T-222

System for Farmers of India To Support the Farmers of India

Problem Statement: "There are around 9 crore farmer families in India and about 0.2% percent face problems all year round. Come up with a solution to help the farmers of India overcome their problems, grow and make ends meet"

Introduction: Our team believes we could help farmers of India by introducing them to the advancements in technology which will help them maximize their yield. There are many factors that impact crop yield from a slight change in pH or nutrients in the soil to improper farming practices that go unnoticed. Hence our interface is prepared to keep such conditions in track and suggest the farmer of the practices he/she must implement for the best yield.
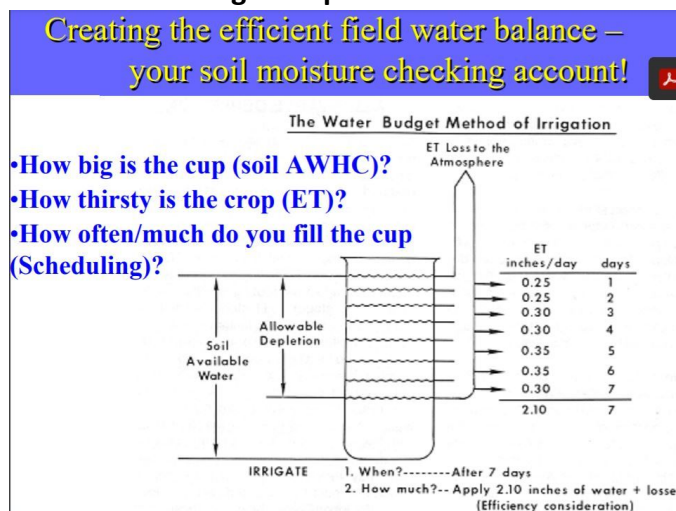
Abstract for solution:
The various methods to increase yield and how these can be implemented through the project are:-

1. Before planting crops, the farmer must know if the soil is ready for the crop. This can be inferred from the moisture content of the soil
2. The soil nutrient levels can be monitored and required measures informed to the farmer as a certain fertilizer
3. Farmer can be informed of modern methods of farming like crop rotation based on whether the soil is strong enough for the required crop. If not, farmer would be suggested to grow a crop which helps in nitrogen fixation
4. When the crop and amount of crop has been decided the interface calculates an estimated yield based on market prices. This information can in turn be used to invest accordingly
5. Along with this the sensor is used to gauge humidity and temperature of the soil at feasible intervals of time. This information can be used to activate sprinklers according to the requirements of the crop.
6. The interface will also include information about various hybrid seeds suitable for the soil and season based on collected information
7. Lastly, it includes any updates related to the agricultural sector and its development in India

STEP BY STEP APPROACH:

1. Get information on the moisture of the soil and check whether the soil has been pre-irrigated to the right amount. If the soil is still moist, inform the farmer to leave it overnight, if it's too dry activate sprinklers and check again after 2-3 hours. If conditions are perfect for sowing, start process to suggest crop selection

2. Test the soil for ammonium and nitrate levels. If these levels are found to be low, inform the user about crop rotation and its benefits and hence give them a choice of opting leguminous crops or continue with initial plans. If levels are good enough for any crop growth, continue to crop options

3. Use existing data and collect new data relating to the pH, soil type, climatic conditions, common nutrients and their amounts present in the soil. Process this data and compare it to find best suited crops. List out these crops along with prices for the farmer to choose from.

4. Reference on what types of crops to grow based on various conditions: Baboo, Prem. (2016). Re: How to determine the kinds of crops suitable to different types of soil?. Retrieved from: https://www.researchgate.net/post/How_to_determine_the_kinds_of_crops_suitable_to_different_types_of_soil/56cfcefe7c19208d3c8b4569/citation/download

5. Application includes an interface to contact other seed farmers in the region and buy reviewed good quality form such farmers. After deciding and buying, farmer is informed to sow and date of sowing stored for later use

6. Reference for growth stage of crop: https://projectblue.blob.core.windows.net/media/Default/Imported%20Publication%20Docs/Wheat%20growth%20guide.pdf

