



SURVEY ON SMART FARMING USING SOIL HEALTH CARD BASED ON MACHINE LEARNING

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Abstract: ‘Smart Farming using machine literacy and data analytics’ is a POC intended for betterment of growers and husbandry in India. Mentioned in the report are the exact pretensions to be fulfilled by this design – videlicet, recommendation of the top n crops grounded on soil parcels and terrain factors. These take into consideration all the nutrients and micronutrients (around 12 of them) with reference to the soil health card. From these top n crops recommended, the planter will also be suitable to know the economically salutary crop where the model tools price vaticination module for the crops. Also a time round plan will be handed to planter to maximize his civilization and earnings through CSM. Besides General information regarding government schemes or soil testing labs will be handed. The experimenter along with these functionalities can pierce certain datasets that he wants to explore. The experimenter can also study the impact of colorful algorithms on varies data. An add on ‘ what if ’ script will help not only the planter but also the experimenter to play around with colorful factors and see the variations in results and do with decision making consequently.

Keywords- Micronutrients, Farmer, Algorithms

I. INTRODUCTION

‘Smart developing utilizing machine learning and data analytics’ may well be a paper pointing considering for advancement of ranchers and cultivating in India. Indicated inside the report are the exact targets to be fulfilled by this amplify – to be particular, proposal of the beat n crops based on soil properties and environment components. These take into thought all the supplements and micronutrients (around 12 of them) with reference to the soil prosperity card. From these best n crops proposed, the agriculturist will as well be able to know the fiscally profitable alter where the appear actualizes taken a toll estimate module for the crops. As well a year circular organize will be given to agriculturist to maximize his advancement and benefit through CSM. Other than nonspecific information with regard to government plans or soil testing labs will be given. The examiner close to these functionalities can get to certain datasets that he should examine.

II. METHODOLOGY

Feting the need Due to the changeable environmental factors or price patterns, growers are unfit to decide which crop to cultivate so as to maximize profit. Indeed if the crop suits his land a lot of it goes waste if there's no request demand. therefore a model was demanded to guide the planter considering his land and Terrain and price factors. Collection of information and data needed in the design was to train the module for vaticination. The data is created by the design members from knowledge set – colorful handbooks, Agriculture College Pune’s App, Soil Health cards study, etc. Price data was taken from government spots. Creating other Indispensable results From stoner’s point of view, he has been given the inflexibility to choose amongst the colorful results handed by app – single or indispensable crop, or a time round plan. From developing point further than 4- 5 algorithms have been explored, considered, enforced to give indispensable Results. Assessing the consequence of different results stoner might choose a result as per his necessity. Algorithms were estimated for delicacy and mean crimes to ameliorate delicacy and reduce crimes. Deciding and specifying final stylish result Farmer should go for economically salutary or time round plan . Algorithm with loftiest delicacy used for base model. Experimenter can relate to data he needs.

III. BACKGROUND AND DOMAIN

India being an agro-based nation, its economy basically depends on farming create development and related agro-industry items. Indian agribusiness generally depends on the precipitation which is profoundly erratic. Cultivating abdicate is additionally generally subordinate on assorted and numerous soil parameters, like Nitrogen, Phosphorus, Potassium, Edit cycle, Soil dampness, soil pH, temperature and climatic perspectives like temperature, precipitation, etc. These days India is exceptionally quickly advancing towards specialized development and improvement. In this way, innovation will be useful as well as blessing to farming which can improve trim efficiency which can result in way better yields to the agriculturist .Different types of soils have colorful mineral contents and every crop demand multiple mineral factors for its better growth. Each and every soil has some specific

characteristics and is suitable to grow only a particular number of crops. thus an agriculturist should be known about the type of soil he has so that he could cultivate better crops. Another important issue that's farmers have to face is the query in the request demand and prices from the time of sow to the time of crop. Machine literacy is a section of Computer Science where new developments evolve at recent times, and also helps in automating the evaluation and processing done by the humanity, therefore reducing the burden on the homemade mortal power. It's a type of Artificial Intelligence that provides bias with the capability to learn without being independently programmed. It gives focus on the development of computer programs that can change when exposed to new data. Chancing out the suitable crops grounded on the soil's appearance becomes tedious for neophyte growers. There also exists a need to help the agrarian decay. It's a system of assaying, drawing, transubstantiating & creating models of data with the end of chancing meaningful and useful information, concluding that information and supporting decision timber. Data analytics systems and enterprise support businesses increase earnings, help in perfecting functional and functional effectiveness, responds snappily to arising request trends and gain a competitive edge over rivals, optimizes marketing juggernauts and client service.

