Smart Agriculture based on Internet-of-Things (IoT)

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ABSTRACT: ***Despite the perception people may have regarding the agricultural process, the reality is that today's agriculture industry is data-centered, precise, and smarter than ever. The rapid emergence of the Internet-of-Things (IoT) based technologies redesigned almost every industry including "smart agriculture" which moved the industry from statistical to quantitative approaches. Such revolutionary changes are shaking the existing agriculture methods and creating new opportunities along a range of challenges. This article highlights the potential of wireless sensors and IoT in agriculture, as well as the challenges expected to be faced when integrating this technology with the traditional farming practices. IoT devices and communication techniques associated with wireless sensors encountered in agriculture applications are analyzed in detail. What sensors are available for specific agriculture application, like soil preparation, crop status, irrigation, insect and pest detection are listed. How this technology helping the growers throughout the crop stages, from sowing until harvesting, packing and transportation is explained.***

KEYWORDS: ***Approaches, Agricultural Process, Modern architectures, Internet-of-Things, Smart Agriculture***

INTRODUCTION

Agriculture is the main source of livelihood of many people in different parts of the world. It is the most important occupation of many families in India. Approximately 60% of the land can be ploughed and used to grow crops such as rice, potato, wheat, onion, tomato, mangoes, sugar cane, bean, cotton, and cereals etc. Unfortunately, farmers are still reliant on traditional techniques that have evolved hundreds of years ago. Due to this the yield of crops are becoming low. Also there are a number of factors that contribute to the low yield of crops such as proper soil preparation, seed rate, seed cultivar, different sowing time, lack of moisture in the fields, water logging and salinity, lack of application of fertilizers, plant protection, adoption of modern technologies, improper marketing and lack of investment. Farmers suffer large financial losses because of usage of incorrect irrigation mechanisms, insect pests and attack of plant diseases, usage of uncalculated amount of pesticides and insecticides, and wrong prediction of weather. For getting higher yield on crops, monitoring is the vital task for the farmers. Due to the various constraints involved in agriculture, there is an urgent need to develop enhanced and economically realistic strategies in growing of crops[1]. The whole population growth listed is projected to happen between developed countries. In the opposite, the urbanization pattern is likely to continue accelerated speed, with some 70% of the world population an associate editor who coordinates and approves the review of this article Kun Mean Hou was to be released[2]. Tion was expected to be metropolitan until 2050 (now 49%). In comparison, the wage ranges are multiple now that will further drive demand for food, especially in developing nations. development countries[3].

This would raise the number of nations carefully about the consistency of their diet and food; Preferences can shift from grain and wheat to legumes and to beef afterwards. To supply this bigger, more urban area, food production could double and the wealthier population the present of 2.1 billion in total the annual production of cereals should impact around tonnes the annual production of meat could rise by 3 billion tonnes to suit the demand for more than 200 million tonnes[4]. Tons 470 million not only for food, but also for crop production. Crops such as cotton, rubber and gumare have a vital role in industry; indeed, they play significant roles in many nations' economies. In addition, the demand for bioenergy dependent on food crops began recently to expand[5]. Just 110 million tonnes of coarse grains were used in ethanol processing until ten years (10% of world production approximately) sadly, just a small part of the surface of the planet is ideal for farming because of different drawbacks, such as temperature, atmosphere, consistency of fertilizer and soil the most appropriate places are not standardized.

Many new habitats and plant forms are zoomed into the variety differences that can be hard to calculate and continue to emerge. In addition, the land available is formed by factors including land and environment cycles, political and economic and density of population, though urbanization is continually rapid threats to arable land supply. In the last year's total farmland for food production for decades there was a decrease[6]. The overall arable land in 1991 19.5 million square miles (39.47% of food production) were available. Land region of the world) that has been limited to about (37.73 per cent of the global area of the earth) 18.6 million

square miles 2013 this is why demand-supply is split into food becomes increasingly important and disturbing time's passage. Further research shows that every area of the crop has different characteristics which can be calculated separately as well as quantities.

Essential features, such as soil form, presence of nutrients, movement of water, resistance to pests, defining the appropriateness and skill of a particular crop in certain cases, features are distinguished there can be one crop area, even though the same crop is being grown in whole farms; hence site-specific assessments Optimum yield output is required. In addition to the period dimensions, special crops rotate in the same area season to year and enter various phases of the biological stage in areas where local and temporal fluctuations lead to unique criteria for growth to maximize crop production, their cycle shall take a year[7]. Actually satellites supplement agricultural services. Sensors can be set up and data collection can begin in a fast period of time, this is then almost online available for further study right now. Cultivation and site-specific sensor technologies farming facilitates the reliable compilation of data from each site.

This article is a facts compendium that will support researchers and engineers for agriculture IoT-based technology for the smart agriculture that we like. It is structured as follows the rest of this paper. Section II offers an insight into the key applications IoT and what we can do in agriculture. These technologies. Section III offers an insight into the IoT's position, such as vertical in advanced farming agriculture, phenotyping and hydroponics to handle questions about the growing urban population highlights of Segment 4 different systems and machines such as cameras, robots, the IoT industry is being used for tractors and networking systems. The importance of UAVs is acknowledged section V of precision agriculture addresses achievements that cannot even be accomplished by the use of such new technology. Other key areas are food safety and transportation to fix hunger concerns that have not arisen get the researchers' attention as they deserve. Division VI provides IoT's position in guaranteeing food quality.

