



Crop-Soil Management Towards A Sustainable Agriculture System

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Abstract: Management of soil is very important either directly or indirectly for the production of crop and environmental sustainability. The management of soil has become increasingly very important in recent years due to an increase in demand for food production. Thus, managing soil nutrient management and conservation practice has come up with a lot of challenges. Literature suggests that crop diversification is a process that apes a complex relationship between soil and plant that help in monitoring the extreme beneficial crop designs. This study focused on the diversified crop models for discovering the appropriate soil management for good production of crops and different soil management and fertility have been explained. The study outcome will be useful for farmers on crop soil management toward sustainable agriculture in India.

Keywords: Soil, Management, Crop, Sustainable Agriculture, India

1. Introduction

Soil provides the main source of extracting the nutrients for most of the living organisms. The management of soil ensures that the nutrients that are present in the soil do not become deficient or do not get toxic for plants which ultimately enters the food chain. Thus management of soil is a very important aspect for the productivity of crop and human health. The management of soil is becoming very important for upcoming years due to a higher demand for food. Thus, further research is essential for avoiding further degradation of soil by any contamination to produce sufficient safe and nutritious food for healthy diets. Soil plays a very important role in increasing the production of a particular crop. Suitable soil should be present for a crop environment so that it has all the nutrients to grow reasonably well. Thus, crop soil database is required to develop a matrix between soil and plant to help in monitoring the healthy crop design and model. Model [1] helps to know which one can be selected appropriately based on the given soil inputs. Literature suggests that there are 9 parameters for soil properties based on which soil can be distinguished. The chemical properties of soil include electrical conductivity, pH value and salinity class [13]. Macro elements like phosphate, potash, and nitrogen are also very essential for the growth of the crop. The physical properties of soil include the texture of the soil, the percentage of silt, clay, and sand [16].

It is well evident from previous studies that managing soil like crop rotation, soil tillage, and organic amendments has a very important role in soil fertility [13]. Soil fertility is imperative for enriching the soil properties like stability in erosion, availability of nutrients, capacity for holding the water, etc. Microorganisms present in the soil also play a very important role in the quality of soil and its fertility as they are part of nutrient cycling, transformation processes and also for soil aggregate stability. Thus, soil microbial groups are affected by both short term and long term management practices. Overall, soil microbial biomass, activity and diversity tends to be higher in organic than in conventional farming systems [5].

It is commonly known that soil-borne disease gets affected through the soil properties. The rotation of crops is mostly used for reducing the existence of pathogenic propagates [13]. The occurrence of definite antagonists or the addition of organic amendments to soil may overpower numerous soil-borne diseases [3] like *Pythium*, *Gaeumannomyces*, *Rhizoctonia*, *Phytophthora*, *Fusarium*, etc. Various mechanisms have been identified for the suppression of crop diseases in recent years. Several definite antagonistic events, the race for nutrients in the rhizosphere as well as stimulation of resistance in the host plant can be the part of these mechanisms. In some particular cases, specific antagonistic species or plant growth-promoting rhizobacteria have been recognized and the essential mechanisms of disease control. Disease suppressiveness has also been linked to high soil microbial activity.

Using soil fertility management techniques [16] for reducing the diseases is a fascinating concept used in theory part but not widely accepted in practical implementation. This technique is not used widely in practical work because of the absence of underlying principles. Regardless of the claims which are made by few organic farmers, no signs have been found for reducing the foliar disease vulnerability is a typical feature of plants grown. The work on foliar diseases over the impact of soil properties was first studied in the late 90s [5]. The main importance of this was to assess the suppressiveness level in organic farms with 15 potato fields in Switzerland. Other research works have been done in recent years to test systems for foliar resistance and *Phytophthora infestans*. Numerous literature review has been carried out on suppressiveness all over; however, there is a lacking on diverse datasets and other valuable formulation by the use of exact optimization methods [4], crop divergence, amongst soil and plant, which aid in regulating the supreme helpful crop designs especially in the third world country like in India.

Therefore, the key issue overcrop soil management toward sustainable agriculture is essential. Consistent with the need to investigate this soil topic, this study analyses the different constraints, measures, intensities, effects, mitigation applications, and diagnosis tools, across the globe to highlight the huge disparity of approaches, which can complicate the transferability of the results.