7. Reference for irrigation patterns:

http://sfp.ucdavis.edu/pubs/Family_Farm_Series/Veg/Irrigating/

8. Inferring data front the above links and existing farmland data, the following processes are done
    *   intervals of time set to test water levels and irrigate when required
    *   estimate and inform the farmer on nutrients required as fertilizer from data and knowing growth stages since most consumption and requirement in peak stage

9. Crop yield can be calculated using the following formula

$$Yield = \frac{\dot{m} * \frac{tonne}{1,000kg} * \frac{3600s}{hr}}{w * v * \frac{1000m}{km} * \frac{ha}{10,000m^2}}$$

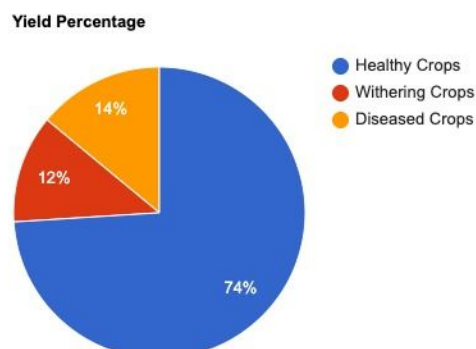| Variable	SI Units	Imperial	Description
$\dot{m}$	kg/s	lbs/s	Grain Mass Flow
v	$\frac{kilometer}{hr}$	$\frac{mile}{hr}$	Harvester Velocity
w	m	ft	Head width
Yield	$\frac{tonne}{ha}$	$\frac{bu}{acre}$	Grain yield as most commonly reported

