholders regarding challenges and expectations in crop management, monitoring and marketing to gather requirements.
On-site Observations: Field visits will be done to observe existing practices to identify opportunities of gathering requirements.

10. Tools and Technologies

Table 2: Tools and Technologies for Proposed Project

	Tools	**Version**	**Rationale**
Tools And Technologies	MS Visual Studio Code	1.88.1	IDE
	MongoDB Compass	7.0	DBMS
	Adobe Photoshop	25.6	Design Work
	MS PowerPoint	2016	Presentation
	MS Word	2016	Documentation
	MS Project	2016	WBS and Gantt Chart
	Figma	9.0	Mockups Creation
	Technology	**Version**	**Rationale**
	Java Script	ES2023	Client-side scripting language
	Mongo DB	7.0	Database
	React JS	17	Front-end JS Framework
	Express JS	4.18	Web development framework
	Python	3.12	AI and ML
	Node JS	21	Backend

11. Project Stakeholders and Roles

Table 3 Project Stakeholders for AgroTech

Project Sponsor	COMSATS University Islamabad, Islamabad Campus
Stakeholders	**Student Names:** • Mohammad Ammar Ali (FA21-BSE-042**)** • Muhammad Moiz (FA21-BSE-044) • Muaaz Bin Mukhtar (FA21-BSE-045) **Project Supervisor Name:** • Mrs Saira Beg **Final Year Project Committee**

