IJCRT.ORG ISSN : 2320-2882

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

FLOWER FARMING RECOMMENDATION APPLICATION SYSTEM

[1]Arun Kumar G, [2]Suman R, [3]Arya G, [4]Suchith S, [5]Dr.Andrews S

[1234]Department of Computer Science And Engineering, CMR University, Bangalore, India
[5]Professor and Department Of AIML, CMR University, Bangalore, India

Abstract: India is a land full of culture, tradition, and spirituality where every region has its own different ways of connecting with the divine. One thing that beautifully ties many of these practices together is the use of flowers. Whether it's a simple daily offering or a grand festival celebration, flowers are seen as a pure and heartfelt symbol of devotion. Because of this, there's always a strong need for a variety of flowers across the country and, India is also land of rich traditions, where culture and rituals are deeply celebrated into everyday life especially during weddings and festivals. Flowers play a big important in these events, often used as offerings to deities or for decoration, making them an essential part of our cultural fabric. Because of this, there's always a high demand for different kinds of flowers. But for many farmers, knowing which flowers will grow best in their soil can be a challenge, Though the flower farming has become an popular and profitable branch of agriculture where the demand is been increasing every year, but choosing the right flowers to grow can be slightly difficult. Farmers often struggle with factors like local climate, soil conditions, and changing market demand. This research introduces a farmer friendly Flower Farming Recommendation Application designed to help farmers make smarter and better decisions,were flower By taking in simple inputs like NPK and pH, values the application, suggests the most suitable flowers to cultivate in a specific region, fertilizer deficiency, irrigation method, market demand and also harvesting type .It uses sensor for data collection and cloud web application to get the suggestions which can be helpful to improve both soil and flower yield. This web application is easy to use with the soil data, especially for small and mid-scale farmers, and encourages more efficient, sustainable farming. This paper explores how the soil data is collected, how to use that data so it can suggest the best flower for that field with required amount of fertilizers also.

1.INTRODUCTION

Agriculture is one of the main sources of livelihood for millions of people in India. However, a large number of farmers still follow traditional farming methods that rely heavily on random work and past experience of them. One of the big problem in this approach is the lack of real-time and accurate information about soil health. Without knowing the exact nutrient levels in the soil, farmers often apply fertilizers without knowing, to improve crop yields. This not only leads to poor productivity and higher costs but also results in the more loss of soil fertility and increases environmental damage. Our project aims to solve this challenge by introducing a smart, technology-driven solution based on Precision Farming techniques. The goal is to provide farmers to understand their soil better, make more precise decisions, and adopt better farming practices. By using advanced sensors and data collection methods, we will offer real-time insights into soil health, and based on those insights, recommend suitable crops and the right kind of fertilizer needed for each part of the farm. Flower farming has been increasing over the time as it is the main sources for millions of people in India for daily needs. The india's demand for flowers has been steadily increasing due to factors such as devotees, the increase of floral decorations in events, and the growing popularity of flower-based products in the market. Selecting the right flower species for a specific area is depend mainly on the soil health, moisture. Additionally, the market demand for certain flowers can vary, making it tougher for farmers to make informed decisions about which flowers to plant for maximum profitability. Regular methods will not be enough in order to get the high and more crop yield.

In the flower farming recommendation application presents an faster solution by considering parameters include soil health indicators such as NPK (Nitrogen, Phosphorus, and Potassium) and pH levels. By iconsidering these inputs into a cloud-based web application, the application not only recommends flower varieties tailored to the local environment but also suggests optimal fertilizer quantities and management practices for better soil health and enhanced productivity.

The integration of real-time data visualization and a web-based interface helps accessibility for users and encourages informed decision-making.

This paper presents the design, methodology, and results of our system, which makes potential to increase precision floriculture and helps small and medium-scale farmers with smart agricultural tools.

