Multiutility Agricultural Motorized Bot

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Abstract— The project is to create on the Agricultural base including elementary operation related to farm. smart spraying using the two axis gimbal methods that will reduction pesticide and there is no damage the human health, farmers to be protected and labor strength can be reduced. The bot will detect the weather condition, then spraying mechanism system construction with servo motor module integration, including obstacle avoidance, the farmers most important thing is that the soil testing i.e. the fertility of soil means the main contain of soil is NPK. Then the nutrient content of crop seedling through its leaves known the farmer how health of the crop of plant is. when there is no main operation is needed to be farming then it should be use as the small vehicle trolley. not only for motion tracking and orientation monitor, but also for path errors compensation to achieve better stability and reliability. The bot will use as the multi-utility it operates the elementary operation. bot will be control through android app and give the result on the mobile screen. This bot should be drive to the motor and give the power DC using rechargeable battery this can charge with solar as well as the electrical AC grid. This project proposes a help farmer in agriculture.

Index Terms- NPK, Elementary, Gimbal, Nutrients, Spraying, Fertility

I. INTRODUCTION

India is an agriculture country and farmers are a heart of our society the primary source of income of our society is agricultural, which accounts for approximately 60% of the country's total population. The spray robot will be developed, including reproduction and analysis of problem avoidance, spraying and sensor incorporations. [1] The agriculture system must be forward-thinking to diminish the hard work of the farmer's solar powered self-governing multipurpose agricultural bot using Bluetooth /android app has been qualified investigation. The apparatus's used for above activities are exclusive and difficult to handle. So, the farming system in India should be stimulated by emerging a system which will diminish the man power and time.[2] The model signifies the innovative system by civilizing the agricultural processes like bot is advanced is give the command then automatically Plentiful operations will be accomplished in the agricultural field. [3] Proper safety measures and protective equipment are essential to minimize these risks. Pesticide spraying and fertilizer distribution are laborious work. The hard work of humans and animals can be substituted by advance mechanization which will be appropriate for small scale farmer for economical and effort point of view. So, developing such equipment which will satisfy all needs and to solve labors problematic. [4] Bot is planned to accomplish the basic functions required to accepted in farms. The bot starts its role by Cultivating. The field subsequently disperses the seeds over the tilled land and concludes the process by covering the planted seeds with earth. It uses basic devices like DC motors, stepper motor, relay and main controller. The mechanical strategy of the bot is also unassuming. It is involuntary to move out the above functions instantaneously. [5] These enhance the effectiveness of planting seed, applying pesticides, and mowing lawns, while also reducing the challenges associated with hand planting.

II. LITERATURE SURVEY & REVIEW

I. "IMPLEMENTATION OF REMOTE CONTROL FOR A SPRAYING ROBOT." Proceedings of the2017 IEEE International Conference on Applied System Innovation IEEE-ICASI 2017 - Meen, Prior & Lam (Eds) INSPEC Accession Number: 17058922

II. "SOLAR POWERED AUTONOMOUS MULTIPURPOSE AGRICULTURAL ROBOT USING BLUETOOTH/ANDROID APP" Proceedings of the Third International Conference on Electronics Communication and Aerospace Technology [ICECA 2019] IEEE Conference Record # 45616; IEEE Xplore ISBN: 978-1-7281-0167-5 INSPEC Accession Number: 18959783

III. "AUTOMATIC SOLAR POWERED GRASS CUTTER INCORPORATED WITH ALPHABET

PRINTING AND PESTICIDE SPRAYER" Published in 2018 International Conference on Intelligent Computing and Communication for Smart World (I2C2SW)Date of Conference: 14-15 December 2018 Date Added to IEEE *Xplore*: 13 February 2020 INSPEC Accession Number: 19361169

IV. MULTIPURPOSE AGRICULTURE MACHINE: APPLICATIONS AND USES Dogo Rangsang Research Journal UGC Care Group I Journal ISSN: 2347-7180 Vol-09 Issue-01 No. 01: 2022

AGRIBOT- A MULTIPURPOSE AGRICULTURAL ROBOT Published in 2017 International Conference on Intelligent Computing and Communication for Smart World (I2C2SW)Date of Conference: 17-23 December 2017 Date Added to IEEE *Xplore*: 15 February 202 INSPEC Accession Number: 12506940

III. METHODOLOGY

Once the battery supply is turned on, the ESP 32 model is ON it is connected to the Bluetooth model, then it has to connect with your smartphone. Once the boat is connected with your smartphone, it works as per the give the command to it. Then what work should we do automatically?