2. Review of literature on the relation between soil environment and crop yields

The relation [11] between soil and crop should be much stronger. Whenever farmers plan to grow any crop, firstly, they see the likelihood of that specific crop in that soil by relating the crop with the soil component. In such a case, soil modeling helps a lot. Once values have been checked by farmers and dropped info into the system, it helps in providing the suitability of crops in a particular order according to the given values. In such a manner farmer selects the best suitable crop for soil that requires less input for the harvest and more yield. By using such a process farmers can save a lot of money by choosing a suitable crop for the specific type of soil and different crops can be grown by farmers in different types of soil. So in such manner crop diversification mechanism can be attained. In common circumstances, soils present chemical limitations for crop improvement. Chemical soil tests are taken into consideration to provide the data related to acidity and supplement levels of each land section of land. The pH¹ The value of the soil is very important for checking the acidity of the soil.

¹ is an amount of the acidity and alkalinity present in the soils. The pH levels of soil range between 0 to 14, where 7 are natural, above 7 are alkaline and below 7 is acidic. For most of the plants, the pH value must range between 5.5 and 7.0.

The regular updates on soil chemical attributes [5] changing in the number of supplements and sharpness, groundwater archives, and the general condition should be checked according to the requirements of crops. Thus, deciding which crop to be the best fit with the chemical attributes of each generation is a fascinating contrasting option where it is important to diminish the cost of soil treatment and limit the potential biological problems. Agriculturists generally develop crops with the most ideal return and least monetary hazard under an arrangement of conceivable situations [14]. The perfect utilization of soils is the foundation of all forms of maintainable land utilize, that is, farming area utilizes that remaining parts gain in the long haul. There are several benefits of an ideal utilization of soils like watershed assurance, feasible agrarian generation, and a decline of rustic neediness, expanded biodiversity and security [17].

2.1 Substantial and approaches

It is one of the difficult choices faced by farmers in which crop to be selected. Risk management strategies for selecting the crop must be well known by the farmers that are the best suited for their needs [12]. One of the most popular approaches to managing risk is to reduce risk exposure through diversification [12]. However, methods that lower down risk generally expected net returns. Thus, it is important to account for the risk tradeoff when selecting the soil to grow for a particular crop. In particular, farmers often need to know how much diversification is enough to capture most of the potential gains from expanding their enterprise mix. The effects of diversification reflected in the relationship between absolute risk levels and the number of crops included in a portfolio [13]. In other words, the most possible risk reduction is achieved by including a few products in a portfolio. This means that adding another crop to an existing rotation or creating an entirely new portfolio may or may not be an effective risk management strategy [11]. Various studies most often have used linear or nonlinear programming procedures to identify optimal crop portfolios for a particular case [11]. Although risk programming approaches lead to theoretically optimal portfolios, there are practical limitations to the use of these methods by agricultural producers [19]. Full details of crop-soil properties database-I and crop-soil properties database-II are shown in Table 1 and 2.

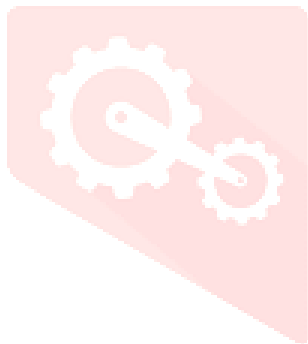


Table 1: Crop-soil properties database-I

Sr. No.	Crops	pH [13]	EC [15]	Salinity Class [11] [13][7]	Planting Depth [11]-[14]
1	Wheat	5.5-6.5	4-8	Slightly Saline	1 inch [20]
2	Cotton	5.5-6.5	2-4	Very Slightly Saline	0.5-1 inch
3	Rice	5.5-6.5	4-8	Slightly Saline	2-5cm
4	Corn	5.5-6.5	2-4	Very Slightly Saline	1.5-2inches
5	Barley	5.5-6.5	8-16	Moderately Saline	50-75mm
6	Peanuts	5.5-6.5	2-4 [17,18,19]	Very Slightly Saline	1.5-2.5 inches
7	Sugarcane	5.5-6.5	2-8 [17,18,19]	Very Slightly Saline	8-10cm
8	Beans	5.5-6.5	0-2	Non Saline	2-6 inches
9	Tomato	5.5-6.5	2-4	Very Slightly Saline	5-6 inches
10	Potato	5.5-6.5	0-2 [17,18,19]	Non Saline	4 inches
11	Soybeans	5.5-6.5	2-4	Very Slightly Saline	1-1.5 inches
12	Onion	5.5-6.5	0-2	Non Saline	1-1.5 inches
13	Sunflower	5-7	0-6	Very Slightly Saline	1 inch
14	Rose	5-7	2-6	Moderately Saline	1-2 inches
15	Grape	7.2-8.2	0-2 [17,18,19]	Non Saline	6m
16	Corn,sweet	5.5-6.5	0-2 [17,18,19]	Non Saline	1-2 inches
17	Watermelon	5-7	2-8	Very Slightly Saline	1 inch