2. LITERATURE SURVEY.

In recent years, technology has started playing a important role in helping farmers make better and good decisions, especially through mobile apps and Applications. Flower farming, although less focused on than food crops, is a growing field with a lot of potential. Choosing the right flowers to grow depends heavily on soil conditions like NPK levels and pH. While there are many systems out there for recommending crops, most of them don't cater specifically to flower farming. Some studies have looked at soil-based recommendations, but they usually focus on vegetables or grains. There's a clear need for tools that offer flower-specific advice in a simple, accessible way.

2.1. Balanced Fertization for Cut Flower Crops.

This paper is, published by the Tamil Nadu Agricultural University (TNAU), looks into how using the right mix of nutrients can boost flower farming. It focuses on popular cut flowers like roses, carnations, chrysanthemums, and orchids. The authors share how each flower type responds to different fertilizers, including both chemical and organic ones like compost and Panchagavya. They also explain when and how to apply nutrients to get better growth, more flowers, and longer vase life. The research is based on real trials and shows clear benefits of balanced fertilization. It's not just about more flowers, but also about healthier plants and better quality. The paper highlights how combining organic and inorganic inputs leads to sustainable flower farming. It gives practical tips for farmers to follow based on soil and weather conditions. The goal is to help growers meet global standards and increase export potential. Overall, it's a guide to smarter, more efficient flower farming.

2.2. Soil and Nutrient Management in Flower Crops.

Soil and Nutrient Management in Flower Crops, In book: Advances in Horticulture Publisher, Akinik publication. This research enhance deep into how essential soil and nutrient management is for growing healthy and high-yielding flower crops. The authors explain that flowers need a balanced supply of 17 essential nutrients, and even small deficiencies can impact their growth, color, and lifespan. They highlight how different flowers like rose, gerbera, tuberose, jasmine, and carnation have their own unique nutrient needs. The paper stresses the importance of not just chemical fertilizers but also organic practices like composting, green manuring, and using biofertilizers. Practical recommendations are shared for how much and when to apply nutrients. The paper also touches on the need to maintain proper soil pH and organic matter to ensure nutrients are actually absorbed. Foliar feeding and drip irrigation are also suggested for better results. This research is a practical guide for floriculture farmers aiming to grow better-quality flowers. It promotes a mix of science and sustainable farming for better yields. Published on ResearchGate in 2021, it's a valuable resource for both students and professionals in floriculture.

2.3. Floriculture:- Student book, Class XI.

This handbook, published by the Central Board of Secondary Education (CBSE), introduces students to the colorful world of floriculture. It shows how flower farming in India has evolved from being just a hobby into a full-fledged commercial opportunity. The book helps and explains how flowers are an essential part of our live used in celebrations, rituals, and even everyday traditions. It teaches students how to grow, care for, and propagate a variety of flowering plants using both traditional and modern techniques. With India's rich climate diversity, there's a huge opportunity to grow flowers all year round. The handbook also discusses how flower farming is creating jobs, empowering women, and boosting exports. It highlights states like West Bengal and Karnataka that are leading the way in flower production. Beyond farming, it encourages students to think about landscaping, urban gardening, and environmental beautification. the readers are inspired to see floriculture as not just a subject but a future career full of possibilities.

2.4. Floriculturist (Open Cultivation)-Class XII.

This is the book, published by the National Council of Educational Research and Training (NCERT), this book contains essential practices of flower farming in open fields. This book gives practical knowledge and skills needed to grow commercial flower crops like marigold, rose, tuberose, chrysanthemum, and more. The book contains everything from land preparation, planting techniques, and pest control to harvesting and post-harvest management. It introduces students to safe agricultural practices and the use of tools and agrochemicals. Each chapter is filled with hands-on activities , making learning more interactive and joboriented.

The goal of the book is to prepare students for a career as skilled floriculturists by aligning the content with the National Occupational Standards (NOS). The book emphasizes sustainable farming, showing how a good balance of traditional and modern practices can boost both flower quality and farmer income. Special attention is given to soil health, nutrient management, and climate suitability for different crops. Students also learn about the commercial value of flowers in domestic and export markets. By linking textbook knowledge to realworld fieldwork, this resource builds both confidence and competence in young learners looking to enter the floriculture industry.

