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Soil Scientist- Soil and Seed Analyzer

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Abstract:

Agriculture is an important source of livelihood. The rising agricultural surplus is caused by increasing and improving agricultural production and productivity which tends to improve the public welfare, specifically in rural areas. Country like India, Agriculture is the backbone of the developing nation, the productivity and yield profit has impact on the financial development. Agriculture sector in India records for 18% of India's Gross Domestic Product (GDP) and provides employment to 50% of the country's workforce. India is the world's largest producer of pulses, rice, wheat, spices and spice product. Since the Indian Agriculture is plagued by several problems. The major problem is the SELECTION OF SEEDS that suits the soil considering the soil parameters such as pH value and type. Though the technologies available in the market help the farmer to test the soil parameters and the seed quality, selecting the appropriate seed is still a problem

Farmers face a severe problem on selecting a crop based on the soil and seed aspect.so we suggest a solution for this problem. By selecting the right crop for the given soil conditions and climate, one can optimize yields and save requirements for irrigation. Without testing the seeds and directly cultivating may leads to the crop failure. To overcome this, we must test the seed quality. The quality of good seed is based on the germination (high percentage of normal seedlings) and vigourness. A single device that helps the farmer by measuring the soil parameters using IoT technology and suggesting the crop that suits the soil and also calculate the germination of the seed. This helps to increase the productivity rate.

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II.WORKING PROCEDURE

The soil parameters can be categorized as physical, chemical and microbiological. The physical parameters are texture, structure, permeability etc., the chemical parameters are pH, Salinity(EC), cation exchange capacity etc., the microbial parameters are soil resporation, enzyme activities etc., these parameters are measured using electrochemical sensors. A procedure intended to establish the quality, performance, or reliability in soil testing for formulated fertilization is to estimate the quality of soil nutrients, followed by recommendation of nutrient needs and site –specific fertilization. Conventional soil NPK testing methods comprises of three steps: soil sampling, sample pretreatment and chemical analysis. The actual measurement of NPK is carried out by electrochemical methods An electrochemical sensors serves this purpose. It is made up of an ion discriminating membrane, which specifically reacts to a target ion, and a transducer that changes the reactions into detectable electrical signals. CW/FET category of electrochemical sensors holds a platinum wire coated with PVC that acts as the membrane matrix and it uses the cationic glass electrode (CGE) and the valinomycin-based selective electrode(VKE) for detection of exchangeable potassium in extracts from the soils.

Germination is the action by which an organism changes physically from a seed. Germination rate is an estimate of the viability of a population of seeds . The germination rate can be measured as the count of pre live seed.

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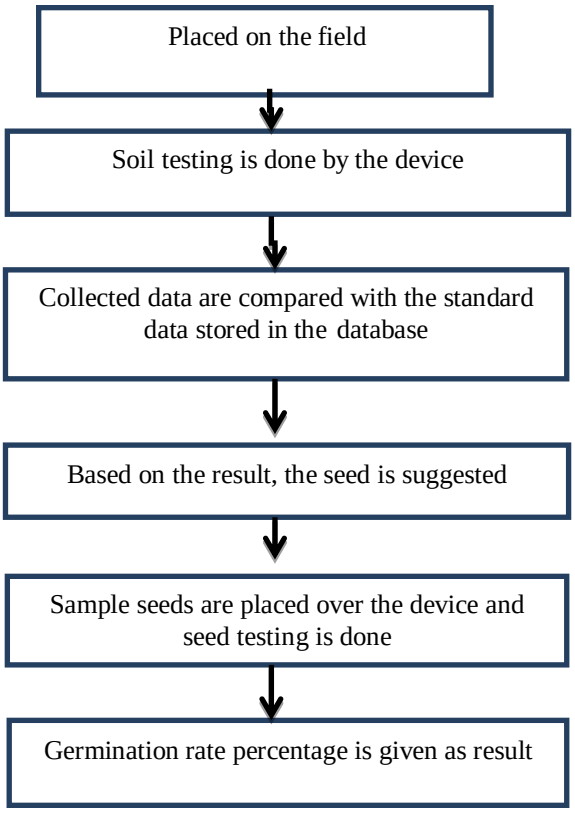
B.FLOW CHART:



The flow chart provides the clear vision about the project. The device when placed in the field, starts collecting the data from the soil .The device suggest a crop based on the data obtained. When the sample seeds are placed on the device, the germinating rate of the seed is predicted.