In this boat measure some Agricultural related parameters just like

- Present weather humidity & temperature
- Soil nutrients and fertility condition of soil,
- Nutrients Deficiency Symptoms on Leaves.

For example: -

i. If in case first former testing the soil fertility means the soil nutrients that is the fertility condition of soil these soil testing report give the former is very fast just in 10-15 second on the screen of smartphone.

ii. When the former harvest a crop in the field, some disease occurs on the crop i.e. the leaves of the crops tree start to fall in different colours means nutrients deficiency symptoms on leaves but how many amount of nutrients on leaves we don't know that is former are use the bot and gets the nutrients report in just 10-15 second on the screen of smartphone.

iii. When disease occurs on crop in the field i.e. know the nutrients deficient report the leaves of crop plant then former sprays the appropriate Pesticide. Its spraying mechanism designed for efficient and versatile. The bot mechanism is equipped with two nozzles and a 35-litter tank, enhancing its spraying capacity. a key feature is its ability to spray in both vertical and horizontal directions, achieved through a flexible range of motion spanning 270 degrees angle. It takes a farmer 40-45 minutes to spray a 35-litter tank when that farmer uses this bot.

iv. When a farmer wants to know how the weather is, he gives the command to the bot to check the weather and he immediately gets the report about the present temperature and humidity in the weather in just a few seconds i.e.10-15 second.

Then determines the parameters and above operation but agriculture has always been heavily dependent on the weather and weather forecasts.

- Pesticides spray.
- Seed sowing.
- Plowing.

The above work can also use this bot are particular time or duration but above all work are complete then bot wok like a mini trolley to carry goods these carrying capacity is minimum 65 to maximum 70 kg, when there is no work.

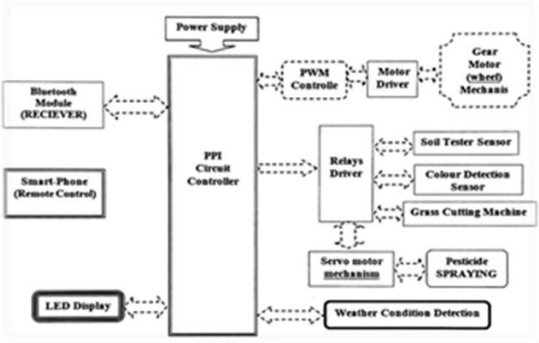


Fig. Block diagram

IV. PROBLEM FORMULATION

Existing System

Farmers work hard in the fields and play an important role for the communities living on this planet by cultivating crops to meet their needs. Many operations like sowing seeds, mowing, plowing, etc. are carried out in agriculture. Current methods of soil testing, seeding, pesticide spraying and trimming are problematic. The apparatus used for the above procedures is exclusive and problematic to handle. The planned robot is powered by solar panel or battery charging and functioned using Bluetooth/Android app. A farmer commands the robot through his smartphone. This robot is so useful to the farmer that once it is given a command, it automatically completes the work that is given the command. This reduces human activity. We can update it like E-bot acts as an Internet of Things (IOT) gadget that collects information from various sensors and gives the data to the client through Wi-Fi. This robot mostly analyzes the soil whether the soil is fertile i.e. how much content it contains, informs the DPC of nutrients in the plants, manages advanced pesticide spraying and mowing methods. It uses a microcontroller like ESP-32 40 pin to control and collect sensor data. Going forward, the farmer can create an intuitive system based on the Internet of Things (IoT) that is compatible with all kinds of soil by creating an IOT-proposed agricultural bot.