2.5. Agriculture Crop Recommendation System Using Machine Learning.

"Agriculture Crop Recommendation System Using Machine Learning" which was published by the Sathyabama Institute of Science and Technology, School of Computing, Department of Computer Science and Engineering, in Chennai, Tamil Nadu. It focuses on improving crop productivity for Indian farmers by recommending the most suitable crops based on soil and environmental data. The main issue addressed is that farmers often choose crops without considering soil requirements, leading to low yields. To solve this, the project proposes a smart system using precision agriculture techniques, which analyze soil properties like nitrogen, phosphorus, potassium, pH, temperature, humidity, and rainfall. Machine learning models specifically Random Forest and KNearest Neighbor are used in an ensemble approach to enhance accuracy and reliability. These models learn from historical agricultural data to recommend the ideal crop for given soil conditions.

3. METHODOLOGIES.

3.1. Data Collection Using Sensors.

To start, the system collects soil data directly from the field using sensors called Electronic Spices NPK and pH sensor which is used to measure essential factors like NPK (Nitrogen, Phosphorus, Potassium) values and pH levels of the soil. This data which is collected from sensor plays a major role in understanding soil fertility and helps determine which flowers will grow best in that specific land or to improve the soil quality to get a good yield on particular flower.

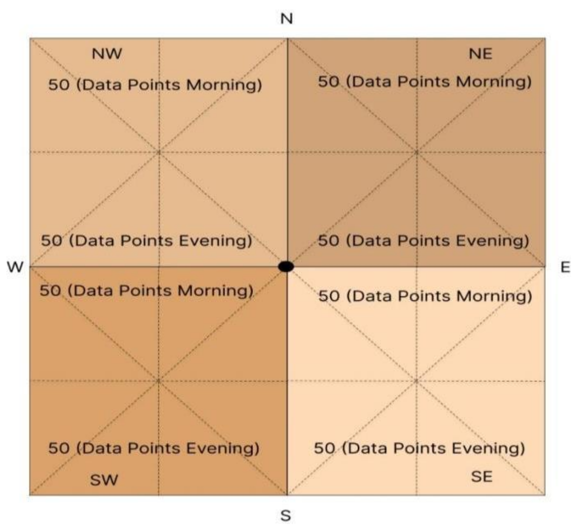

Fig: 3.1.1: Field Division for Data.

3.2. Data Input and Processing.

The collected data will be pre-processed and analyzed then the factors like NPK (Nitrogen, phosphorus, potassium) and other key factors like farm area, flower name these factors will be uploaded to the web application by zone-wise or overall farm**.** In alternative to AI and machine learning models this project uses the rule-based method for this web application. This method also uses some mathematical concepts to calculate the NPK deficiency in the soil based on the selected flower by the End-user and the rule-based method is used for the recommendation along with the flower farming insights.

3.3. Rule-Based Recommendation Engine.

In alternative to AI and machine learning models this project uses the rule-based method for this web application. This method also uses some mathematical concepts to calculate the NPK deficiency in the soil based on the selected flower by the End-user and the rule-based method is used for the recommendation along with the flower farming insights.

3.4. Output Generation.

After processing the input data, the system will give the detailed information on the recommendation such the identified nutrient deficiency along with the fertilizers name and quantity to be applied to the farm to improve the soil quality and for the better crop yield. In addition to this the system also provides the market information on the flower and farming methods which is best suited to the selected flower.

3.5. Web Application Deployment.

The entire system is built using Python and deployed as a cloud-based web application. This makes it easy to access from any device with an internet connection. The front-end interface is kept clean and simple, so even farmers with minimal technical knowledge can use it with ease.

