



AgroPredict

Empowering Agriculture through Innovative Solutions

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Problem Statement

As the world grapples with population growth, climate change, and the need to sustainably feed a burgeoning global population, small-scale farmers often find themselves hampered by outdated practices and a lack of access to advanced technologies. This results in inefficiencies, crop losses, and diminished livelihoods. Recognizing these challenges, AgroPredict emerges as a visionary solution, integrating cutting-edge technologies and expert consultation to transform agriculture into a sustainable and technologically advanced future, thereby improving food sustainability and precision agro-technology practices.

Overview

AgroPredict is more than a web application; it embodies a revolutionary approach to agriculture. By leveraging machine learning and deep learning algorithms, it empowers farmers with unprecedented insights, expert consultation, and sustainable practices. In doing so, AgroPredict not only addresses immediate pain points but also positions agriculture as the lynchpin of a future where technology and tradition harmoniously coexist, thereby improving food sustainability and precision agro-technology practices.

Key Features of AgroPredict

1. Precision Crop Selection

AgroPredict harnesses machine learning algorithms to provide meticulous recommendations for crop selection. By analyzing intricate details of soil properties such as composition, nutrient levels, and climatic conditions, the platform empowers farmers to make decisions that maximize productivity while minimizing environmental impact.

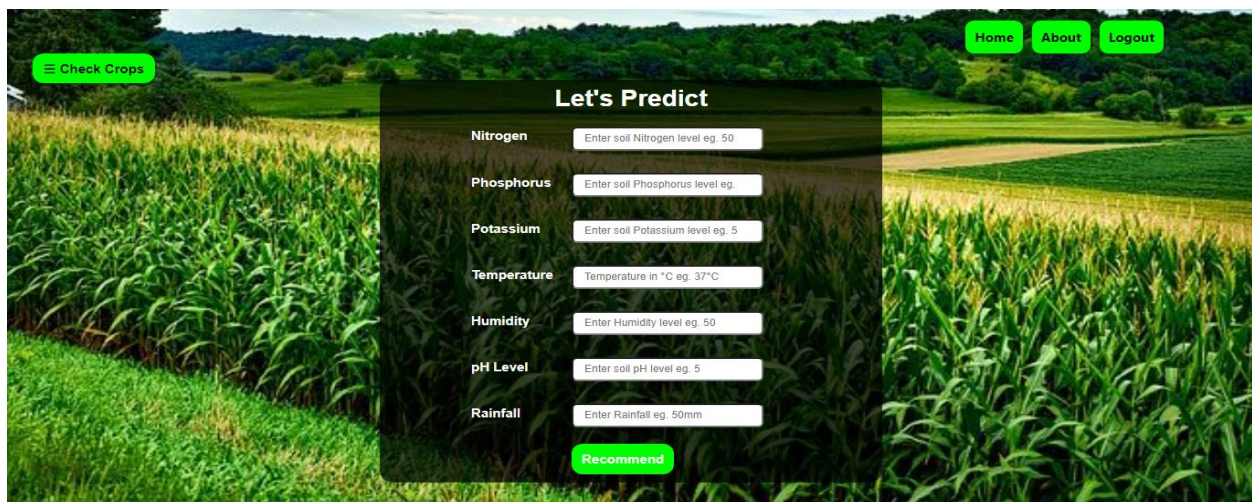


Fig. 1 Predict Crop Interface

Crop Descriptions

AgroPredict doesn't just stop at providing recommendations; it goes a step further by offering detailed descriptions of different crops. This feature enriches farmers with valuable information about various crops, including growth patterns, ideal conditions, and potential challenges. By enhancing crop knowledge, AgroPredict ensures that farmers are equipped to make informed decisions about their agricultural practices.



Fig. 1.1 Specific Crop Description Interface

2. Early Disease Detection

Deep learning algorithms power AgroPredict's ability to facilitate early disease detection through the analysis of plant leaves. This proactive stance enables farmers to implement timely interventions, reducing reliance on chemical treatments and embracing sustainable farming practices.

