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Nutrients detection in the soil: Review paper

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Abstract

This paper specializes in analysing the content material of micro nutrient and macro nutrient present in soil. Soil plays a critical position in the discipline of agriculture. The amount of vitamins available to the roots of the plant is the principle element limiting the yield of plants. depending on those oil type, weather and crop grown during previous years the fertilizer requirements range inside a field and for the duration of the year. The Macro nutrients (Nitrogen, Phosphorous and Potassium) and Micro vitamins (Iron, Zinc, and Copper) are crucial for healthful plant boom. Macro nutrients are wanted in big amount and micro nutrients are wished in smaller amounts. Both micro and macro vitamins are obviously acquired by means of the roots from the soil. There are one of a kind principles of soil pH detection strategies and technologies. Soil pH is a key parameter for crop productivity. Soil pH influences the soils physical, chemical and biological houses and for that reason plant boom. Soil pH is a measure of hydronium ion (H⁺) attention traditionally tested in labs to determine how plenty fertilizer to apply to the sphere. in addition, they may be used to display the impact of past fertility practices on changes in a area's nutrient popularity. Sensing all the above parameters is feasible with the optical diffuse reflectance sensing, electrochemical sensing and electro conductivity sensing. adding nowadays's era closer to agricultural fields a actual time Embedded based soil analyser can be evolved with short and reliable automated device which is used to analyse diverse soil nutrients with the help of pH cost. As in line with the provision of vitamins, tips of cultivating the particular crop and right fertilizer will be given.

Keywords: Soil nutrient detection, nitrogen, phosphorus, potassium, micro nutrient and macro nutrients in soil

1. Introduction

The soil macro nutrients, Nitrogen (N), Phosphorous (P) and Potassium (K) are essential elements for crop growth. The application of commercial N, P and K fertilizers has contributed to a tremendous increase in yields of agricultural crops that feed the world's population. However, excessive use of these fertilizers has been cited as a source of contamination of surface and ground water. Ideally, application rates should be adjusted based on estimates of the requirements for optimum production at each location because there is high spatial variability of N, P and K within individual agricultural fields. Healthy soil forms the foundation of the food system in India. A healthy soil produces healthy crops. Maintaining a healthy soil demands care and effort from farmers. In the recent years, a declining trend of total factor productivity and compound growth rates of major crop and low nutrient use efficiency have been observed primarily due to deterioration of soil health.

The main reason of soil health deterioration are

- Wide nutrient gap between nutrient demand and supply
- High nutrient turnover in soil- plant system coupled with low and imbalanced fertilizer use
- Decline in organic matter status
- Emerging deficiency of secondary micro nutrients
- Nutrient leaching and fixation problems
- Soil pollution and soil acidity etc. Deficiencies in micro and secondary nutrients in soil lead to mineral deficiency disorders. Therefore, to enhance sustainable production, timely testing of soil nutrients and prevention and soil degradation through improved soil health is important.

This paper describes the use of wireless sensor network technology to decide the extent of soil vitamins. since no validated economic technique has been yet devised to efficaciously and

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effectively allocates chemical compounds to meet crop desires, substantial strength waste takes place in utility of agriculture chemical compounds consequently chemical substances and fertilizers are carried out in uniform amount regardless of nearby adjustments in soil chemical circumstance. wi-fi sensor networks are extensively used in agriculture to increase the productiveness and screen diverse bodily and chemical properties of the soil. diverse sorts of sensors are used which plays numerous duties like water tracking, soil moisture tracking, tracking of soil chemical degree and weather change consequences. The sensor networks in this paper senses the soil chemical situation in actual time and as per the measured deficit or extra chemical circumstance, appropriate amount of fertilizer and compost are carried out to the soil.

Literature survey

All through the 1990's hobby in soil nice and expertise its significance has come to the vanguard of environmental sustainability. The phrases soil excellent, soil degradation, soil fitness, soil resilience are getting used extra frequently and with greater urgency in connection with techniques to protect our international environment. The need to enhance our exceptional of lifestyles and protect many scarce herbal sources are forcing society to realise the importance of there soil aid. but, soil excellent and land control each have direct have an effect on water and atmospheric nice and by way of extension to human and animal health. whilst reputedly a simple concept, soil pleasant has been tough to define and more difficult to quantify.

Soil is a mixture of weathered rock fragments, minerals and organic count number that are on the earth's surface. It affords a "home" to infinite microorganisms, invertebrates, and plant roots. Its intensity varies from a few inches to numerous toes. Soil offers nutrients, water and bodily guide for the plants. it is also a supply of air for plant roots. Roots located in the soil are nature's number one recyclers which flip lifeless cells and tissue into vitamins, energy, carbon dioxide and water to gas new life. Soil is a precious useful resource as a foundation of plant growth. a few farmers and different land managers have soil analysed for nutrient tiers. commonly, soil assessments have increases to high degrees within the remaining several decades. As stated in advance, a few soils are natively high in positive nutrients.