DISCUSSION

Major Application:

By using the latest technology in sensing and IoT every element of traditional agriculture in agricultural practises basically, processes may be updated. Seamless at present in smart agriculture, combining wireless sensors and IoT will increase agriculture to previous levels. Inconceivable. IoT will continue to strengthen the solutions of many conventional ones by adopting the practise of intelligent agriculture agriculture challenges such as erosion, yield optimization, land appropriateness, drainage and management of pests.

A. Soil Sampling and Mapping:

Soil is a plant's "stomach" and its sampling is first analysis phase in order to obtain field-specific knowledge, that is then used to make some important decisions at various points soil research is primarily planned determine the state of a field nutrient to allow for steps where nutritional shortages are detected, be taken accordingly. An annual full soil test is recommended. Basis, preferably in spring, but dependent on soil and conditions it can be rendered in fall or winter with the permission of weather. The soil type, growing history and application of fertilizer are the main factors to the study of soil nutrient content; level, topography, etc. irrigation these considerations are obvious chemical, physical and biological environments a ground that can define the limiting factors thus be handled. Soil mapping unlocks the seed door in a particular area to best balance soil diverse crop varieties assets, such as seed health, seed time and even, as some are firmly planted and other planting depth fewer. In addition, multiple crops may also be grown together to make the most of the smarter use of agriculture resources resources[8].

B. Irrigation:

Around 97% of the world's water is oceans and salt water seas and freshwater is just 3%, above and above 2/3 of the shapes of the glaciers are frozen and Caps for polar ice. Just 0.5% of the new frosted water is in the air or above the ground, the remainder lying in the ground in short, mankind depends on this 0.5% to conserve the environment as sufficient, all its requirements in rivers, reservoirs and the like, fresh water must be preserved thanks to finance. It should only be noted that around 70% of this available fresh water is used for agricultural industries. The condition is rising to 75 percent in many nations, for example. Brazil, in some countries more underdeveloped, it's also over 80%. This high water is the main factor. Consumption is the follow-up protocol in 2013, as well, visual inspection of crops for decisions about irrigation was most popular

after almost 80% of US farms were that was observed different regulated irrigation systems, e.g. including the irrigation with sprinklers, to tackle waste concerns that have also been observed in conventional water furrow drainage and irrigation techniques. The two quality and quantity of crops are severely impaired water scarcity contributes even to waste, as intermittent irrigation, lower soil nutrients and cause multiple microbial infections[9].

C. Fertilizer:

A fertilizer is a natural material or chemical that can be used to provide essential growth and fertility nutrients plants. Three key macro-nutrients are required by plants: the leaf grows; the root, flowers, and phosphorus fruit production; stem growth and water movement potassium (K). Fruit development. Any shortage or excessive application of nutrients may be extremely damaging to the plant. Health above all, the overuse of fertilizers is not just essential results in financial damages as well as adverse consequences by diluting soil content, to soil and climate, poisoning groundwater and helping the global ecosystem modifications[10].

D. Croup Diseases and Pest Management:

The diet and the food the FAO reports 20 to 40% Agriculture Association (FAO) of global crop yields from pests and diseases are annually lost. To control these major losses in quality, pesticides and significant components of and other agrochemicals has become last century's agricultural sector. It is determined around half a million tonnes of pesticide are available per year. Used alone in the US, though over two million tonnes are available used internationally This pesticide are mostly risky heavy, perhaps permanent, human and animal health; environmental consequences that eventually cause full habitat pollution[11].

E. Yield Monitoring, Forecasting and Harvesting:

The mechanism used to evaluate different yield monitors appropriate farm production, such as grain mass flow, content of humidity and volume of cereal harvested. It will improve to determine the crop yield and moisture correctly by recording degrees to determine how good and what to do with the crop that's right next. Yield tracking, not just at harvest but also before harvesting is an important part of precision agriculture. This plays a key role in controlling the yield output. Return many aspects, e.g. enough pollination, decide efficiency especially when predicting seed with good pollen renders in shifting circumstances

CONCLUSION

In this paper, design and implementation of a novel wireless mobile robot is designed and implemented. It is equipped with various sensors to monitor different environmental parameters that are suitable for crop yield. Monitoring of crops wirelessly allows reducing labor costs and also helps to track the changes accurately occurring instantly in real time at the field. The proposed system is capable of controlling the essential parameters necessary for plant growth. So this proposed smart agricultural system of farming is user-friendly and highly robust. New methods for enhancing the production and management of crops can be established easily See now: technology-weaned, younger and creative agriculture as a form of being used as a profession freedom from fossil fuels, crop growth monitoring, security and marking of nutrition, farmers' partnership, providers, dealers and purchasers.

This paper takes all into account. These aspects and the position of different technologies have been emphasized, IoT in particular to make agriculture smarter and more productive to fulfil future standards more effectively. To the end, UAVs, Cloud Computing, networking, wireless sensors. Technology is extensively discussed. In comparison, a deeper one latest analysis activities are provided with insight. Moreover, different architectures and platforms based on IoT are accessible regarding uses for agriculture. A review of the emerging problems and priorities of the sector identified for researchers and engineers to provide guidance it can be inferred from all this that every inch of to increase crop yield, agriculture is critical.

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