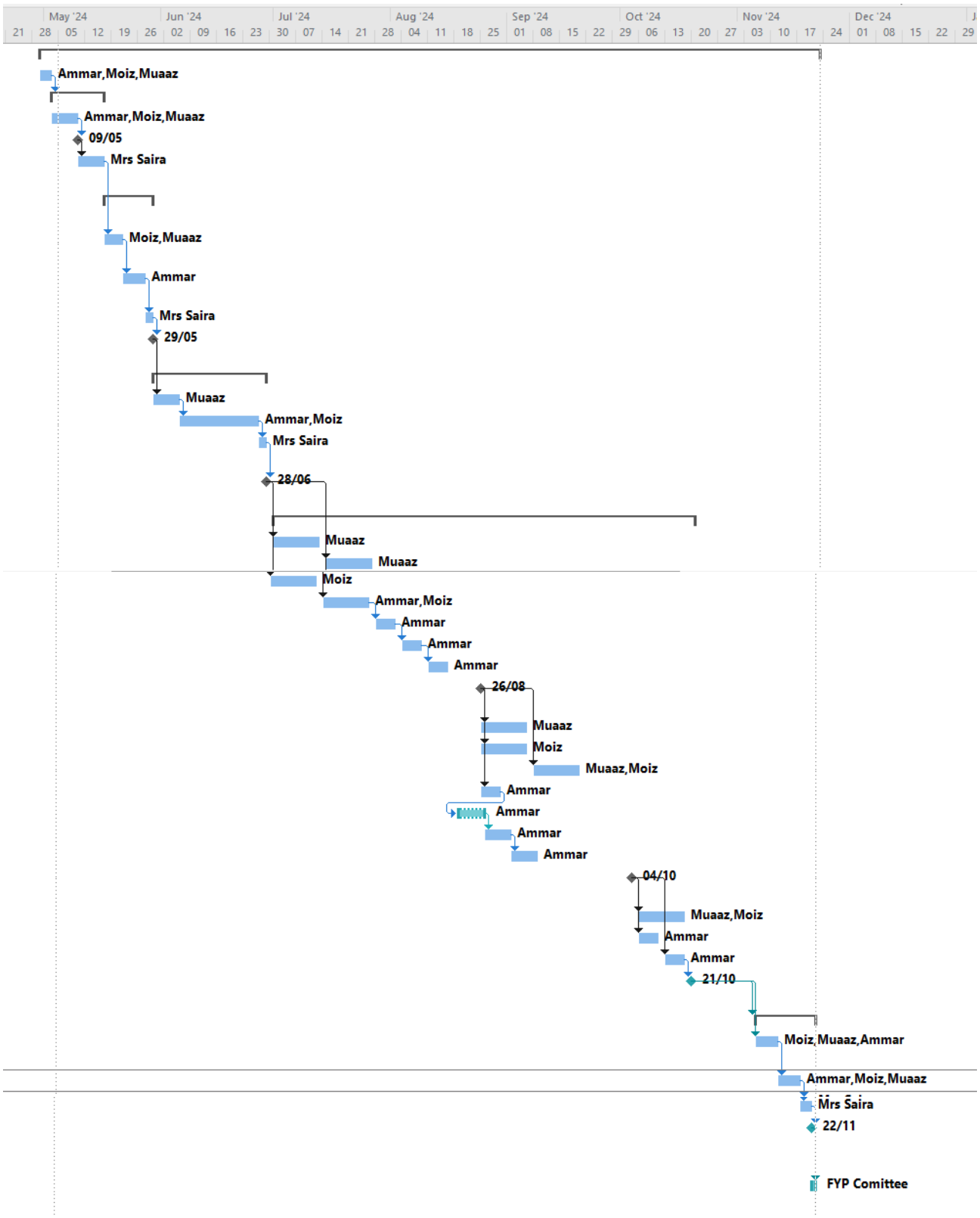
12. Module based Work Division

Table 4 Team Member Work Division for Proposed Project

Student Name	Student Registration Number	Responsibility/ Module / Feature
Muaaz Bin Mukhtar	FA21-BSE-045	• Module 2: Soil Analysis module • Module 3: Climate Analysis module • Module 4: Crop Recommendation module • Module 5: AgroTech Chatbot • Module 8: Crop Maturity Assessment module (FE-1, FE-3)
Muhammad Moiz	FA21-BSE-044	• Module 5: AgroTech Chatbot • Module 6: Crop Health Monitoring module • Module 7: Yield Estimation and Prediction module • Module 8: Crop Maturity Assessment module (FE-2, FE-4) • Module 9: Harvesting Module (FE-1, FE-2)
Mohammad Ammar Ali	FA21-BSE-042	• Module 9: Harvesting module (FE-3, FE-4) • Module 10: Transportation module • Module 11: Storage module • Module 12: Online market place module • Module 13: Reports and Analytics module