IV.LITERATURE REVIEW

1.CROP YIELD PREDICTION AND EFFICIENT USE OF FERTILIZERS [IEEE 2019]

The system provides a model precise in predicting the crop yield and also recommendations about the required fertilizers ratio based on soil parameters and atmospheric conditions to maximize the crop yield and farmers revenue. Among the factors for better crop yield, use of fertilizers is also an important factor as it directly affects the fertility of soil.

2.DECISION MAKING SUPPORT SYSTEM FOR PREDICTION OF PRICES IN AGRICULTURAL COMMODITY [IEEE 2019]

Agriculture commodity prices have a variable nature impacting the profit negatively. Agriculture price prediction has always been a challenging problem for farmers. Farmers are unable to get the desired price for their crops due to which suicide rate is increasing year by year. Different social and economic factors are responsible for fluctuation of prices of agriculture commodity

3.RECOMMENDATION SYSTEM FOR CROP IDENTIFICATION AND PEST CONTROL TECHNIQUE IN AGRICULTURE [IEEE 2019]

In this paper, the authors have developed a system that will recommend a suitable crop specifically focusing on a particular targeted small region considering soil and its parameters and some other parameters. Also, the system will target pest removal techniques and help the farmer similarly. An existing paper that selected the crop based on soil properties was used for reference.

4.PREDICTIVE ANALYSIS TO IMPROVE CROP YIELD USING A NEURAL NETWORK MODEL [IEEE 2018]

The architecture proposed in this paper provides a computational dimension to enhance knowledge about the yield before the crop sowing period. It provides unique model which performs joint prediction of both rainfall and soil features on the yield, which is also termed as hybrid model. The model reads historic data and learns through computational processes like ARIMA.

5.CROP PREDICTION USING PREDICTIVE ANALYTICS [IEEE 2017]

In this paper, the author mainly focuses on aggregating various papers and further utilizing them to develop a model to predict suitable crops, crop yield and recommending fertilizers (future scope).

V. SOFTWARE REQUIREMENTS

5.1 Analysis Models: SDLC

Software development life cycle for the proposed design went through following phases Conditions Gathering The conditions for the design started right from the basics to see if the problem is really worth working. Therefore colorful husbandry sodalities were visited to gather the conditions. The conditions substantially included perfection in the vaticinator as, though being models can be seen, utmost of them fail to give accurate results. The data needed for the same was gathered in the form of knowledge set through husbandry council handbooks and sanctioned app. The specialized conditions of platform, technologies, etc. were decided through conversations with the companion Analysis .The results from the being models failed due to the query in environmental conditions and lack of parameters considered for vaticinator. Therefore it was decided to consider parameters that would yield a better result. Dataset was generated from the knowledge set by study and analysis. A lot of papers through literature check also helped to analyses the gaps that could be worked upon for a better model. Plan and Design therefore the software design was generated that included the software armature, all the necessary UML plates, and schemas for data and the modules that would be handed through the web app. crucial deliverables of the app were decided and operation of algorithms, technologies, platforms, language, database, etc. were also decided. The layout of the app and its interface were proposed. A plan was therefore sketched , figure factual coding needed was done. This included machine literacy algorithms prosecution, frontal end canons – for static and dynamic web runners, machine learning canons API generation, etc. between bias . It also enables better application of the grid by detecting the device's effectiveness at a particular time. Remote Sensing is one of the important wireless measures of Smart Grid Applications. Test The generated web app was tested and validated for colorful situational inputs. This included substantially usability testing ,security testing, maintainability testing, scalability testing, login testing, database testing ,comity testing, etc. Emplace Presently the app is stationed as customer garcon Armature with guests abiding in the same network as that of the garcon. Farther deployment on pall for access over the internet is planned. Maintain Check for bugs and diving them is planned when will be demanded. The system would be maintained for its vacuity, security, usability, scalability, and any updates grounded on druggies demand would be tried to fulfill.