4. IMPLEMENTATION.

Flower farming recommendation application represents on six popular flowers that are more grown in the Bengaluru regions: Rose, Chrysanthemum, Marigold, Tuberose, Gladiolus, and Crossandra. Roses are known for their colourful petals, rich fragrance, and wide range of colors, making them one of the most cultivated flowers. Chrysanthemums looks out for their variety in shape, size, and are morly stored for their long time. Marigolds are hardy, fast-growing plants that grown in different climates and are recognized by their bright orange and yellow colours. Tuberoses produce long, white, tubular flowers with a strong and beautiful fragrance, growing well in warm conditions. Gladiolus plants are admired for their tall spikes and layered blossoms that come in a wide spectrum of colors. Crossandra, a compact flowering plant, is noted for its striking orange blooms and ability to thrive in semi-shaded areas. Each flower has unique soil and nutrient needs, which the application analyzes to provide a better recommendations. This approach helps farmers grow flowers that are well-suited to their land, increasing productivity and sustainability.

4.2. System Design.

The process begins with the end user (Farmer/Field Assintant), typically a farmer or a grower, who wants to improve their flower farming practices using informed, data-driven decisions. The journey starts with the soil sensor setup, where sensors are installed in the field to collect essential soil data. These sensors are configured to measure key soil properties that directly affect plant growth.

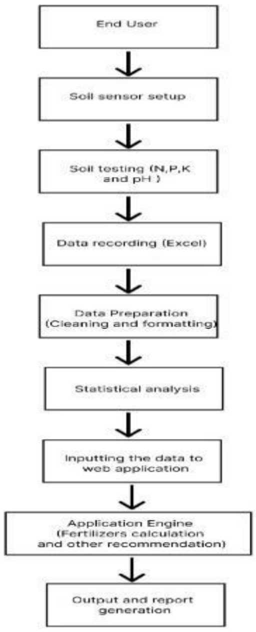

Fig: 4.2.1: System design

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Once the sensors are in place, the next step is soil testing, which involves gathering readings for NPK (Nitrogen, Phosphorus, Potassium) levels and pH value. These are critical nutrients and indicators of soil health, and knowing their levels helps determine what kind of flowers will thrive best in that environment.

After the test results are available, they are carefully recorded in a structured format typically using Excel sheets. This makes it easier to manage the data and ensures it's stored safely for the next steps.

The recorded data will be used data preparation, which involves cleaning and formatting. This means checking for errors, removing duplicates, increasing accuracy, making standardize units, and organizing everything neatly so the data is ready for proper analysis.

Once the data is clean, statistical analysis is carried out. Here, trends and patterns are studied to understand the condition of the soil better. This step helps in interpreting what the numbers really mean in terms of soil fertility and crop suitability.

After analysis, the results are inputted into a web application. This is the platform where all the calculations (uses specified formulas) and logic behind flower recommendations happen. The app is designed to take the cleaned data and process it through its backend engine.

When it comes the application engine, which is the main part of the system. It takes the soil data and runs calculations to recommend the right type of fertilizers, and also suggests the most suitable flower crops based on the soil's condition. This Application works using pre-set rules and formulas.

Finally, the system moves to output and report generation. A complete report is created for the user, detailing the soil status, recommended fertilizers, the best flowers to grow in that particular soil,and market demand for the particular crop. This report is such precise that it helps the farmer make easy , confident decisions for growing the crop.

4.3. Architecture.

The architecture represents the process of the Flower Farming Recommendation System works, starting from the field and ending with practical outputs for the farmer. The process involves multiple steps: hardware setup, data collection, analyze backend processing, and frontend output all will be working together to help farmers make easy decisions.