Proposed System

Multi-utility agricultural motorized bot will be design to. The farming system ought to be non- traditional to reduce the labor of the farmers. This model represents innovative system for civilizing the agricultural procedures such as bot is developed is give the command then automatically determines whether condition report, soil fertility means the soil nutrients report that is the fertility condition of soil, nutrients deficiency symptoms on leaves, and advance technically spraying and work as mini-trolley this is the robotic assistance. While doing traditional manual pesticide spraying, there is great damage to the human body and when this pesticide comes into interaction with the farmer throughout spraying, Pesticide exposure poses health risks to farmers, farmworkers, and nearby communities. Inhalation, skin contact, or ingestion of pesticides can lead to various health problems, ranging from mild irritation to more severe long-term effects. Proper safety measures and protective equipment are essential to minimize these risks. Pesticide spraying and fertilizer distribution are laborious work. Although this work is now necessary, farmers still find it a dangerous process. Therefore, we introducing an multi-utility bot which can do all sort of above things. This bot can operate by android app on smart phone using the Bluetooth module receiver. Only one person is needed. He can sit in one place and do the work of comfortably. Bot will be operated with smartphone or the RC transmitter model remote About 1 to 1.5 km distance will be Control the Robot. Low-cost robotic vehicle will rise efficiency, safety and demand in agricultural applications.

V. AIM OBJECTIVES

- Weather temperature for the future analysis.
- To estimate the fertility and nutrient status of soil for providing an index of nutrient accessibility or supply in a given soil.
- To measure nutrient, contain or the water deficit stress in plant leaves.
- To provide pesticides spray as well as grass cutting mechanism.
- It can be utilized as trolley.

VI. SURVEEY REPORT

A. SOIL FERTILITY CONDITION (NPK)

The NPK sensor is suitable of measuring the level of nitrogen, phosphorous and potassium in the soil, assessing soil fertility through the change in conductivity of these nutrients in the soil of different field crop.

i. COTTON FIELDS

The nutrient requirements for cotton plants vary depending on factors such as soil fertility, climate, and growth stage. However, as a general guideline, cotton field soil, the typical nutrient content can vary, but a rough estimate of nutrient levels might be around the nitrogen (N) 168 mg/kg average, nitrogen content in cotton plants ranges from 1.5% to 2.5%, phosphorus (P) 37 mg/kg. This content typically ranges from 0.2% to 0.5% of the plant's dry weight, and potassium (K) 254 mg/kg. This ranges from 1.0% to 4.0% of the plant's dry weight, with higher concentrations often

found in leaves and stems compared to roots content in cotton plants. These values can fluctuate based on various factors such as soil type, management practices, and environmental conditions.

ii. TOOR FIELDSS

The nutrient requirements for pigeon pea (Toor) plants, like any other crop, can vary based on factors such as soil fertility, climate, and growth stage. However, as a general guideline, the pigeon pea plants generally require a moderate amount of nitrogen for healthy growth and development. Nitrogen (N) content in pigeon pea plants can range nutrient levels might be around 29 mg/kg. Nitrogen (N), from 1.5% to 3.0% of the plant's dry weight during the vegetative growth stage, Phosphorus (P) is essential for root development typical 11mg/kg. This content can range from 0.2% to 0.5% of the plant's dry weight. And potassium (K) content in pigeon pea plants is plays a crucial role in various physiological processes in pigeon pea plants, including water regulation and stress tolerance 76 mg/kg. this content in can range from 1.0% to 2.5% of the plant's dry weight. Flowering and fruit set in pigeon pea plants. These nutrient percentages are approximate and can vary based on factors such as soil type, fertilizer application, and environmental conditions.

iii. HORTICULTURE FIELDS

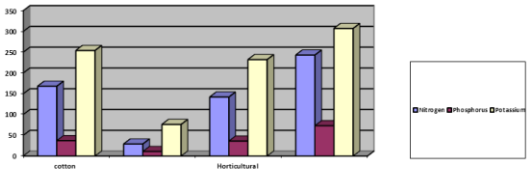
In horticulture, the nutrient requirements for plants can vary widely depending on the specific species being grown, as well as factors such as soil type, growing conditions, and growth stage. However, here are some general guidelines for the typical nutrient levels of nitrogen (N) 142 mg/kg this is content in plants can range from 1% to 5% of the plant's dry weight. However, some fast-growing leafy vegetables may have higher nitrogen content, while woody plants like trees may have lower nitrogen content, Phosphorus (P) plays a vital role in plant growth and stress tolerance, as well as in the development of fruits and seeds. And Potassium content in horticultural crops can vary widely depending on the species and growth stage. And Phosphorus (P) 36 mg/kg. This is content in plants typically ranges from 0.1% to 0.5% of the plant's dry weight. However, certain flowering plants and fruit-bearing crops may have higher phosphorus requirements during their reproductive stages. And potassium (K) content 232 mg/kg in plants can range from 1% to 4% of the plant's dry weight.