This data can be further measured accurately by using Satellite Imaging, Peak growth prediction and Image recognition for withering.
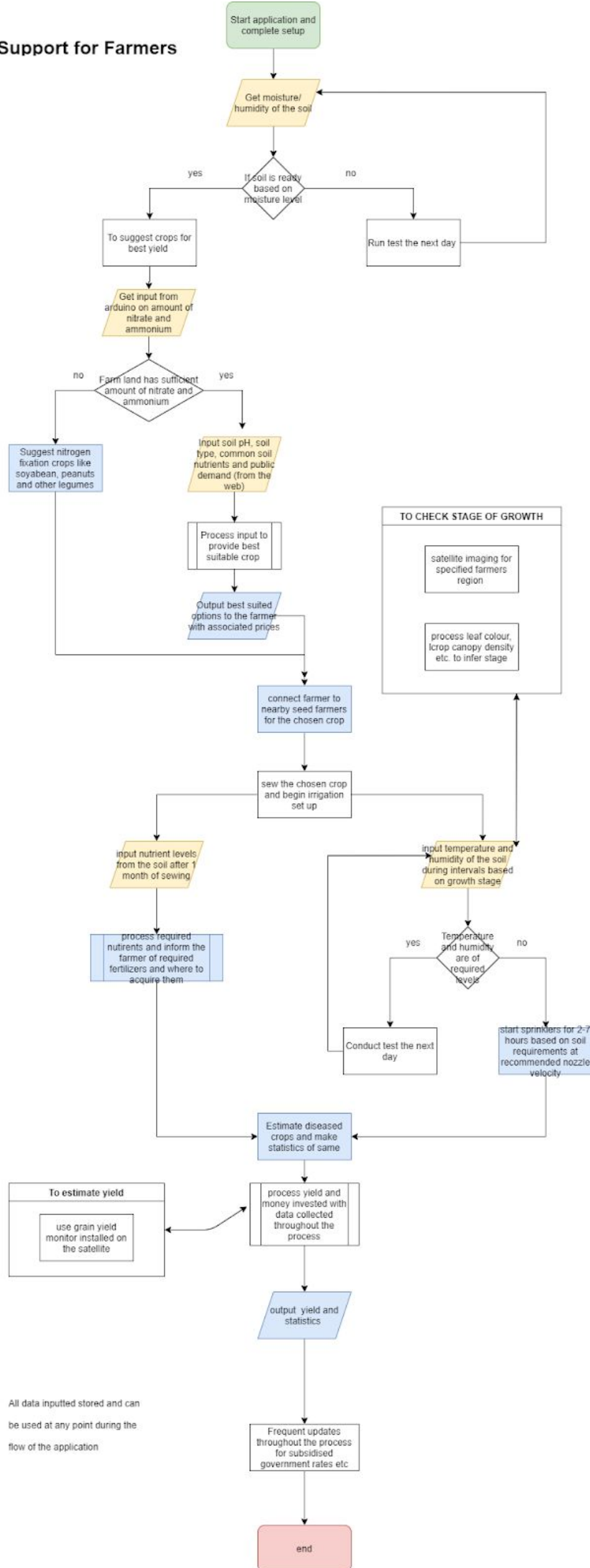
10. **Satellite Imaging:**Satellite Imaging can be used to generate 'Yield Maps'. Yield maps are used in management decisions such as fertilizer application rates and seeding population rates in support of site specific farming and can help in making decisions on best management practices in terms of comparing crop varieties, fertilizer types and application rates, and pesticide application. And hence, can help a farmer to make informed decisions of his crops and farm land.
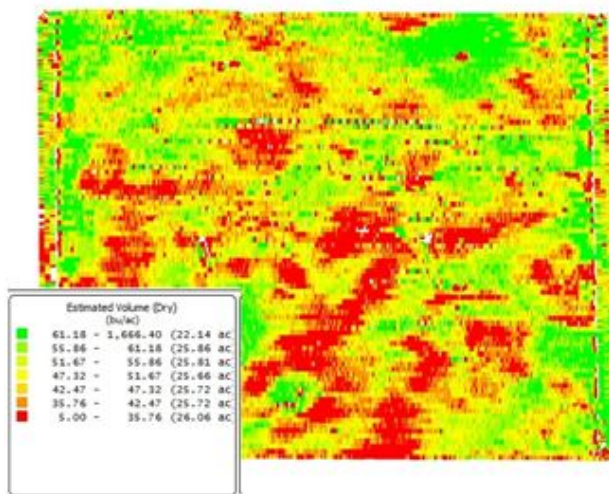
11. **Peak Growth:**Using the data from Arduino, the peak growth of the plant can be calculated, that is, the time when the growth of the crop is taking place at the fastest rate. This information is useful, since it is the best time to add fertilizers to the crops(based on the soil composition) increasing the overall yield. This can be used in addition with satellite imagery as the farmer can compare his land with other farm lands.

12. **Image recognition for withering:**Cameras around the fields can be used to track the plants that are diseased or are withering. This information can be used to analyze the yield of the crops.

Support for Farmers

Start application and complete setup

Get moisture/ humidity of the soil

If soil is ready based on moisture level
- yes → To suggest crops for best yield
- no → Run test the next day

Get input from arduino on amount of nitrate and ammonium

Farm land has sufficient amount of nitrate and ammonium
- no → Suggest nitrogen fixation crops like soyabean, peanuts and other legumes
- yes → Input soil pH, soil type, common soil nutrients and public demand (from the web)

Process input to provide best suitable crop

Output best suited options to the farmer with associated prices

TO CHECK STAGE OF GROWTH

satellite imaging for specified farmers region

process leaf colour, lcrop canopy density etc. to infer stage

connect farmer to nearby seed farmers for the chosen crop

sew the chosen crop and begin irrigation set up

input nutrient levels from the soil after 1 month of sewing

input temperature and humidity of the soil during intervals based on growth stage

process required nutirents and inform the farmer of required fertilizers and where to acquire them

Temperature and humidity are of required levels
- yes → Conduct test the next day
- no → start sprinklers for 2-7 hours based on soil requirements at recommended nozzle velocity

Estimate diseased crops and make statistics of same

To estimate yield

use grain yield monitor installed on the satellite

process yield and money invested with data collected throughout the process

output yield and statistics

All data inputted stored and can be used at any point during the flow of the application

Frequent updates throughout the process for subsidised government rates etc

end

Trello