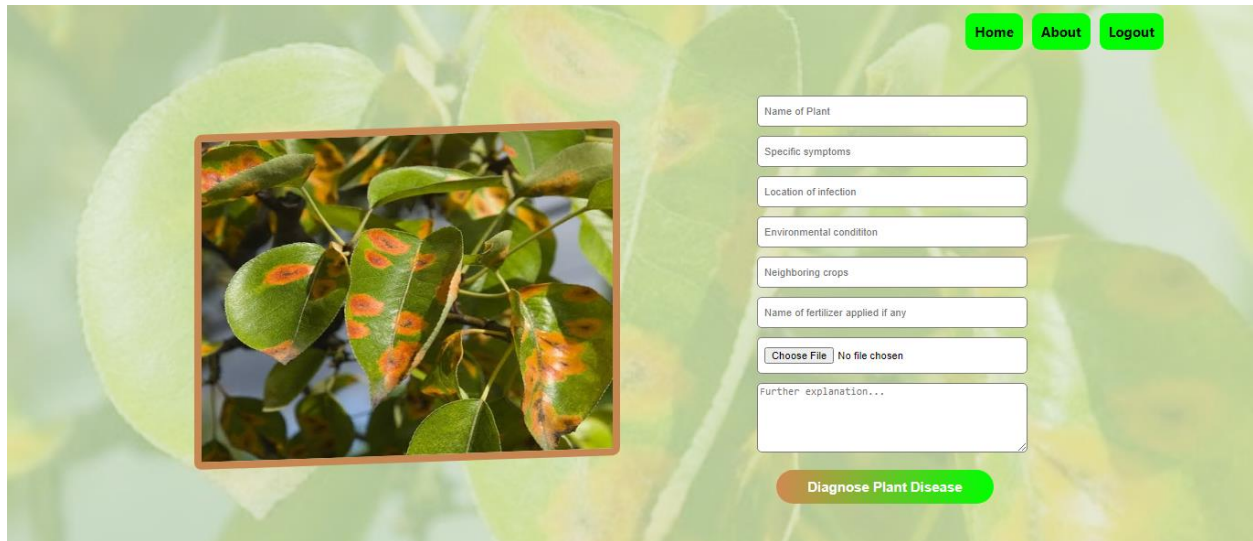
The interface for predicting crop disease features a green background with a large, semi-transparent image of a plant leaf showing brown spots. On the left, there is a smaller inset image of a leaf with similar spots. On the right, there is a form with the following fields: 'Name of Plant', 'Specific symptoms', 'Location of infection', 'Environmental condition', 'Neighboring crops', 'Name of fertilizer applied if any', a file upload button labeled 'Choose File' with the text 'No file chosen' next to it, and a text area for 'Further explanation...'. At the top right are three green buttons: 'Home', 'About', and 'Logout'. At the bottom right is a green button labeled 'Diagnose Plant Disease'.

Fig. 2 Predict Crop Disease Interface

3. Tailored Fertilizer Recommendations

AgroPredict eliminates guesswork by providing personalized fertilizer recommendations. Real-time environmental factors and crop-specific needs are considered, ensuring optimal nutrient utilization and fostering long-term soil health.