Table 2: Crop-soil properties database-II

S. No	Crops	Percentage of Sand Silt Clay			Texture [16]	Nitrogen [13]	Phosphorus [12]	Potassium[11]
1	Wheat	32	38	30	Clay loam or loam structure. Clay and sandy loam soils also used	67	70	162
2	Cotton	50	20	30	Sandy loam.	50-70	56	89
3	Rice	10	20	70	clay and sandy loam	25-50	16-62	25-40
4	Corn	60	30	10	Sandy loams	120-160	200	113-190
5	Barley	60	30	10	Sandy to loam soils.	150-200	0-30	10-50
6	Peanuts	50	20	30	Friable sandy loam or sandy clay loam.	112	27	34
7	Sugarcane	50	20	30	Loamy soils.	175-275	62.5	112.5
8	Beans	50	20	30	Sandy clay loam or clay loam with clay 15-35%.	10-30	10-25	10-25
9	Tomato	35	50	15	Clay loam and silt loam soils.	90-120	50	50
10	Potato	50	20	30	Sandy loam, sandy clay loams and silt loams.	60-90	30-60	250-300
11	Soybeans	42	40	18	Loamy soils.	55-135	5-12	15-40
12	Onion	85	10	5	Sandy soils.	20-70	18-172	55-110
13	Sunflower	10	20	70	Clayey soil.	80-100	10-35	65-80

14	Rose	65	25	10	Sandy-loam, red-loam, silt-loam.	35-40	15-25	35-45
15	Grape	36	30	34	Clay loam soils.	90-120	0-30	38-100
16	Corn, sweet	10	55	35	Sandy loam or silty clay loam.	140-180	35-50	120
17	Watermelon	60	30	10	Sandy loam soils.	55-80	10-30	60-80

2.2 Fitness function

Richards (1954) discovered the fitness function in the relation between soil environment and crop yields. Parameters to construct the fitness function are listed below.

[fit,best crop1,best crop2,best crop3]=...
function_crop_selection_GSA(f(1),f(2),f(3),f(4),f(5),f(6),f(7),f(8),f(9),f(10))

Sharma et al (2017) did a research work using a case study of improving yield prediction and sulfur deficiency detection using optical sensors and the relationship of historical potato yield with weather data in Maine to enhance fitness. Parameters that are used to construct the fitness are listed below.

Objective function: Fitness

[Fitness(i),Location]=max([objfnc_{crop1},objfnc_{crop2},objfnc_{crop3},.....objfnc_{cropj})

The program underneath defines the design of fitness for all crop and lastly chooses the crops which have greater value amongst all. Rodriguez-Alvarez et al (2011) reviewed crop growth and soil moisture monitoring from a ground-based instrument implementing the Interference Pattern GNSS-R Technique by to generate each crop distinctly and liable upon the standards of the soil's strictures. There is a good number of related studies have been carried out all over the world; however, a huge lacking is observed in the case of India.

The present study tried to overcome the research lacking in principally addressing India. Particularly, in this study, the study focused on the diversified crop models for discovering the appropriate soil management for good production of crop and different soil management and feasible fertility have been explained.

Parameters used are discussed below:

1. **f(1)=[PH_{low} PH_{high}];**

f(1) signifies first quality feature PH significance of the crop. It has scope of two where Range_{low} and Range_{high} of the PH are specified in matrix .Likewise other structures as qualities are clear as given below;

2. **f(2)=[EC_{low} EC_{high}];**

Where EC is electrical conductivity whose components are in the form of deciSiemens/metre. EC_{low} and EC_{high} are lowermost and uppermost likely events verified for a soil model.

f(3)= Salinity class.