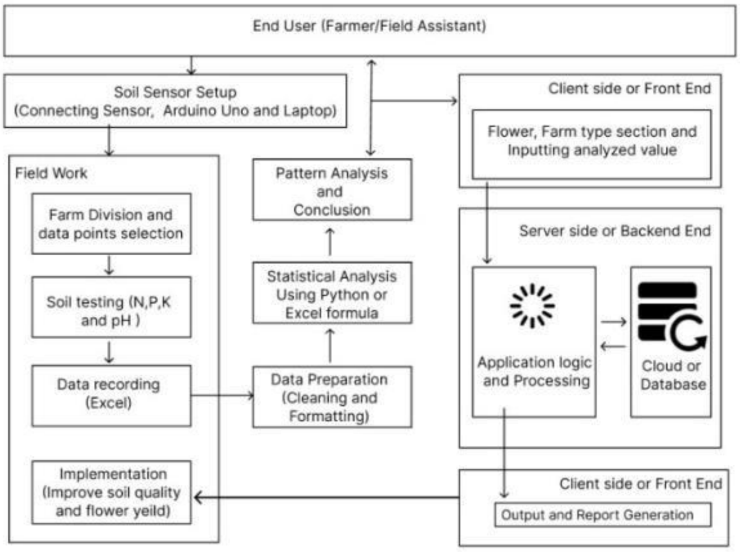

Fig:4.3.1: Architecture design.

4.2.1 : End User.(Farmer/Field Assistant).

The beginning process starts form the end user, who can be either farmer or a field assistant. They who are responsible for setting up the Hardware connections setup in the farm field to collect the data for the input.

4.2.2: Soil Sensor Setup.

The End User or field assistant setups the soil sensor, usually by connecting them to devices to an Arduino Uno and a laptop. This Setup is important for collecting requried soil data from different parts of the farm.That enables accurate measurement of key soil parameters.

4.2.3: Field Work

The field work begins with dividing the farm into smaller sections or zones equally , making it easier to manage and understand the soil conditions across different sections which uses the method called precision farming. From each of these smaller sections, points are carefully selected for collecting soil samples.After the data points are marked, soil sensors are used to test the required elements like Nitrogen (N), Phosphorus (P), Potassium (K), and pH levels in the soil. These values are very much required because they directly affect how well flowers can grow in the soil. After testing, all the collected data is recorded in an Excel sheet. This helps keep everything structured and ensures that no collected data is lost or missed.

When the data has been analyzed and the particular recommendations are generated, the farming will be done on the field . These recommendations guide the farmer on how to improve soil quality, fertilizer quantity,market demand of the crop. which in turn leads to healthier plants , better flower yields and profit for the farmer.

4.2.4: Data Preparation.

The collected raw data from field work will be analyzed, cleaned and formatted.

If any missing,duplicate,or inconsistent data will be analyzed and fixed, the data is structured or formatted properly that it can analyzed by manually or by system. This data prepartion is essential for maintaining the quality, usability and realiability of the soil information throughout the final process.

4.2.5: Statistical Analysis.

By using tools of Python scripts or Excel formulas, the cleaned data is analyzed to identify trends and connections such as which soil conditions leads to better flower yields. This analysis is more important for making accurate, personalized recommendations.

4.2.6: Application logic and influence of cloud and database.

All the logic falls under rule-based methodology where this application uses pre-defined rules to calculate the deficiency and quantity of the fertilizers to be applied to the farm.

Flower name	N	P	K
Rose	20	12	15
Chrysanthemum	12	39	19
Marigold	8	4	8
Tuberose	20	8	15
Gladiolus	20	20	20
Crossandra	5	10	6

Table:4.2.6.1: Minimum values nutrient of flowers.

$$\text{Nutrient Deficiency } (\text{g/m}^2) = \begin{cases} N_r - N_t, & \text{if } N_r > N_t \\ P_r - P_t, & \text{if } P_r > P_t \\ K_r - K_t, & \text{if } K_r > K_t \\ 0, & \text{otherwise (no deficiency)} \end{cases}$$

Fig:4.2.6.1: Formula for calculating Nutrients Deficiency.

$$\text{Fertilizer Amount (kg)} = \frac{\text{Nutrient Deficit } (\text{g/m}^2) \times \text{Area } (\text{m}^2)}{\text{Fertilizer Composition } (\%)/100}$$

Fig: 4.2.6.2: Fertilizer Amount Calculation.