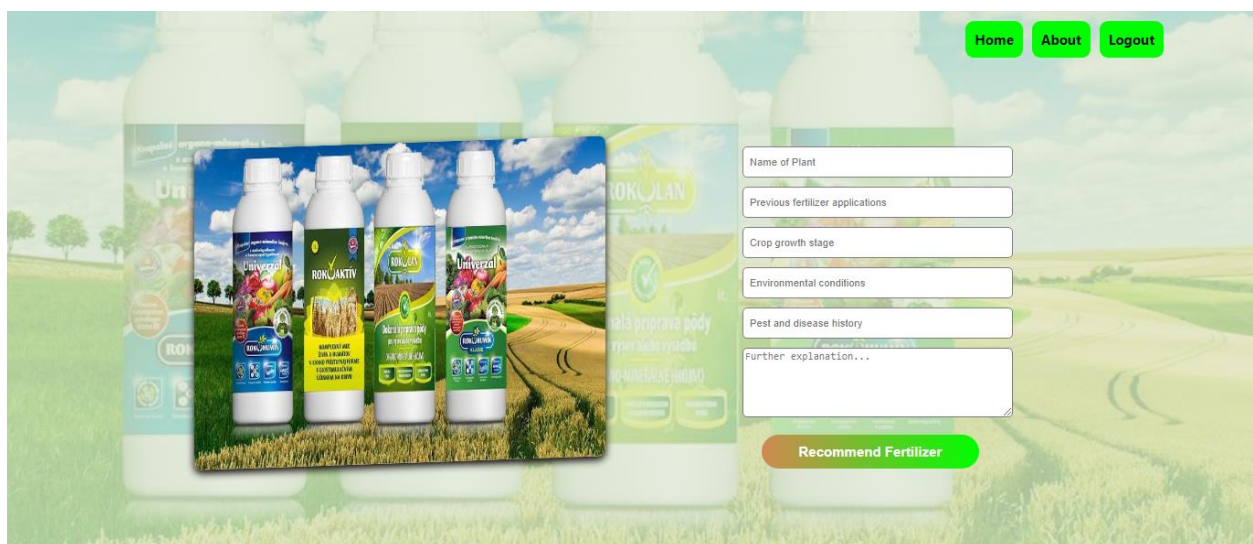
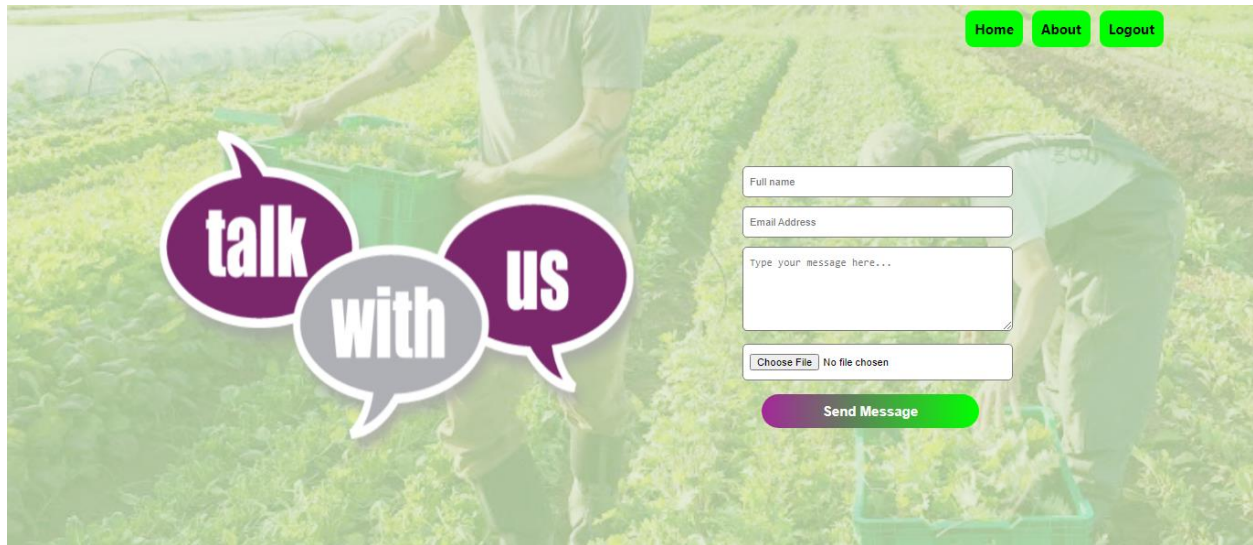
The interface for recommending fertilizer features a green background with a large, semi-transparent image of a field. On the left, there is a smaller inset image showing four bottles of fertilizer. On the right, there is a form with the following fields: 'Name of Plant', 'Previous fertilizer applications', 'Crop growth stage', 'Environmental conditions', 'Pest and disease history', and a text area for 'Further explanation...'. At the top right are three green buttons: 'Home', 'About', and 'Logout'. At the bottom right is a green button labeled 'Recommend Fertilizer'.