This quality is branded into 4 altered classes named as

- Marginally Saline
- Exact Marginally Saline
- Abstemiously Saline
- Non Saline

These qualities have allocated Numeric standards so that it will be easy for evaluation like: Slightly =1, Very Slightly =2, Moderately Saline =3, and Non Saline = 4.

3. [f(4) f(5) f(6)]= [% Sand % Silt % Clay].

Where :-

f(4) is % of Sand kind in the specified soil example,

f(5) is % of Silt type in the specified soil example

f(6) is % of Clay type in the specified soil example

f(7)=Texture;

It considered into 11 subsequent kinds:

- Clay and sandy loam, Grimy Loam, Friable sandy loam, Loamy Muds, Filthy Clay loam, Clay loam and deposit loam soils, Sandy Soils, Clayey soils, Sandy-loam, red-loam, silt-loam, Clay loam soils, Silty clay loam,

Numeric standards are allocated to Texture quality as in the case of Saline Class like Clay and Sandy loam = 1 and so on....

4. Nitrogen=F8

5. Phosphorus= F9

6. Pottasium= F10

Here, Unit of Nitrogen(N), Phosphate(P₂O₅), Potash(K₂O) is lb/acre or lb/1000ft².

f(1), f(2)...f(10) feature qualities assesses middle limits t₁, t₂, t₃....t₁₀ for each separate crop which are additional used to discover the fitness charge for each crop and the therefore lastly makes the value of maximum fitness of a specific yields from all the crops used in evaluation. If the t₁, t₂,....t₁₀ of a crop increases, Therefore, summary of attribute features of a crop for output grows are selected as the objective function. i.e.,

$$objfnc_{cropj} = \sum_{i=1}^{10} t_i$$

Where t_i is the feature attribute of acrop.

Where t₁, t₂, t₃ ...t_i,.....t₁₀ are described as follows for each crop

$\text{if } f_i < \text{lowerbound}_{\text{cropj}}$
 $t_i = 1 - \frac{|f_i - \text{lowerbound}_{\text{cropj}}|}{\text{lowerbound}_{\text{cropj}}}$
 $\text{else if } f_i > \text{highbound}_{\text{cropj}}$
 $t_i = 1 - \frac{|f_i - \text{highbound}_{\text{cropj}}|}{\text{highbound}_{\text{cropj}}}$
 $\text{else if } f_i < \text{highbound}_{\text{cropj}} \ \& \ f_i > \text{lowerbound}_{\text{cropj}}$
 $t_i = 1$
 $\text{else it has only single fix value i.e. no limit range}$
 then
 $t_i = 1 - \frac{|f_i - \text{fixbound}_{\text{cropj}}|}{\text{fixbound}_{\text{cropj}}}$

Here $\text{lowerbound}_{\text{cropi}}$ and $\text{upperbound}_{\text{cropi}}$ differs from crop to crop. Where cropj is j th crop designated for reference. Total 17 crops are stated in the earlier segment.

The main objective of this research is to enhance the fitness. Henceforth,

Objective : best use of Fitness

$[\text{Fitness}(i), \text{Location}] = \max([\text{objfnc}_{\text{crop1}}, \text{objfnc}_{\text{crop2}}, \text{objfnc}_{\text{crop3}}, \dots, \text{objfnc}_{\text{cropj}}])$

The program underneath defines the design of fitness for all crop and lastly chooses the crops which has greater value amongst all.

$\text{Array1} = [\text{fitc1} \ \text{fitc2} \ \text{fitc3} \ \text{fitc4} \ \text{fitc5} \ \text{fitc6} \ \text{fitc7} \ \text{fitc8} \ \text{fitc9} \ \text{fitc10} \ \text{fitc11} \ \text{fitc12} \ \text{fitc13} \ \text{fitc14} \ \text{fitc15} \ \text{fitc16} \ \text{fitc17}];$