13. WBS and Gantt Chart

	Task Mode	Task Name	Duration	Start	Finish	Predecessors	Resource Names	% Complete
1		**Agro Tech**	**149 days?**	**Tue 30/04/24**	**Fri 22/11/24**		**Ammar,Moiz,Muaaz**	**0%**
2		Planning	3 days	Tue 30/04/24	Thu 02/05/24		Ammar,Moiz,Muaaz	0%
3		**Scope Document**	**10 days**	**Fri 03/05/24**	**Thu 16/05/24**	**2**	Ammar,Moiz,Muaaz,Mrs Saira	**0%**
4		Preparing Scope	5 days	Fri 03/05/24	Thu 09/05/24		Ammar,Moiz,Muaaz	0%
5		Scope Completion	0 days	Thu 09/05/24	Thu 09/05/24	4	Ammar,Moiz,Muaaz	0%
6		Review Scope Document	5 days	Fri 10/05/24	Thu 16/05/24	5	Mrs Saira	0%
7		**Requirement Analysis**	**9 days**	**Fri 17/05/24**	**Wed 29/05/24**			**0%**
8		Requirements gathering	3 days	Fri 17/05/24	Tue 21/05/24	6	Moiz,Muaaz	0%
9		Documenting requirements	4 days	Wed 22/05/24	Mon 27/05/24	8	Ammar	0%
10		Review Requirements	2 days	Tue 28/05/24	Wed 29/05/24	9	Mrs Saira	0%
11		Complete SRS Document	0 days	Wed 29/05/24	Wed 29/05/24	10	Ammar,Moiz,Muaaz	0%
12		**Design**	**22 days**	**Thu 30/05/24**	**Fri 28/06/24**			**0%**
13		Prepare Design Models	5 days	Thu 30/05/24	Wed 05/06/24	11	Muaaz	0%
14		Project Interface	15 days	Thu 06/06/24	Wed 26/06/24	13	Ammar,Moiz	0%
15		Review design and interface	2 days	Thu 27/06/24	Fri 28/06/24	14	Mrs Saira	0%
16		Complete SDS Document	0 days	Fri 28/06/24	Fri 28/06/24	15	Ammar,Moiz,Muaaz	0%
17		**Development**	**85 days?**	**Mon 01/07/24**	**Fri 25/10/24**			**0%**
18		Module 2	10 days	Mon 01/07/24	Fri 12/07/24	16	Muaaz	0%
19		Module 3	10 days	Mon 15/07/24	Fri 26/07/24	16	Muaaz	0%