Fig. 3 Recommend Fertilizer Interface

4. Expert Consultation Anytime, Anywhere

Connectivity with agricultural specialists is at the heart of AgroPredict's commitment to farmer empowerment. An integrated chat feature facilitates seamless advice-seeking, knowledge-sharing, and professional guidance, transforming individual farmers into contributors to a collective agricultural intelligence.



Home About Logout

talk with us

Full name

Email Address

Type your message here...

Choose File No file chosen

Send Message

Fig. 4 Chat with us Interface

Technologies Used

1. HTML, CSS, JavaScript

The frontend is crafted using these standard web development technologies to ensure an intuitive and user-friendly interface.

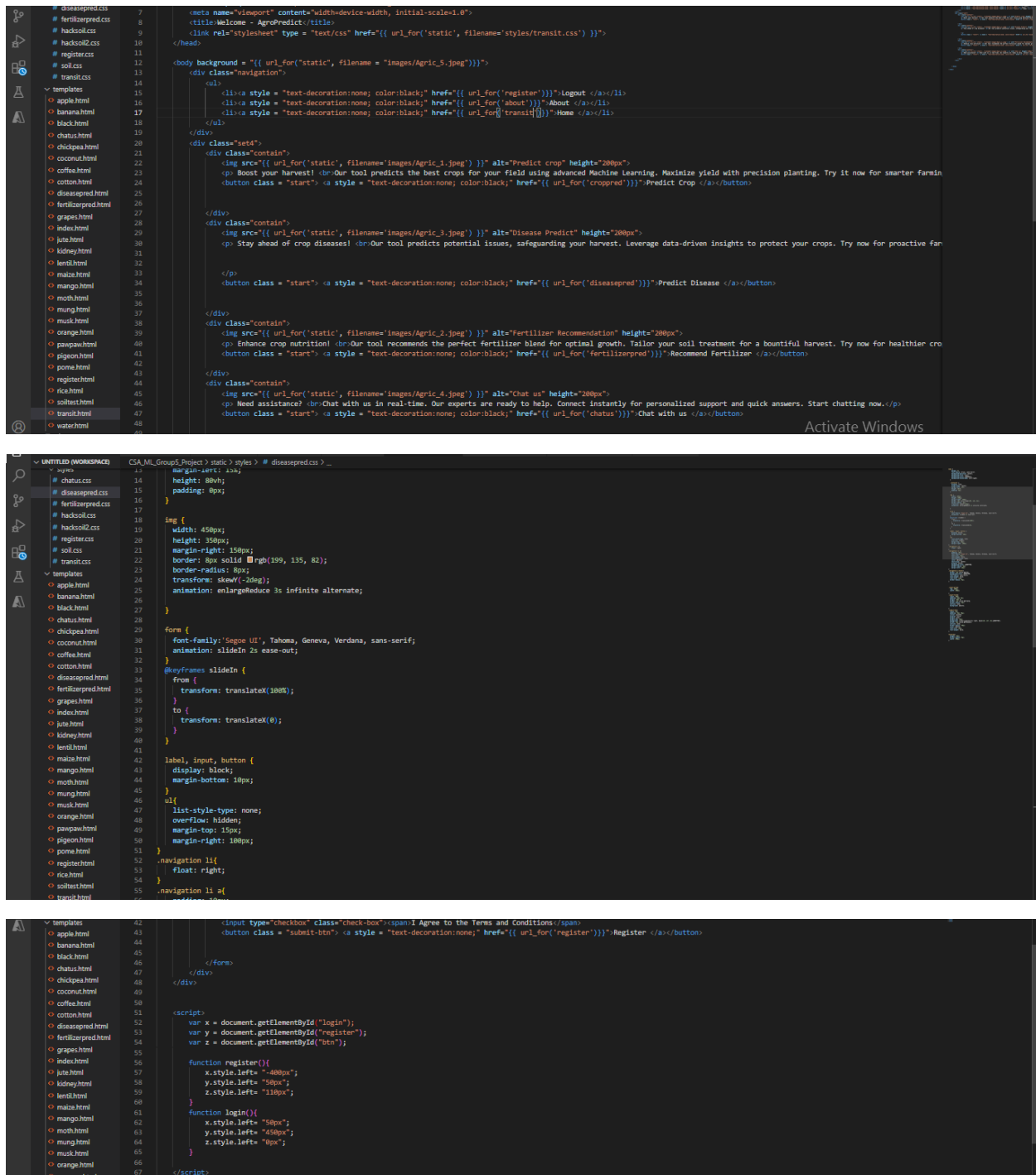


Fig. 5 HTML, CSS and JavaScript Code snippet

2. Flask

The backend of AgroPredict is powered by Flask, a lightweight and flexible Python web framework. Flask enables seamless integration between the frontend and the machine learning algorithms.

```
File Edit Format Run Options Window Help
# Import the libraries
import numpy as np
from flask import Flask, request, jsonify, render_template
import pickle

# Load the pickle model file
app = Flask(__name__)
model = pickle.load(open('model.pkl', 'rb'))

# Route the Homepage
@app.route('/')
def home():
    return render_template('index.html')

# Route the Soil Test webpage
@app.route('/test')
def test():
    return render_template('soiltest.html')

# Route the Prediction value via the form on the Soil Test webpage
@app.route('/predict', methods=['POST'])
def predict():
    int_features = [float(x) for x in request.form.values()]
    final_features = np.array(int_features)
    prediction = model.predict(final_features)

    output = prediction[0]