$[\text{fitness value}, \text{location1}] = \max(\text{Array1})$

$[\sim, l] = \text{sort}(\text{Array1}, 'descend');$

$\text{location1} = l(1);$

$\text{location2} = l(2);$

$\text{location3} = l(3);$

explanation of objective purpose for separate crops founded on their particular lowbound and highbound required varieties has been given below:

$$\text{wheat} = \left[t1 \ t2 \ 1 - \frac{|f3-1|}{1} \ 1 - \frac{|f4-32|}{32} \ 1 - \frac{|f5-38|}{38} \ 1 - \frac{|f6-30|}{30} \ 1 - \frac{|f7-1|}{1} \ 1 - \frac{|f8-67|}{67} \ 1 - \frac{|f9-70|}{70} \ 1 - \frac{|f10-162|}{62} \right];$$

$$\text{cotton} = \left[t1 \ t2 \ 1 - \frac{|f3-2|}{2} \ 1 - \frac{|f4-60|}{60} \ 1 - \frac{|f5-30|}{30} \ 1 - \frac{|f6-10|}{10} \ 1 - \frac{|f7-2|}{2} \ t8 \ 1 - \frac{|f9-56|}{56} \ 1 - \frac{|f10-89|}{89} \right];$$

$$\text{rice} = \left[t1 \ t2 \ 1 - \frac{|f3-1|}{1} \ 1 - \frac{|f4-10|}{10} \ 1 - \frac{|f5-20|}{20} \ 1 - \frac{|f6-70|}{70} \ 1 - \frac{|f7-1|}{1} \ t8 \ t9 \ t10 \right];$$

$$\text{corn} = \left[t1 \ t2 \ 1 - \frac{|f3-2|}{2} \ 1 - \frac{|f4-60|}{60} \ 1 - \frac{|f5-30|}{30} \ 1 - \frac{|f6-10|}{10} \ 1 - \frac{|f7-2|}{2} \ t8 \ 1 - \frac{|f9-200|}{200} \ t10 \right];$$

$$\text{barley} = \left[t1 \ t2 \ 1 - \frac{|f3-3|}{3} \ 1 - \frac{|f4-60|}{60} \ 1 - \frac{|f5-30|}{30} \ 1 - \frac{|f6-10|}{10} \ 1 - \frac{|f7-2|}{2} \ t8 \ t9 \ t10 \right];$$

