Online Plant Analysis

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Abstract— Our Thesis paper is on "Online Plant Analysis" determines essential nutrient concentrations in sampled plant tissues. It complements a proven soil testing plan and helps identify ways to use nutrients more efficiently. Unseen nutrient imbalances or toxicities can be identified, as well. It also measures the efficacy of fertilization and nutrient programs, as well as the levels of nutrients such as, copper, iron, sulfur and others not observed in routine soil tests. Plant nutrient levels vary depending on the stage of maturity, the part(s) sampled, hybrid or variety and environmental conditions. Sampling earlier in the season identifies deficiencies in time to make corrective nutrient applications, if needed, to help reach yield goals and manage economic risks. In addition, plant tissue analysis is a proven diagnostic tool to help compare nutritional variances between normal and abnormal sections of fields. No matter the crop, plant tissue analysis is worthwhile to help determine nutrient needs. As crop values continue to rise, tools such as this and soil sampling are essential to fiscal and yield success. Balancing conservation practices, input use, and tillage to achieve optimum yield and plant nutrition are approached using a holistic point of view. The aim of the project is to facilitate user around the globe to provide method to test nutrient in the plant by analyzing plants leaf. This website concentrates on the plant health. This website allows user to measure the nutritional requirements of a plant, based on the color, texture, climate, soil etc. of the particular plant. It will guide user how to maintain the nutritional balance in the soil for optimal plant growth & high yields. Also this website can be modified and upgraded in better way for future use where people can use this software as an advanced guide to their farm, garden & vegetative production. Knowledge of nutrient concentration in growing plants can serve as a tool for correcting any deficiencies where carried out early enough to safeguard yield. The nutrient uptake by a healthy crop, which has attained its growth and yield potential, is taken as the effective requirement for the crop.

Key words: Web Application, Nutrient, Agile SDLC, Iterative

I. INTRODUCTION

This web application will help agricultural fields to analyze and advise on the plant's health. This website allows user to measure the nutritional requirements of a plant, based on the color, texture, climate, soil etc. of the particular plant. It will guide how to maintain the nutritional balance in the soil for optimal plant growth & high yields. Good crop production is directly tied to maintaining the optimum balance of key nutrients. For irrigated crops, plant analysis can be used as an aid in making decisions about nutrient applications such as nitrogen and some micronutrients. Plant analysis is a good way to confirm that your fertility management plan is working. Plant analysis can be used to evaluate new fertilizer placement and timing techniques. The information collected can then be used to make necessary adjustments to your fertility plans. This type of plant analysis includes all forms of each nutrient found in plant tissue.

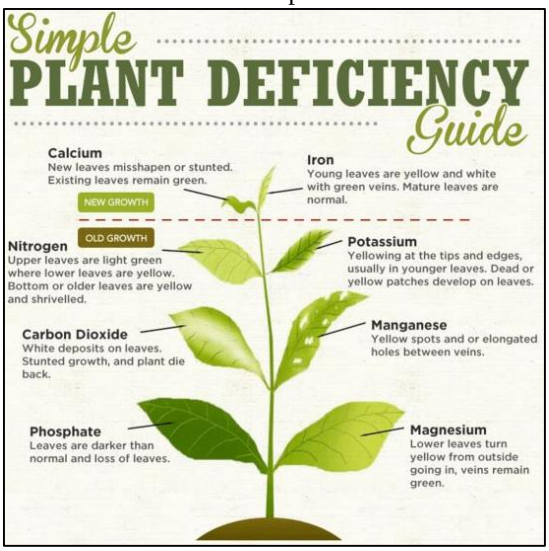

Fig. 1: Plant Deficiency

In this website plant analysis is conducted in order to determine the total nutrient uptake for plant to be meaningful as a diagnostic tool, the collection of particular plant parts (tissue) at the right stage of growth for analysis is very important. Plant leaves are considered the focus of physiological activities. The concentrations of leaf nutrients appear to reflect changes in mineral nutrition. The interpretation of plant analysis data is usually based on the total concentrations of nutrients in the dry matter of leaves so that right action fertilizers etc. can be used to save / maximize the agricultural yield.

II. EXISTING SYSTEM

At present at most of the places the existing system is manual system. It contains collecting samples of leafs of various plants and then at laboratory do chemical process on it and view results under microscope to make noting on papers then do comparison actuals with ideal result and then arrive at conclusions.

A. Drawbacks of the Existing System

- The manual work is not user friendly.
- It is highly complex to maintain.
- Chances for the occurrences of the error are more.
- Retrieving the record is more difficult and also consumes more time.
- Results are not accurate,
- Chances for frequent data loss.

B. Proposed System

In our web application whole plant analysis is conducted with leaf images in order to determine the total nutrient uptake. For plant analysis to be meaningful as a diagnostic tool, the collection of particular plant parts (tissue) at the right stage of growth for analysis is very important. Plant

leaves are considered the focus of physiological activities. The concentrations of leaf nutrients appear to reflect changes in mineral nutrition. The interpretation of plant analysis data is usually based on the total concentrations of nutrients in the dry matter of leaves or other suitable plant parts compared with standard values of "critical nutrient concentrations" ("critical values"). Between the nutrient concentrations of the deficiency range and those of adequate supply, there is the critical nutrient range. The critical level is that level of concentration of a nutrient in the plant that is likely to result in 90 percent of the maximum yields.

The leaf tests showed several things quite clearly-

- Normal P and K levels in plant,
- Very deficient Ca and Mg levels despite apparently adequate levels on the CEC.
- Very over-range iron, Sulphur, and manganese levels.