    return render_template('soiltest.html', prediction_text='The most suitable crop for planting on this piece of land is {}'.format(output))

# Route the rice data page
@app.route('/rice')
def rice():
    return render_template('rice.html')

# Route the maize page
@app.route('/maize')
def maize():
    return render_template('maize.html')

# Route the chickpea page
@app.route('/chickpea')
def chickpea():
    return render_template('chickpea.html')
```

Activate Windows
Go to PC settings to activate Windows.

Fig. 6 Flask Code snippet

3. Scikit-learn Library

This Python library is instrumental in implementing machine learning algorithms for crop selection, disease prediction, and fertilizer recommendations, ensuring accuracy and reliability in decision-making.

```
In [5]: 1 properties = df[["N", "P", "K", "temperature", "humidity", "ph", "rainfall"]]
        2 target = df["crop"]
        3
        4 from sklearn.model_selection import train_test_split
        5
        6 X_train, X_test, y_train, y_test = train_test_split(properties, target, test_size = 0.25, random_state = 2)
```

In []:

K Nearest Neighbour

```
In [6]: 1 from sklearn.neighbors import KNeighborsClassifier
        2
        3 accuracy_value = []
        4 k_value = list(range(1,51))
        5 for i in (k_value):
        6     knn = KNeighborsClassifier(n_neighbors=i)
        7     knn.fit(X_train,y_train)
        8     knn_predict = knn.predict(X_test)
        9     knn_accuracy = metrics.accuracy_score(y_test, knn_predict)
        10    accuracy_value.append(knn_accuracy)
```

Fig. 6 Machine Learning Code snippet

User Experience

AgroPredict's user-centric design transcends technological complexities, ensuring accessibility for farmers of all backgrounds. The platform's intuitive interface bridges the gap between traditional wisdom and modern innovation.