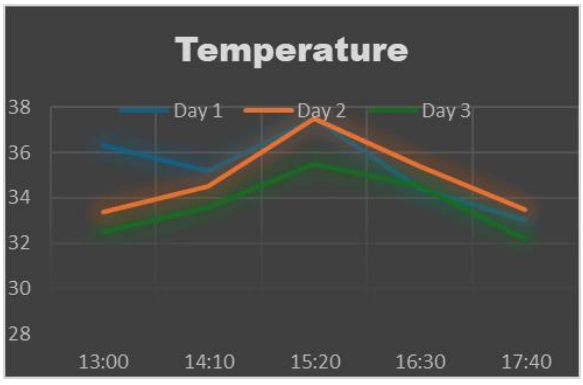
i. FLORICULTURE FIELD

In floriculture field soil, the nutrient content can vary depending on factors such as the specific types of flowers being grown, soil type, fertilization practices, and environmental conditions. Generally, floriculture soils are often enriched with nutrients to support the vigorous growth and vibrant blooms of flowers. Typical nutrient levels might range from 100-300 mg/kg of nitrogen (N), 20-100 mg/kg of phosphorus (P), and 100-400 mg/kg of potassium (K). However, these values can vary significantly based on various factors, and soil testing is recommended for precise nutrient management in floriculture.

NOTE: -

It's important that these nutrient percentages are approximate and can vary based on factors such as soil fertility, fertilizer application, and environmental conditions. Nutrient content can change throughout the growing season. Regular soil testing and plant tissue analysis can help determine the specific nutrient need of NPK.





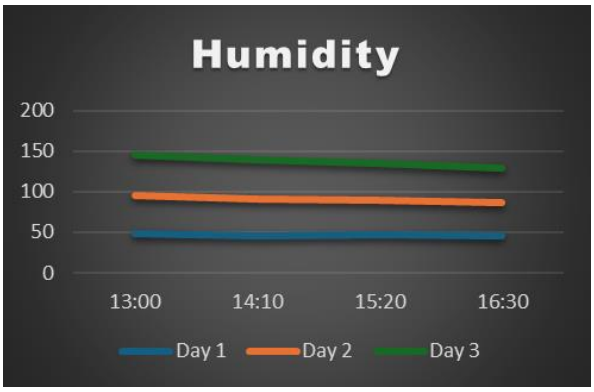


Fig. Weather monitoring analysis

B. PLANTS NUTRIENT DEFICIENCY

Plants depend on 16 vital nutrients for normal growth. When a plant does not receive enough of any of these crucial nutrients, it experiences a nutrient shortage. Inadequate levels of these essential nutrients result in poor growth and the plant often exhibits different signs indicating the shortfall.
Namely: Plants necessitate substantial quantities of nitrogen, phosphorus, potassium, sulphur, calcium, and magnesium.
Micronutrients, which can also be referred to as trace elements or minor nutrients
Namely: Plants need these elements in lesser amounts: copper, manganese, zinc, iron, boron, and molybdenum.

i. NITROGEN (N)
Nitrogen ranks as a primary nutrient frequently used in fertilizers. Plants absorb nitrogen in the form of either ammonium or nitrate, both of which can easily dissolve in water and be washed out of the soil. Plants require nitrogen to promote swift growth, particularly for the production of fruits and seeds. Moreover, nitrogen enhances the size and quality of leaves and hastens the maturation of plants.

Deficiency symptoms: The entire plant exhibits a widespread lightening to a pale green colour, known as chlorosis, before the older leaves begin to turn yellow, with this discoloration progressing towards the younger leaves. If these initial signs are not addressed, the plant become elongated and under developed, with weak, poorly developed shoots.

Fig. stating from the lower to upper leaves, whole leaves turn yellow.

ii. PHOSPHORUS (P)
Phosphorus ranks as the second key ingredient in fertilizers. Plants absorb this element in the form of phosphate. Essential for plant growth, phosphorus promotes photosynthesis, aids in the creation of proteins, supports seed sprouting, stimulates flowering, and is crucial for the development of buds. Additionally, it hastens the ripening process.