This result then clearly illustrates an interaction between different nutrients, an interaction with physical conditions, and the deficiencies of many feeding programs. The main advantage of critical values, once properly established, is their wide applicability for the same crop. Their disadvantage is that they only provide "yes or no" type of information and do not cover the entire range over which nutrient supplies need to be managed.

Foliage analysis can be a powerful tool, and, unless more is done we never will build up the necessary understanding of the data. The difficulty and strength of foliage analysis is best illustrated by Table 1.1. It is a list of typical ranges for plant nutrients in the young foliage of turf grasses. It has been generalized across a number of species. Typical Ranges of Plant Nutrients young leafs of Turf grasses.

Element	% contain / gm
Nitrogen N	2.0-4.5 %
Phosphorus P	0.2-0.5 %
Potassium K	2.0-4.0 %
Calcium Ca	0.5-2.0 5 %
Magnesium Mg	0.1-0.5 %
Sulphur S	0.2-1.0 %
Iron Fe	100-500 gm
Manganese Mn	30-100 gm
Zinc	40-100 gm
Copper Cu	5-50 gm
Boron B	5-50 gm
Molybdenum	1-4 gm

Table 1: Element

- Activity Flow: Operations in our projects are as follows,

1) Login: This module allows the registered user to login into the account & use all the features of the system.
2) Analysis: This module is only for registered users, the user can either upload the image form a file or click the picture of the plant leaf from the web camera and analyze plant based on physical appearance, color & find the deficiency in the plant.
3) Payment: This module allows payment of the analysis done. The user has to pay the analysis fee which is done through this module.
4) Report Generation: This generates the report of the analysis & displays the deficiency & tips to overcome those deficiencies of that particular plant.
5) Enquiry: This module helps the user to ask any query related to plant report & its deficiencies & other facilities provided by the system.
6) Feedback: This module allows user to share their experiences & share their views & suggestions for the improvement of the system.

III. LIMITATIONS

Following area need to be taken care of while getting leaf of plants,

- All excessive dust should be shaken or brushed off the plant sample. Excessive dust on the plant sample will result in high iron test levels due to the high iron content of the dust.
- Ventilated sample bags prevent the plant sample from deteriorating while carrying from distant farm.
- If image of samples cannot be sent immediately, place them in a refrigerator to avoid sample deterioration from occurring.

IV. METHODOLOGY

We have used Agile SDLC model for our project which is a combination of iterative and incremental process models with focus on process adaptability and customer satisfaction by rapid delivery of working software product. Agile Methods break the product into small incremental builds. These builds are provided in iterations. Each iteration typically lasts from about one to three weeks. Every iteration involves cross functional teams working simultaneously on various areas like planning, requirements analysis, design, coding, unit testing, and acceptance testing.

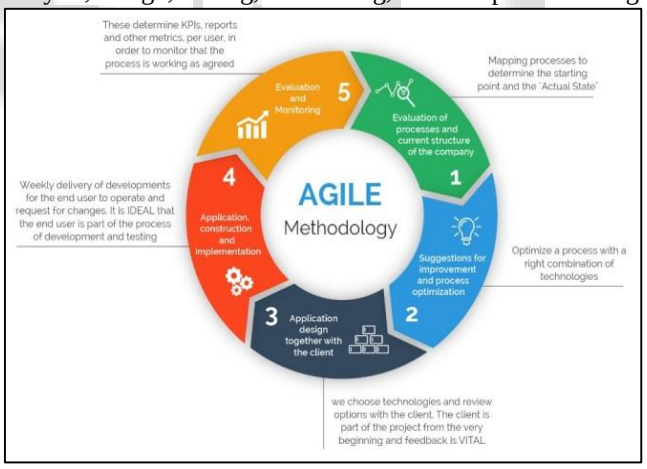

Fig. 1: Methodology

We have followed the Agile Manifesto principles for our project,

- Individuals and interactions - in agile development, self-organization and motivation are important, as are interactions like co-location and pair programming.
- Working software - Demo working software is considered the best means of communication with the customer to understand their requirement, instead of just depending on documentation.
- Customer collaboration - As the requirements cannot be gathered completely in the beginning of the project due to various factors, continuous farmers/ customer interaction is very important to get proper product requirements.

- Responding to change - agile development is focused on quick responses to change and continuous development.

V. CONCLUSION

In our project through testing and analysis module we have successfully recognized deficiencies in the plants. Nutrient deficiencies and toxicities cause crop health and productivity to decrease and may result in the appearance of unusual visual symptoms. Understanding each essential nutrient's role and mobility in the plant can help determine which nutrient is responsible for a deficiency or toxicity symptom. General deficiency symptoms include stunted growth, chlorosis, intervene chlorosis, purple or red discoloration and necrosis. Deficiencies of mobile nutrients first appear in older, lower leaves, whereas deficiencies of immobile nutrients will occur in younger, upper leaves.

Nutrient toxicity is most often the result of over application, with symptoms including abnormal growth (excessive or stunted), chlorosis, leaf discoloration and necrotic spotting. When in excess, many nutrients will inhibit the uptake of other nutrients, thus potentially causing deficiency symptoms to occur as well. As a diagnostic tool, visual observation can be limited by various factors, including hidden hunger and pseudo deficiencies, and soil or plant testing will be required to verify nutrient stress. Nonetheless, the evaluation of visual symptoms in the field is an inexpensive and quick method for detecting potential nutrient deficiencies or toxicities in crops, and learning to identify symptoms and their causes is an important skill for managing and correcting soil fertility and crop production problems. We hope our web application have given helping hand to farmers at far distant to easily sent images of leafs or plant and get analytical report about deficiency in their crop and take corrective action to obtain maximum yield.

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