Detailed

$$\begin{aligned} \text{peanuts} &= \left[t_1 \ t_2 \ 1 - \frac{|f_3-2|}{2} \ 1 - \frac{|f_4-50|}{50} \ 1 - \frac{|f_5-20|}{20} \ 1 - \frac{|f_6-30|}{30} \ 1 - \frac{|f_7-3|}{3} \ 1 - \frac{|f_8-112|}{112} \ 1 - \frac{|f_9-27|}{27} \ 1 - \frac{|f_{10}-34|}{34} \right]; \\ \text{sugarcane} &= \left[t_1 \ t_2 \ 1 - \frac{|f_3-2|}{2} \ 1 - \frac{|f_4-35|}{35} \ 1 - \frac{|f_5-35|}{35} \ 1 - \frac{|f_6-30|}{30} \ 1 - \frac{|f_7-4|}{4} \ t_8 \ 1 - \frac{|f_9-62.5|}{62.5} \ 1 - \frac{|f_{10}-112.5|}{112.5} \right]; \\ \text{beans} &= \left[t_1 \ t_2 \ 1 - \frac{|f_3-4|}{4} \ 1 - \frac{|f_4-50|}{50} \ 1 - \frac{|f_5-15|}{15} \ 1 - \frac{|f_6-30|}{30} \ 1 - \frac{|f_7-5|}{5} \ t_8 \ t_9 \ t_{10} \right]; \\ \text{tomato} &= \left[t_1 \ t_2 \ 1 - \frac{|f_3-2|}{2} \ 1 - \frac{|f_4-35|}{35} \ 1 - \frac{|f_5-50|}{50} \ 1 - \frac{|f_6-15|}{15} \ 1 - \frac{|f_7-6|}{6} \ t_8 \ 1 - \frac{|f_9-50|}{50} \ 1 - \frac{|f_{10}-50|}{50} \right]; \\ \text{potato} &= \left[t_1 \ t_2 \ 1 - \frac{|f_3-4|}{4} \ 1 - \frac{|f_4-50|}{50} \ 1 - \frac{|f_5-20|}{20} \ 1 - \frac{|f_6-30|}{30} \ 1 - \frac{|f_7-5|}{5} \ t_8 \ t_9 \ t_{10} \right]; \\ \text{soybeans} &= \left[t_1 \ t_2 \ 1 - \frac{|f_3-2|}{2} \ 1 - \frac{|f_4-35|}{35} \ 1 - \frac{|f_5-35|}{30} \ 1 - \frac{|f_6-30|}{30} \ 1 - \frac{|f_7-4|}{4} \ t_8 \ t_9 \ t_{10} \right]; \\ \text{onion} &= \left[t_1 \ t_2 \ 1 - \frac{|f_3-4|}{4} \ 1 - \frac{|f_4-85|}{85} \ 1 - \frac{|f_5-10|}{10} \ 1 - \frac{|f_6-5|}{5} \ 1 - \frac{|f_7-7|}{7} \ t_8 \ t_9 \ t_{10} \right]; \\ \text{sunflower} &= \left[t_1 \ t_2 \ 1 - \frac{|f_3-2|}{2} \ 1 - \frac{|f_4-10|}{10} \ 1 - \frac{|f_5-20|}{20} \ 1 - \frac{|f_6-70|}{70} \ 1 - \frac{|f_7-8|}{8} \ t_8 \ t_9 \ t_{10} \right]; \\ \text{rose} &= \left[t_1 \ t_2 \ 1 - \frac{|f_3-3|}{3} \ 1 - \frac{|f_4-65|}{65} \ 1 - \frac{|f_5-25|}{25} \ 1 - \frac{|f_6-10|}{10} \ 1 - \frac{|f_7-9|}{9} \ t_8 \ t_9 \ t_{10} \right]; \\ \text{grape} &= \left[t_1 \ t_2 \ 1 - \frac{|f_3-4|}{4} \ 1 - \frac{|f_4-36|}{36} \ 1 - \frac{|f_5-30|}{30} \ 1 - \frac{|f_6-34|}{34} \ 1 - \frac{|f_7-10|}{10} \ t_8 \ t_9 \ t_{10} \right]; \\ \text{cornsweet} &= \left[t_1 \ t_2 \ 1 - \frac{|f_3-4|}{4} \ 1 - \frac{|f_4-10|}{10} \ 1 - \frac{|f_5-55|}{55} \ 1 - \frac{|f_6-35|}{35} \ 1 - \frac{|f_7-11|}{11} \ t_8 \ t_9 \ 1 - \frac{|f_{10}-120|}{120} \right]; \\ \text{watermelon} &= \left[t_1 \ t_2 \ 1 - \frac{|f_3-2|}{2} \ 1 - \frac{|f_4-60|}{60} \ 1 - \frac{|f_5-30|}{30} \ 1 - \frac{|f_6-10|}{10} \ 1 - \frac{|f_7-2|}{2} \ t_8 \ t_9 \ t_{10} \right]; \end{aligned}$$

3. Materials and Methods

To understand how consistent the different studies are, how comparable the results, and how formalized the procedures of analysis and tools, this study analyses and classifies crop soil management literature in three stages:

- Analysis of different soil management and soil fertility and description of the principle and effects
- Analysis of different soil management and soil-borne diseases and geographical cover, the scale of assessment, description of the principle and effects
- Analysis of different soil fertility management techniques and disease reduction, and type of assessment and limitations.

4. Discussions and Implication

This work diversified crop models to usage for discovering the appropriate soil for good production of crops. There are a good number of scientific references addressed in this subject matter since the 70s till today. Many developing countries are receiving benefits from diversified crop models with appropriate soil modeling. This study contends the adoption challenges of new modeling technology as outlined. This study also addresses the outline that India (and other countries) might use to overcome common policy adoption challenges of diversified

crop models. This study has identified that with the help of optimization techniques, crop diversification is a process that apes complex relationships between soil and plant that help in monitoring the extreme beneficial crop designs in the case of India.

In this study, an outcomes-based approach with the previous literature support discussed with Gravitational Search Algorithm (GSA) which is an optimization technique orientation [6] [9]. Full details of crop-soil properties database-I and II with fitness functions are shown in Table 1 and 2. This study used likely agriculture crops like wheat, cotton, rice, corn, barley, peanuts, sugarcane, beans, tomato, potato, soybeans, onion, sunflower, rose, grape, corn, and sweet-watermelon with potential of hydrogen (pH), electrical conductivity (EC), salinity class planting depth, percentage of sand silt clay, texture, N*, P2O5*, K2O* characteristics to understand the crop nourishment, soil richness and ecological influences for the crops yields. The outcomes are outlined in this study are similar by the research works addressed by Genyun Sun et al. [2], Naserbegi et al. [8], Lakesh et al. [13], Kar, G et al [18], and Baidu-Forson [19].