Deficiency symptoms: The undersides of mature leaves can exhibit a purple or bronze hue as a result of the accumulation of the pigment anthocyanin. Plants that are impacted by this condition grow at a much slower pace and are shorter in stature when compared to typical plants.

fig. *upper and lower sides of the older leave's discolouration in purple and bronze colour.*

iii. POTASSIUM (K)
Potassium ranks as the third primary ingredient in fertilizers. Plants absorb Potassium in its ionic form, but it is prone to being rapidly washed away from the soil due to leaching and run-off. Plants require Potassium to promote the creation of sugars necessary for synthesizing proteins, to facilitate cell division, and to support the growth of roots. Additionally, it enhances the plant's ability to withstand diseases.

Deficiency symptoms: Chlorosis along the margins of newly matured leaves, accompanied by interveinal browning and dead tissue extending from the edge to the central vein, indicates increasing deficiency. Even when potassium is supplied to plants, the yellowing caused by a lack of this nutrient cannot be reversed.

fig. *on the leaf edges of newly matured leaves there is browning and yellowing*

iv. MAGNESIUM (MG)

Magnesium serves as a key building block of the chlorophyll molecule. Plants require magnesium to support the function of enzymes involved in the production of carbohydrates, sugars, and fats, as well as in managing the uptake of nutrients. When magnesium is severely lacking, the growth pace of plants slows down, leaves become smaller, and the lower leaves may fall off.

Fig. compared to upper leaves with dark green veins, lower leaves are paler and chlorotic.

v. CALCIUM (CA)

Calcium is an essential component of plant cell walls, providing them with structural reinforcement. Once deposited, calcium does not move throughout the plant and stays in the older tissues during the growth period. Consequently, the initial signs of a deficiency are typically observed in the younger leaves and at the tips of leaves. Plants require calcium for the development of new growth areas and for the tips of their roots.

Deficiency symptoms: young leaves, shoots, and roots exhibit immature development. The newer leaves tend to curl downward, exhibiting a browning at the margins and tips. Certain plants may also display an atypically vibrant green in their foliage. The roots have become abbreviated and thickset.

Fig. *on comparison with older leaves new leaves are paler with stunted growth.*

vi. MANGANESE (MN)

Manganese serves as a catalyst for enzymes involved in nitrogen regulation. Plants require manganese for processes such as photosynthesis, respiration, and various enzymatic functions.

Deficiency symptoms: New leaves that are sprouting display a spread-out pattern of yellowing that is interrupted by vaguely distinct green regions surrounding the veins. Symptoms frequently include yellowing and the appearance of dead, spotted areas. When the deficiency is severe and without additional factors, the newly formed leaves tend to be smaller, and the tips may wither and die.

Fig.in younger leaves, there is yellowing between veins and broad green areas around veins

vii. ZINC (ZN)

Zinc is essential for the activation of plant growth regulators, primarily Auxin and Indole Acetic Acid (IAA). The presence of zinc is necessary to trigger these regulators and promote plant growth.

Deficiency symptoms: The emerging leaves exhibit symptoms such as chlorosis, bronzing, or a blotchy pattern. These immature leaves also show chlorosis between the veins, which is followed by stunted growth of new shoots characterized by shortened spaces between the nodes. Additionally, the leaves may be undersized and discoloured, resulting in a clustered, rose-like appearance in the impacted section.

Fig. Bronze spots and veins between yellowing in younger leaves

viii. BORON (B)

Plants absorb boron from the soil in the form of borate. This element is essential for cell differentiation at the active cell division sites found in the growing regions of plants.

Deficiency symptoms: Plants exhibit restricted growth and deformities. An increase in auxiliary branches, referred to as 'witches' broom,' becomes apparent as the primary stem ceases to grow, allowing the horizontal shoots to remain dormant. This phenomenon is recognized as the breakdown of apical dominance. Flowering bushes experience a transformation in new foliage, turning a deep green, and produce small, rigid leaves that are curled or crinkled with limited space between nodes..

Fig .They will break and drop eventually as leaf buds are discolored.

VII. RESULT ANALYSIS

SOIL TESTING CAN HELP

- Optimize crop production.
- Avoid excessive fertilizer use.
- Make informed fertilizer decisions.
- Improve nutritional balance.
- Increase crops yield.

NUTRIENTS DEFICIENCY

Plant require an adequate supply of vital nutrients to thrive, and a lack of these nutrients, such as Nitrogen (N), Phosphorous (P), Potassium (K), Magnesium (Mg), Calcium (Ca), Manganese (Mn), Zinc (Zn), and other, can lead to poor growth and a range of deficiency signs.

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