Nutrient	**Fertilizer Name**	**Composition**
Nitrogen (N)	Urea	46% N
	Ammonium Sulphate	21% N
	Calcium Ammonium Nitrate (CAN)	26% N
Phosphorus (P)	Single Super Phosphate (SSP)	16% P_2O_5 (≈ 7% P)
	Di-Ammonium Phosphate (DAP)	46% P_2O_5 (≈ 20% P), 18% N
	Triple Super Phosphate (TSP)	44% P_2O_5 (≈ 19% P)
Potassium (K)	Muriate of Potash (MOP)	60% K_2O (≈ 50% K)
	Sulphate of Potash (SOP)	50% K_2O (≈ 42% K)
Mixed (NPK)	NPK Complex Fertilizers (e.g., 10-2626)	Custom % N, P_2O_5, K_2O ratios

Table: 4.2.6.2: Fertilizer compositions.

4.2.7: Conclusion.
After the Statistical Analysis is done, the patterns will be identified,which includes specific nutrients that are required or balance pH levels for flowers,this conclusions guide farmer or the user to take the further actions.

4.2.8: Development (Client side and Server Side).
The user (Farmer/Field Assistant) inputs the data,to the application which are like , Nitrogen, Potassium, Phosporous,(NPK) and pH Values taken by the Farm.
In the Server side or backend System of the system, the main engine also known as the application logic takes over the user inputs the analyzed soil data. This part of the application processes the information using pre-defined rules and scientific logic to generate personalized recommendations. It suggests the right type and amount of fertilizers, identifies which flowers are best suited for the current soil conditions, and may also provide additional advice to improve crop health and yield. Once this processing is complete, all the data including user inputs, analysis results, and recommendations is securely stored in a cloud server or a centralized database. This ensures the information is safe, easy to access anytime, and can be reused or referenced in the future for further farming decisions.

4.2.8: Output and Report Generation.
In the output, the frontend of the application shows a clear and well-structured output report to the user. This report provides a detail of the current farmsoil condition, giving the farmer a better understanding of what their land needs. Based on the analyzed data, the system also recommends the most suitable flower crops that are likely to grow well in that specific soil conditions. The report includes practical suggestions for improving

soil quality, such as the type and amount of fertilizers to use. Altogether, it offers a complete and easy-to-understand information of the farming that helps the user make future decisions for good flower farming results.

5. Conclusion And Future Works.

The Flower Farming Recommendation Application System is a future step in combining traditional agricultural method with modern technology to support farmers in making informed, data-backed decisions. By focusing on soil health mainly analyzing NPK levels and pH the system provides personalized recommendations for suitable flower crops,required fertilizers, market demand necessary soil improvements. This not only helps increase productivity but also ensures better use of land resources, resulting in healthier plants and improved yields. This smarter approach helps farmers to make well-informed decisions that lead to higher crop productivity, better crop quality, and more efficient fertilizers use.

In future, the potential for this system to evolve is higher. One of the most exciting prospects is the development of a complex, handheld device that can instantly test soil samples and provide real-time feedback. This innovation would eliminate the need for farmers to rely on manual data recording or wait for lab results and backend processing. With just a immidiate soil scan in the field, the device could immediately display recommendations for the best flower crops to plant, optimal fertilization strategies, and any necessary soil requirements. This would more reduce the time between analysis and action, which make farmers to respond fastly and precisely to their farm land needs.

Moreover, integrating this system with GPS and cloud technology could further enhance its functionality. Location-specific data could be stored and tracked over time, allowing for historical comparisons, seasonal predictions, and adaptive planning. With complex algorithms, the system could continuously improve its accuracy based on new data, offering even more acuurate recommendations as it learns from each interaction.

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