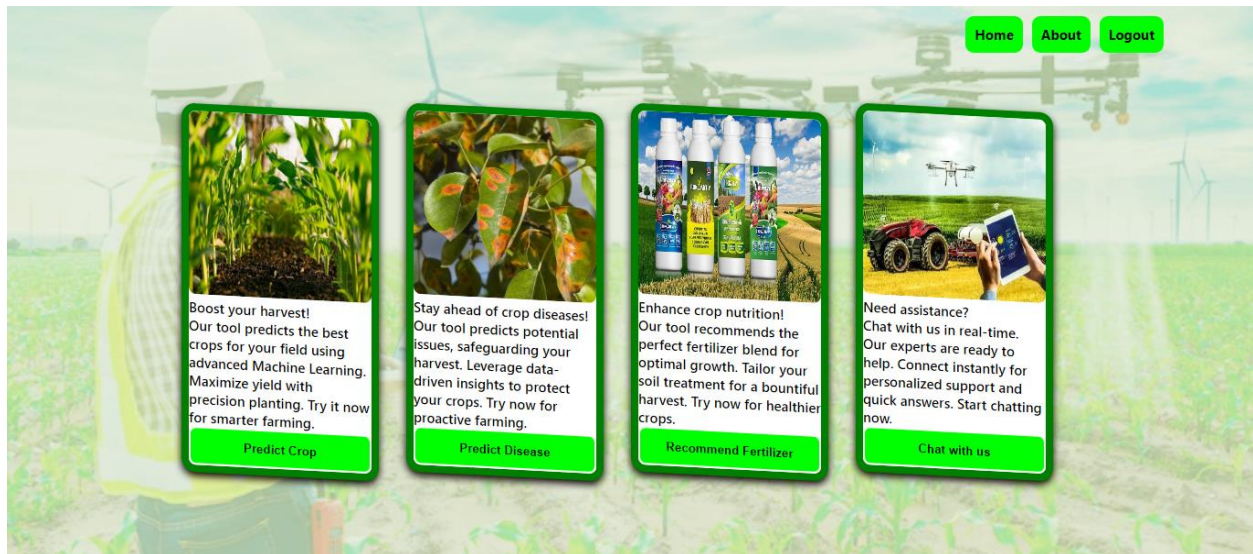


Fig. 5 Services Interface

Sustainability and SDG Alignment

SDG 2: Zero Hunger

AgroPredict actively contributes to SDG 2 by promoting precision agriculture, minimizing crop losses, and ensuring sustainable food production. The platform's features align with global efforts to eradicate hunger and create a resilient agricultural ecosystem.

SDG 9: Industry, Innovation, and Infrastructure

By integrating advanced technologies into agriculture, AgroPredict aligns with SDG 9, fostering innovation, improving agricultural infrastructure, and driving the industry towards a more efficient and sustainable future.

Agriculture: The Future of the World

Agriculture isn't just a sector; it's the future of the world. AgroPredict recognizes this profound truth and, in its essence, strives to empower farmers with tools and knowledge that transcend the present, cultivating a future where agriculture is not just productive but sustainable, resilient, and technology-driven.

Collaboration with Professional Agricultural Institutes

AgroPredict recognizes the importance of collaboration with esteemed agricultural institutes in Nigeria, such as NIHORT (National Horticultural Research Institute), IITA (International Institute of Tropical Agriculture), and CRIN (Cocoa Research Institute of Nigeria). We aim to liaise with these institutions for the regularization and standardization of our solution. By seeking the expertise and guidance of these institutes, AgroPredict aspires to align its practices with industry standards, ensuring that our solution not only meets but exceeds the expectations of the agricultural community in Nigeria.

Future Improvements of AgroPredict

1. Premium Consultation Services

AgroPredict envisions a premium version that offers dedicated agricultural consultants. These experts will provide personalized monitoring, strategic advice, and continuous support, creating a synergistic relationship that nurtures long-term growth and success for farmers.

2. Multilingual Support

To ensure inclusivity across diverse linguistic landscapes, AgroPredict plans to introduce multilingual support. This enhancement will break language barriers, making the platform accessible to farmers worldwide and fostering a global community of agricultural innovators.

3. Mobile Application

Recognizing the need for on-the-go access to critical insights, AgroPredict is committed to developing a mobile application. This initiative aims to empower farmers in remote areas, giving them real-time access to information and support, transforming their smartphones into powerful tools for agricultural progress.

4. Subscription Model

AgroPredict operates on a sustainable subscription model. After three trial uses, users are encouraged to subscribe for a yearly fee of \$10. This subscription not only unlocks the full potential of the platform but also supports ongoing advancements in agricultural technology, contributing to the shared goal of a sustainable and tech-driven future for global agriculture.