C. DESCRIPTION: The nutrients of various types of crops are listed below. Each type of crop suits different type of soil and its parameters

Kind of seed	%carbo-hydrate	% lipids	% protein
Wheat	67	2	13
Bean	56	1	23
Corn	62	5	1
Oat	66	5	12
Pea	40	2	20
Peanut	23	45	25
Barley	76	2	9

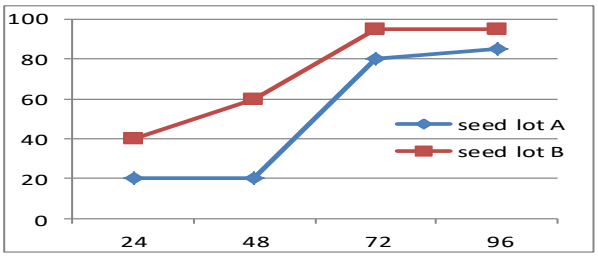
The nutrient level of the soil plays a vital role in producing a healthy crop. The soil parameters are tested and the productivity of the crop in that soil is determined.

The soil test is done and the parameters are measured using the electrochemical sensors. The different crops require different range of nutrients and the water. The data collected from the field by our device is compared with the standard values stored in the database and the result is displayed as suggestion.

The germination rate of the seeds is one of the important criteria for better productivity of the crops. To determine whether the seed can germinate or not is by calculating the pure live seed ratio. The pure live seed (PLS) percentage point out the respective germination utility of seed and replicates germination rate as well as purity. The PLS grade is computed by increasing the purity rate by the germination proportion, where both values are expressed as decimals. For example, seed with 98 percent purity and 80 percent germination rate has a pure live seed rating of:

98(purity) * .80(germination) = .78 pure live seed

The purity is the percentage of seed by weight that is labeled species. An absolute usable seed is the percentage of seed which will germinate (germination and dormant). By multiplying these two elements together, one can decide the percentage of materials that is actually pure live seed versus the percentage of materials that is essentially worthless.



X-axis indicates the number of seeds in a slot
Y-axis indicates the time in hrs.

Fig 1.1 Speed of germination under favourable condition

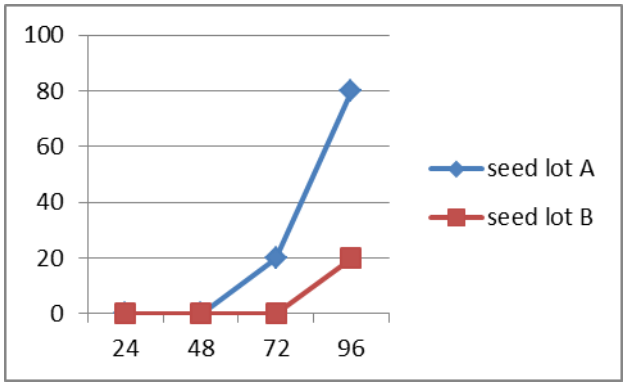


Fig 1.2 Speed of germination under unfavourable conditions

D.WORKING:

Emerging Internet of Things (IOT) can be used to collect vast amount of environmental and crop performance data ranging from time series data from sensors(Spatial Data) to human observation collected and recorded via mobile smart phone applications. The determined soil parameters is compared with the studied soil comparison(cloud database) also the determined seed parameters is compared with the studied seed comparison(cloud database). To test the soil quality, the pH sensor and Electrochemical sensors are integrated in the device. The pH sensor sense the pH value of the soil and the Electrochemical sensor sense the numeric value [NPK].The collected data are stored in a database [cloud] IoT Technology.The database is compared with existing standard data of the soil that matches the seed. The result from these procedures, gives as suggestion to the farmer and he buys the sample of seeds based upon the suggestion. When the seeds are placed on the seedbed,it will display the germination rate & vigourousness

A SINGLE DEVICE is used to test the quality of the soil and the germinating rate of the seed leading to improvement in crop yield and helps the farmer to work independently. This device can be easily handled by the farmer. The accuracy given by the device can be much more beneficial to the farmer. Another advantage of this model is, it mainly saves time. This makes them efficient for them than using traditional methods.

E.DEVELOPMENT OF PROTOTYPE:

Phase 1**:** This phase would be of electrochemical sensors and the cloud database that stores the standard values of the data.

Phase 2**:** This phase comprises of the seed testing that determines the germinating rate of the seed.

Phase 3**:** The final outcome would be our objective that is to integrate both the soil testing and seed testing into a single device.

F. ADVANTAGES:

Low investment and high productivity range. Usage of fertilizers is minimized, thus improving the soil quality.

III.CONCLUSION:

Through the usage of this device, the farmer can identify the germinating rate of the seed and improve the cultivation. This results in low investment and maximum yield productivity. The independency of the farmer in testing the soil quality and germinating rate of the seed which leads to less time consumption

REFERENCES

[1] www.omicsonline.org
[2] www.graniteseed.com
[3] "Handbook of Bio-Medical Instrumentation" by R.S.Khandpur.
[4] www.ieeeexplore.ieee.org/ie15/10678/33710 /01694113.pdf?arnumber=1604113
[5] www.dailymail.co.uk
[6] of sciences.com
[7] http://courses.ece.uiuc.edu/ece445/projects/fall2006/project9_proposal.doc.
[8] www.national academy
[9] www.cnnnews.com
[10] Electronics For You.(edition:may2006)
[11] www.bbc.com