20		Module 6	10 days	Mon 01/07/24	Fri 12/07/24	16	Moiz	0%
21		Module 9	15 days	Mon 15/07/24	Fri 02/08/24	16	Ammar,Moiz	0%
22		Module 10	10 days	Mon 05/08/24	Fri 16/08/24	21	Ammar	0%
23		SRS + 30% Development	0 days	Mon 26/08/24	Mon 26/08/24		Ammar,Moiz,Muaaz	0%
24		Module 4	10 days	Mon 26/08/24	Fri 06/09/24	23	Muaaz	0%
25		Module 7	10 days	Mon 26/08/24	Fri 06/09/24	23	Moiz	0%
26		Module 8	15 days	Mon 09/09/24	Fri 27/09/24	23	Muaaz,Moiz	0%
27		Module 11	10 days	Mon 26/08/24	Fri 06/09/24	23	Ammar	0%
28		Module 12	15 days	Tue 20/08/24	Mon 09/09/24	27	Ammar	0%
29		SDS + 60% Development	0 days	Fri 04/10/24	Fri 04/10/24		Ammar,Moiz,Muaaz	0%
30		Module 5	15 days	Mon 07/10/24	Fri 25/10/24	29	Muaaz,Moiz	0%
31		Module 13	10 days	Mon 07/10/24	Fri 18/10/24	29	Ammar	0%
32		Development complete	0 days	Mon 21/10/2	Mon 21/10/24		Ammar,Moiz,Muaaz	0%
33		**Testing**	**12 days**	**Thu 07/11/24**	**Fri 22/11/24**	**32**		**0%**
34		Test Cases development	4 days	Thu 07/11/24	Tue 12/11/24	32	Moiz,Muaaz,Ammar	0%
35		Test modules	4 days	Wed 13/11/24	Mon 18/11/24	34	Ammar,Moiz,Muaaz	0%
36		Review test cases	3 days	Tue 19/11/24	Thu 21/11/24	35	Mrs Saira	0%
37		Complete Documentation + 100% Development	0 days	Fri 22/11/24	Fri 22/11/24	36	Ammar,Moiz,Muaaz	0%
38		Evaluation	1 day	Fri 22/11/24	Fri 22/11/24	37	FYP Comittee	0%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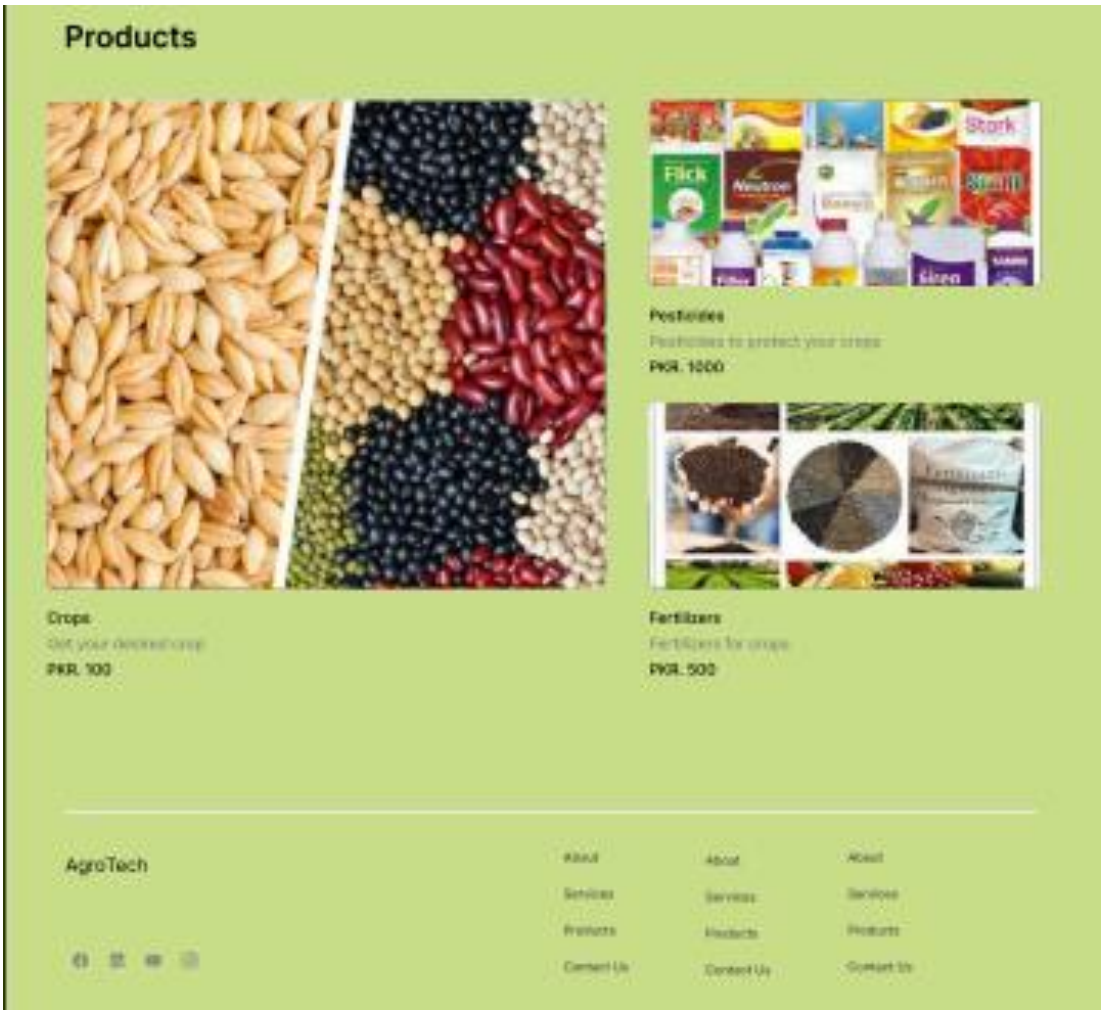
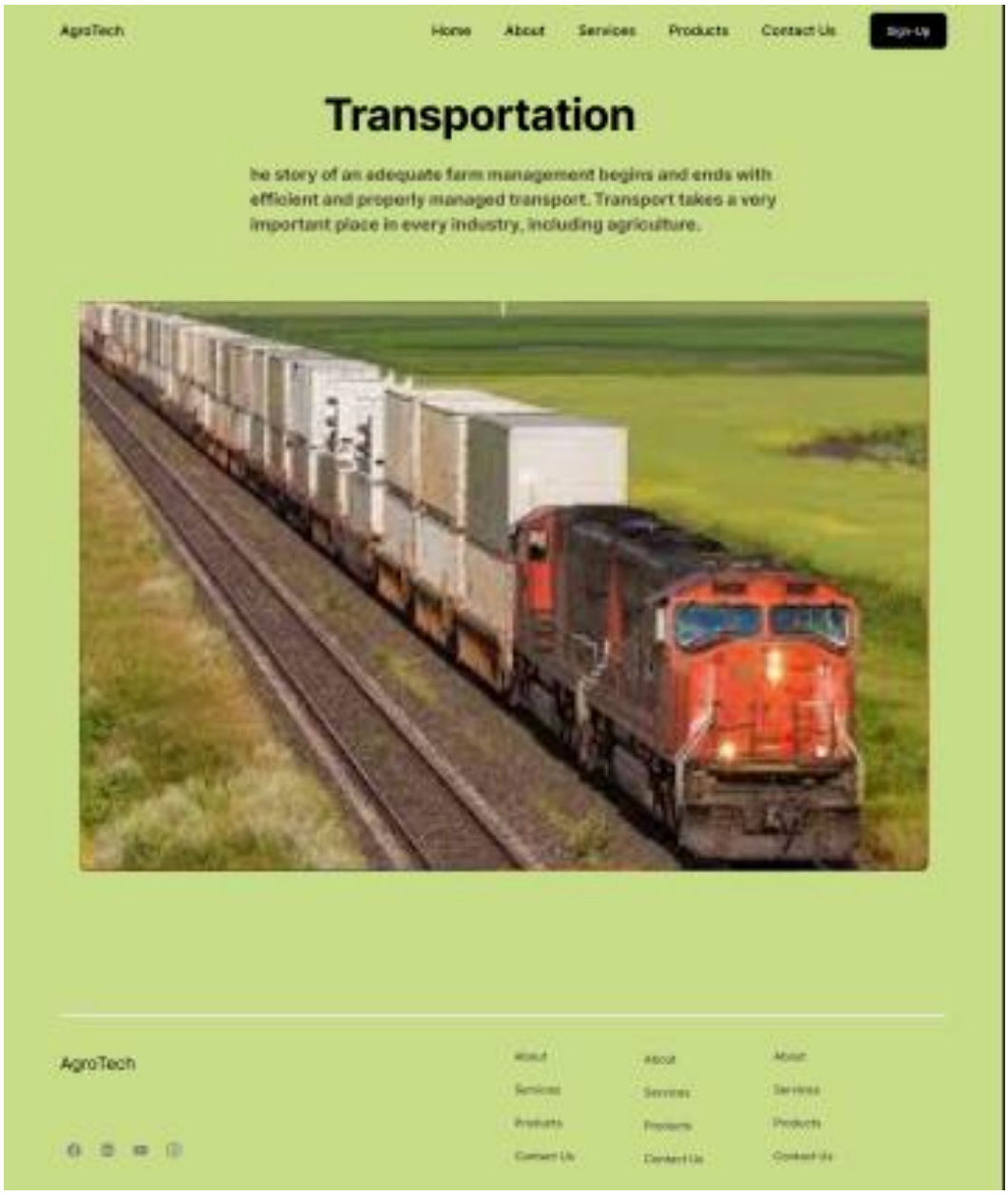
Ammar
Ammar
21/10
Moiz,Muaaz,Ammar
Ammar,Moiz,Muaaz
Mrs Saira
22/11
FYP Comittee