5.2 Data and Sources of Data

5.2.1 Soil nutrient and climatic factors for crop dataset:

Many researchers nowadays are working on crop recommendation and crop prediction problem despite of that finding data related to this was the biggest hurdle we faced during our project. The major focus of our project was to include climatic conditions as well as all the major soil parameters for crop recommendation because no model yet includes them all together for multiple crops. Hence, no readymade dataset was available to us. We made use of the available knowledge sets to build our final dataset which includes all the necessary soil parameters as well as climatic factors.

A	B	C	D	E	F	G	H
crop_name	Soil_Type	Duration	Temp	Rainfall (cm)	pH	EC (dS/m)	Organic_Carbon (%)
Rice	clay	130	26	6	5.5		H
Rice	clay	130	26	6	5.6		H
Rice	clay_loam	130	26	6	5.7		H
Rice	clay	130	26	6	5.8		H
Rice	clay_loam	130	26	6	5.9		H
Rice	clay	130	26	6	6		H

Fig 5.2.1 Data Sets

The coming important question to bandy is why we've chosen only these particular soil parameters. During our exploration work in the early phase of our design we came across the conception of soil testing. We came to know that lot of soil testing laboratories have been setup by government as well as by some private institutions which performs the analysis of soil and give details of that analysis in the form of SOIL HEALTH CARD to famers.

5.3 Soil Health Cards

It's Indian Government's scheme promoted by the Department of Agriculture and Cooperation under the Ministry of Agriculture and Farmer's weal. This scheme is being enforced by the Department of Agriculture of all the State and Union Territory Governments. A Soil Health Card gives planter soil nutrient status of his holding and advises him on the operation of diseases and also the demanded soil emendations that he should apply to maintain soil health. A published report of Soil Health Card has the status of soil having 12 parameters, videlicet N, P, K(Macro-nutrients) Fe, Cu, S, Zn, Mn, Bo(Micronutrients); and EC, pH, OC(Physical parameters). We wanted to include all the major factors that impact the crop suitable for particular soil type hence we had to consider all these 12 factors along with type of soil average downfall, temperature of that region.

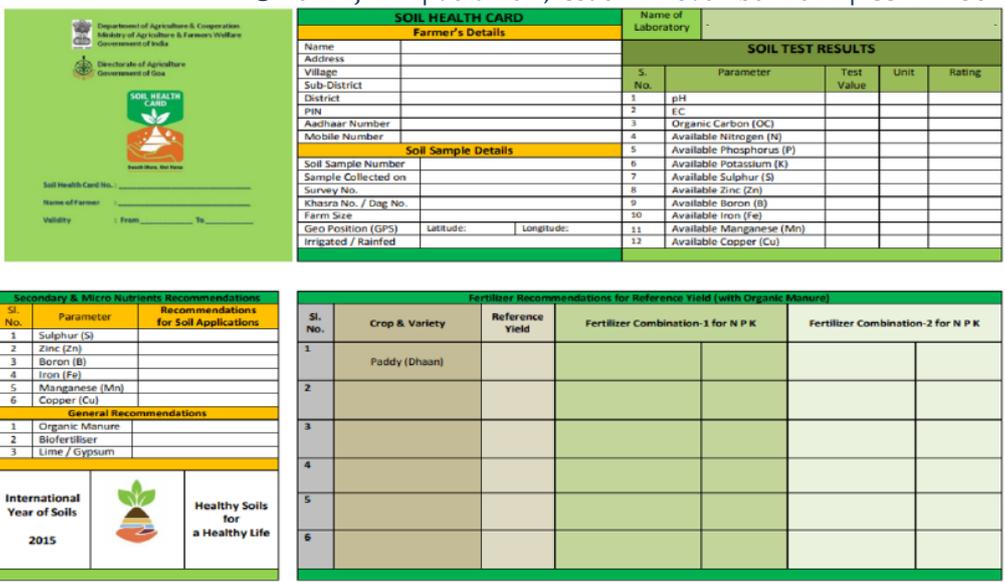


Fig.5.3 Soil Health Cards

5.4 Market Price Prediction Dataset:

For unborn price vaticination, the dataset is collected from agmarknet.nic.in in which a government website is furnishing druggies with prices of crops. It has quarter wise price distribution having minimal price, maximum price and modal price. The methodology section outline the plan and method that how the study is conducted. This includes Universe of the study, sample of the study, Data and Sources of Data, study’s variables and analytical framework. The details are as follows:

Sl no.	District Name	Market Name	Commodity	Variety	Grade	Min Price (Rs./Quintal)	Max Price (Rs./Quintal)	Modal Price (Rs./Quintal)	Price Date
1	Ahmednagar	Ahmednagar	Bajra(Pearl Millet/Cumbu)	Other	FAQ	1711	2500	2105	31-Dec-19
2	Ahmednagar	Ahmednagar	Bajra(Pearl Millet/Cumbu)	Other	FAQ	2031	2342	2186	30-Dec-19
3	Ahmednagar	Ahmednagar	Bajra(Pearl Millet/Cumbu)	Other	FAQ	1697	2300	1998	28-Dec-19
4	Ahmednagar	Ahmednagar	Bajra(Pearl Millet/Cumbu)	Other	FAQ	1726	2122	1924	27-Dec-19
5	Ahmednagar	Ahmednagar	Bajra(Pearl Millet/Cumbu)	Other	FAQ	1700	2000	1850	26-Dec-19
6	Ahmednagar	Ahmednagar	Bajra(Pearl Millet/Cumbu)	Other	FAQ	1775	2075	1925	24-Dec-19
7	Ahmednagar	Ahmednagar	Bajra(Pearl Millet/Cumbu)	Other	FAQ	1800	2053	1926	23-Dec-19

Fig.5.4. Market Price Prediction Dataset

5.5 CSM Dataset:

The third dataset that we’re using is csm_dataset for Crop Selection Method algorithm. This dataset contains the sowing period, harvesting period, growth period, and prognosticated yield rate of crop.

A	B	C	D	E
crop_name	Sowing_period	Harvesting_period	Growth_day	Predicted_yield_rate
Rice	June	Sept	4	2000
Rice	July	Oct	4	2000
Soybean	June	Oct	5	1264
Soybean	July	Nov	5	1264
Sweet_potato	July	Oct	4	800
Sweet_potato	Aug	Nov	4	800
Arhar	July	Dec	6	1359
Arhar	Aug	Jan	6	1359
Castor_seed	July	Feb	8	1064
Castor_seed	Aug	Mar	8	1064

Fig.5.5. CSM Dataset

VI. ALGORITHMS:**6.1 Machine Learning:**

Machine Literacy is a section of Computer Science where new developments evolve at recent times, and also helps in robotization of the evaluation and processing done by the humanity and reduces the burden on the homemade mortal power. It's a type of Artificial Intelligence that provides bias with the capability to learn without being Independently programmed. It gives focus on the development of computer programs that can change when exposed to new data. Chancing the suitable crops grounded on the soil's appearance becomes tedious for neophyte growers. There also exists a need to help the agrarian decay.

6.2 Neural Network:

The Neural Networks Model(NNM) is used to consider the functionality of nonlinear data. The model shows the capability to learn as it follows similar data processing structure. These ways give successful results by applying on numerous problems like bracket, control and vaticination like a natural brain. The model is different to both bracket model as well as decision tree due to its factor of likely hood vaticination. The neural network has numerous ways which has graces and faults. The exploration suggests neural network to be better than decision tree and retrogression analysis model used in churn vaticination.

6.3 Decision Tree:

The decision tree is one of the most prominent prophetic models that are used for the churn vaticination grounded on bracket. The decision tree has of two way 1.Tree structure- The training data set is recursively partitioned according to values of the attributes. This process continues till there are no partitions left having identical values. 2. Tree pruning- Then some values may be removed from the data which is noisy data. The largest set up out error rate branches are named and farther removed in pruning. To prognosticate delicacy and reduce complexity of decision tree is therefore called tree pruning.

6.4 Data Analytics:

It's a system of assaying, drawing, transubstantiating & creating models of data with the end of chancing meaningful and useful information, concluding that information and supporting decision making. Data analytics systems and enterprise support businesses increase earnings, help in perfecting functional and functional Effectiveness, responds snappily to arising request trends and gain a competitive edge over rivals, optimizes marketing juggernents and client service sweats.

VII. CONCLUSION:

Summing up, as this paper is an attempt is made to bridge the gap between labor, finance, land etc. invested in agriculture and yet its lower contribution to GDP. The datasets needed for the project have been gathered. It includes datasets with fields of land properties, environmental factors as well as the future price consideration of crops. Interactions with various agricultural colleges, labs and experts have been done for the same. As mentioned, data analytics and machine learning are the main domain areas focused on technically.

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