With the use of mathematical optimization techniques, crop diversification is a procedure that apes the complex relationship between soil and plant, which helps in controlling the maximum beneficial crop designs. A model known as a computer-based model by simulating the soil-plant systems with various new mathematical optimization techniques should be implemented. An effective tool that is useful for facilitating crop diversification for planners is making sound decisions prior to crop season and plantation. The main goal of crop diversification is to get numerous crops instead of only one or two and select the crop in such a way so that it gives maximum production with minimum investment where the implementation GSA algorithm can be a useful option to reach a crop production target.

Genyun Sun et al. [2] introduced that soil organization practices are beleaguered to deliver satisfactory crop nourishment and confirm tough soil richness and ignore bad ecological influences as similar properties addressed in Table 1. Soil organization is a part of goals to decrease pest and illness burden on crops. Organic agricultural is supposed to raise soil suppressiveness in the direction of soil-borne sicknesses as well as inflight illnesses. This study also deliberates the possible soil organization as an instrument to recover illness suppressiveness in exercise.

A. Naserbegi et al. [8] addressed the attentions of 18 inorganic rudiments in ripening forms from ectomycorrhizal, saprophytic, and epiphytic fungi from varied forestry of pines and oaks on quartzite acidic soils in Ciudad Real, Spain. They report meaningfully advanced copper (Cu) and rubidium (Rb) attentions in ripening figures from ectomycorrhizal class and meaningfully advanced Zn absorptions in fruiting bodies from saprophytic species. This study also deliberates the possible soil organization as an instrument to recover similar issues as shown in Table 1 and Table 2. Sharma, Lakesh et al. [13] Grant stated that durum wheat is grown in the Canadian steppes to have better particle yield, greater grain Zn concentrations, and minor grain cadmium (Cd) when refined with condensed cultivation than with conservative tillage which is similar as this study outlined.

Kar, G et al [18] presented that CropSyst is the crop development prototype selected as a choice instrument for the Tadla Benchmark project. It is a daily-step imitation method to help as a logical device to educate the result of collecting schemes organization on output and the atmosphere. The method pretends the soil water financial plan, soil-plant nitrogen plan, crop canopy and root development, dry matter production, yield, residue production, and decomposition. Thus, crop divergence is important option to optimize the crop productions all over the world that aids in possible danger organization implement in contradiction of vagueness, revenue and service cohort chance, skill to decrease illnesses, weed and bug build-up and option to raise soil richness and amongst others which this study addressed. The study's aim was that when agriculturalists are having superior for choosing a suitable crop model option for an exact soil it may aid in using such a prototype in the Indian case.

Rashedi et al [10] developed Gravitational Search Algorithm (GSA) by the agents which perform search work with a specific mass where every object in the system relates to other objects by some gravitational force. The agent's position helps in presenting a solution for the problem, whereas the mass of the agent is given during an objective function. The movement of all the objects is done with the help of the gravitational force in achieving sub-optimum solutions. Rashedi was the one who firstly worked for making the gravitational search algorithm (GSA) and can be utilized in agriculture for sustainable yields by analyzing different soil fertility management techniques and disease reduction and type of assessment and limitations.

The study had a limitation in the sense that the availability of reliable data and country-specific information. Data provided in the study has thus been carefully scrutinized and is provided on occasions there are assurances they are robust.

5. Conclusion

This study contends that the adoption challenges of this new modeling technology that can overcome less agro production through the use of development strategies outlined in this paper. This study also addresses the background that India (and other countries) might use to overcome common policy adoption challenges for agro production. To have a better understanding, this study addressed the soil organization and fruitfulness by obtainable optimization solutions. Numerous literature review related to the optimizing technique is discussed with the scope of diverse datasets and other valuable formulation methods. This study considers the Indian context as a case study; nevertheless, the suggestions outlined can potentially help in other countries with similar ecological settings where the need for new agriculture potential with appropriate modeling option is a fundamental issue.

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