14. Mockups

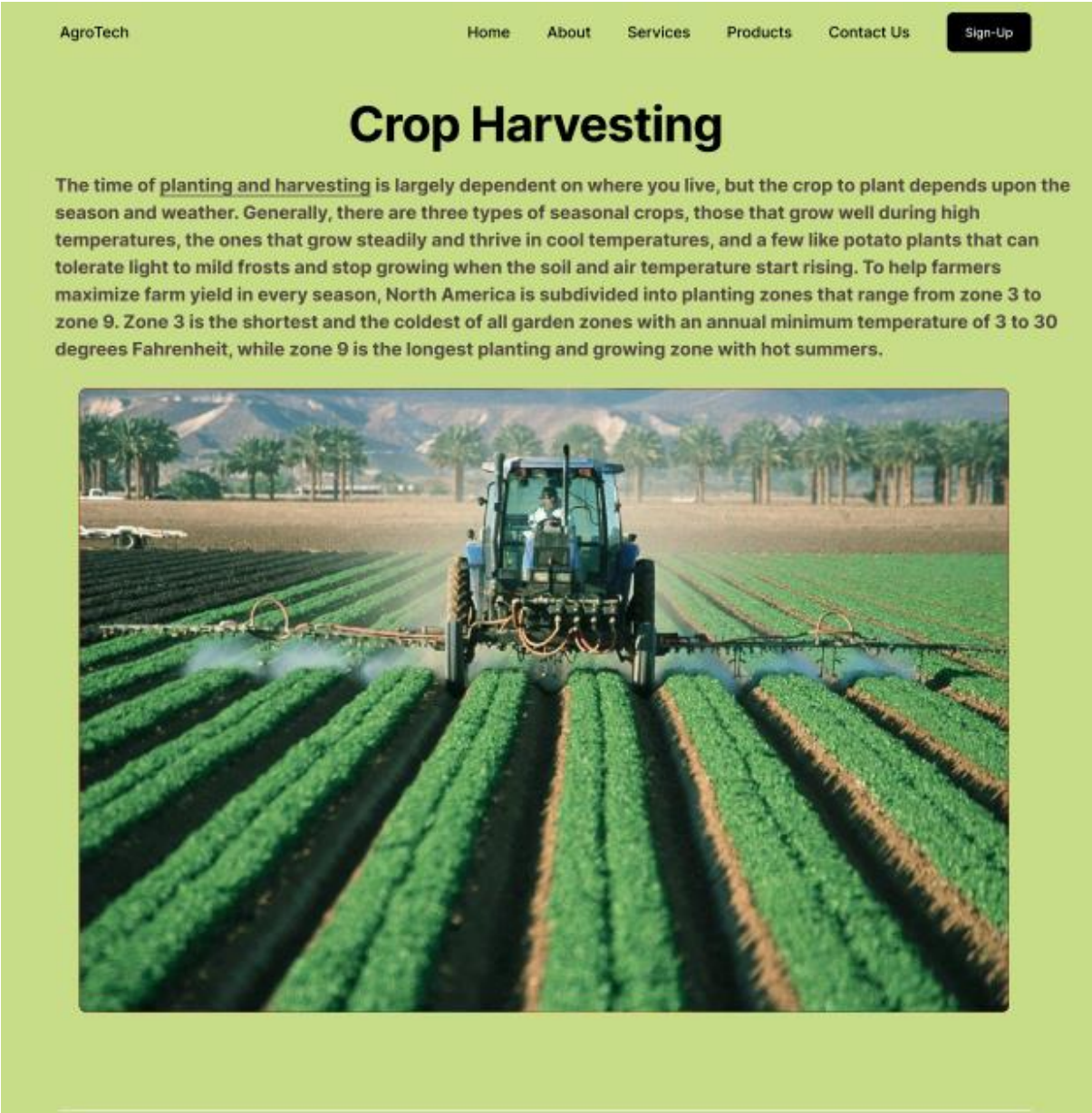
Mockup 1: Home Page



Mockup 2: Products



Mockup 3: Transportation



Mockup 4: Crop Harvesting

Mockup 5: Soil Analysis

15. References

Related Systems:

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16. Plagiarism Report