The vital plant nutrients consist of carbon and oxygen that are determined from the air, where as different vitamins which includes hydrogen are typically acquired from the soil. Micro nutrient concentrations are normally higher in the surface soil and reduces with soil depth. no matter the excessive attention of maximum micro nutrients in soils, only a small fraction is available to vegetation. Micro nutrients, also known as hint elements, are required in micro quantities but there lack can motive critical crop production and animal fitness trouble. plants range considerably in their reaction to various micro vitamins. Micro nutrient deficiencies are greater not unusual in humid tropical areas, in addition to in humid temperature areas, because of severe leaching related to high precipitation. Deficiency signs and symptoms for maximum micro vitamins appear on the more youthful leaves at the top of the plant, in which as toxicity signs usually appear at the older leaves of the plant.

The micro nutrients are Boron (B), Chlorine (Cl), Copper (Cu), Iron (Fe), Manganese (Mn), Molybdenum and Zinc (Zn). Those plant meals factors are used in very small quantities, but they're simply as essential to plant

development. Boron: it's miles crucial for the motion and metabolism of sugar within the plant and synthesis of plant harmonic and nucleic acids. It additionally functions inside the lignin formation of cell partitions. Chlorine: it's miles vital for osmosis and ionic balance; it also plays a function in photosynthesis. Copper: it is a formation of cellular partitions. concerned inside the photosynthesis respiratory and methods within the plant concerning nitrogen. Iron: it's far concerned in photosynthesis, breathing and chlorophyll formation and plenty of enzymatic reactions. Manganese: It is part of enzymes and is also worried in photosynthesis and root growth. it's far worried in nitrogen fixation. Molybdenum: it is worried in nitrogen fixation and nitrification. Zinc: It is a part of organic complexes and DNA proteins. it is an essential enzyme for protein synthesis. Zinc is developed in the increase of harmonic production and seed development.

The Macro nutrients are important elements utilized by plant life in quite massive amount for plant growth is known as macro nutrients. The primary macro nutrients are Nitrogen (N), Phosphorous (P), Potassium (K). Calcium (Ca), Magnesium (Mg) and Sulphur (S) are also macro vitamins. All six nutrients are important ingredients in soil that sell plant growth. Concentrations of those macro nutrients in the soil are generally decided before the web page is sent. further to macro nutrients, there are numerous hint factors which might be vital for plant boom. those trace elements are wished in smaller portions than macro vitamins. If the trace detail is required for plant boom it's far called micro vitamins. those consist of Aluminium, Arsenic, Boron, Cadmium, Chlorine, Copper and others. Nitrogen: it's far an important for a boom due to the fact it is a major part of all amino acids, which are the building blocks of all proteins, together with the enzymes which manage definitely all organic processes. an awesome deliver of nitrogen stimulates root increase and improvement, as well as the uptake of other nutrients. Phosphorous: It complements many aspects of plant body structure, including the essential tactics of photosynthesis, nitrogen fixation, flowering, fruiting and maturation In plant, it's far gift particularly as a structural factor of the nucleic acid, deoxyribonucleic acid (DNA) and ribose nucleic acid (RNA). it is found in each natural and inorganic bureaucracy, each of which are with ease translocated within the plant. All energy transfers inside the cell are severely dependent on phosphorous is focused at the most actively developing factors of a plant and saved within seeds in anticipation of their germination. Phosphorous is to be had to flora in restricted portions in most soils due to the fact it is launched very slowly from insoluble phosphates and is hastily fixed once more.

Potassium: It happens in all elements of plants in considerable amounts. Potassium is important in leaves and at growing factors. It is splendid amongst the nutrient elements for its mobility and solubility inside plant tissue. Potassium regulates the outlet and ultimate of the stomata by means of a potassium ion pump.

Calcium: Calcium in plant life takes place mainly in the leaves, with the decrease awareness in seeds, fruits and roots. A principal characteristic is as the constituent of cellular walls. The nutrients worried in photosynthesis and plant shape. Magnesium: it's miles the constituent of the chlorophyll molecule. when deficient is translocated from older to younger tissues, so that signs and symptoms of deficiency appear on the oldest first and then spread steadily

to more youthful tissue.

Sulphur: It is structural thing of a few amino acids and vitamins and is crucial in the manufacturing of chloroplast. symptoms of deficiency consists of yellowing of leafs and stunted growth. The soil pH measurement is also one of the important parameter for the measurement of vitamins inside the soil. it's far used to measure the acidity or alkalinity of soil. The pH values for the one-of-a-kind vitamins are distinct.

Conclusion

Growing concern about environmental pollution by excessive use of fertilizers lead to increases in needs to monitor soil nutrients required for crop growth. The sensor network technology will help the farmers to know the soil requirements which will help them take better decisions and preventive measures at the right time. This will lead to tremendous improvement in the crop productivity. This, intern, will save there time, labour, money and make effective use of resources.

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