

A REVIEW : SMART FARMING USING INTERNET OF THINGS

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Abstract—The need for increase in food production is necessitated to feed ever increasing world population. The summons of contest is that increasing of food production with shrinkage of the working labour in agronomic parts and the rising production cost through intensive agricultural interventions is becoming a major concern[1]. To enable this challenges, smart farming is a farm management approach where Internet of Things (IoT) is used to overcome this concern. Smart farming[2] is an approach that intend to communicate information and communication technologies as facilitator of profitable farming operations. Smart Farming system is noticed as a gizmo focusing on the live monitoring of environmental data in conjugation of temperature, moisture and other types depending on the sensors integrated with it. The model hands over the concept of “plug and sense” methodology in which the user can directly implement smart farming by putting the system in the field and getting live feeds on various devices like smart phone, Tablet and others and the data generated via these sensors can be easily shared and viewed by agriculture consultants anywhere remotely through Cloud Computing technology integration. This project pave farmers to change themselves from conventional to automated way of farming which will lead to production of good quality of crop produce which will enhance the revenue generation. The effigy contribute's to the generic nature and the transformation by individual farmers is nominal. In the era of food scarcity this will help us to provide third green revolutions by not modifying the yield but involving automation in agricultural practices. This paper is the semantic review of the abstract on the smart farming with IoT. The major concern of the contest is delivery of the meaningful information in near-real-time. This paper focuses on the platform, network protocols, processing data and the applicability of smart farming with IoT to agriculture. The classic access shows the data used in the reactive manner. In todays modern era where technology pave the lifestyle, new technological development enables data to over come crop issues and reform the certainty of crop diagnosis. Thus, this paper presents the analysis of the effigy of farms management which underpin the future of smart farming as a technology which inculcate automation in agriculture.

Keywords—Precision agriculture, Smart Irrigation System, Smart controlling System, Wireless Sensor networks, IOT.

INTRODUCTION

In 21st century the rapid increase in the population round the globe is a major concern to feed the burgeoning population growth[3] that tends to increase year after year. In this regard the food production paradigm that is scarce puts us in major stress. Regardless, it is predicted that by 2050 the world's population will increase from 7.8 billion to approximately 9.8 to 10.2 billion people which will lean on the world's biodiversity to endure a healthy lifestyle nevertheless, there will be increase in demand for dedicated food production. In India, agriculture plays a very pivot role in one's livelihood. Agriculture is the main source of livelihood for about 70% of India's population to be precise with 18.2% contribution to the gross domestic product (GDP) where 52% of jobs are dependent on agricultural practices. Now the major concerns faced in vast agricultural areas is the inadequacy of mechanisation for the agricultural operations. Basically, In India the rate of literacy in agronomical areas is less due to which the agricultural practices are carried out by the manual labour by using tools like plough, sickle so on and so forth.

In recent years, smart technologies to improve agricultural interventions and improve crop production and quality is the need of the hour. The smart farming system will reduce the manual labour and will allow farmers to move from the conventional to automated way of agricultural practice. In today's era owing to food scarcity and to become sustainable, this project will help in increasing the total yield by not changing the main composition but by involving digitalisation in farming sector for controlling the harsh effect of external factors (humidity, weather, moisture etc.) affecting the crop production. The curb in the global digitalisation that plays a very rigid role, wherein digitalisation busted in almost every sector that it is a high time to incorporate automation in agricultural sector. This project focuses on the live monitoring of the crop. Internet and mobile networks play a pivot role in agriculture as this project is concerned on the live monitoring of the crop. The availability of the internet will allow agriculture information service related and searchable and abreast on the mobile phone whenever and wherever a farmer requires it. In recent development in technology is in the areas concerned by IoT addresses an easier adaptation and use of smart farming with IoT. This include reduction of hardware size, optimization of power consumption and devices pricing.

Smart farming is the concept which revolve around management of farm with modern information and technologies to increase the quantity and the quality of the yield with minimisation of human contact.

Technologies used are :

- Sensors: soil, water, light, humidity, temperature management
- Connectivity: cellular, LoRa, etc.
- Location: GPS, Satellite, etc.
- Data analytics: analysing data , adding predictions .

The main components used:

- Soil moisture sensor[SM150T]: Soil moisture sensors can be stated as sensors that estimate volumetric water content that is the accurate amount of water needed to the plant. It's measuring range temperature 0.....-60°C, accuracy 0.5°C.
- Ldr (light sensor): Light plays an important factor in the growth of plant hence, These devices are used only where there is need to presence and absence of light is required. These resistors are used as light sensor.
- BMP 180 (Atm sensor): These devices enable the negative environmental externalities therefore designed to measure atmospheric pressure. The basic principal of this device is to weigh the air base.
- DHT 11(temp nd humidity sensor):Round the world , climatic conditions vary hence this sensors are used to calculate the temperature and humidity . This sensor is basic, ultra low-cost digital temperature and humidity sensor. Its uses a capacitive humidity sensor and thermistor measure the surrounding air. This sensor can measure temperature from 0°C to 50°C and humidity from 20% to 90% with an accuracy of $\pm 1^\circ\text{C}$ and $\pm 1\%$. So if we are looking to measure this range then this sensor might be the right choice for us.
- Water pump : To overcome the problem of excess water usage . Water pump will optimise the water usage .

The major concern of use of automation is to provide solutions for farming which include following common application :

- Crop monitoring.
- Disease prevention.
- Soil management.
- Supply chain traceability[4] .
- Irrigation control. [5]

The major concern is to minimize the negative environmental externalities[6] to improve the yield ,for that wireless sensor network comes handy which can handle different activities in the area and provide suitable information with respect to soil moisture ,temperature ,humidity etc. climate change have changed the out look of weather condition . Due to the prevailing weather conditions[6] , their is a increase of water level which can not be overcome with the help of traditional manual farming hence smart farming is the solution for healthy farming practice thereby the water level can be managed by the farmer in both automatic or manual by

using mobile application .While , IOT technology in agriculture is so efficient as it provides global connectivity through any device , minimum human efforts , faster access, time efficiency , efficient communication this all makes the technology favourable[4].

Smart farming is emerging topic in todays era, hence, research for the same is the recent trend in which implementation of IOT in smart farming is the major concern. Wireless sensor network (WSN) technology has rapidly evolved over the years enabling a spectrum of applications such as military, industry, agriculture and healthcare[7] .As a result many technology company indulge themselves into digitalisation in agriculture sector .

LITERATURE SURVEY

1. Towards smart farming: Systems, frameworks and exploitation of multiple sources Anastasios Lytos et.al [2019]

In this paper the author shows the main concern on the food security problem. In the world where we have sufficient food to feed then to some can not avail the same , the reason is simple the management of food is not up to the mark due to various negative environmental externalities .

In whole the agriculture sector focuses on various areas from soil fertility and water management to food availability and cooperate modelling .hence this paper covers the various problems and evolution of IOT and big data in agricultural sector. In this author have shifted focus on the data collection and implementation of the same technically with the help of big data . This paper draws the line on how digitalisation of agricultural sector can lead to increase of food productivity and sustainability. although from recent times the productivity is not a big concern but sustainability immersed as the major issue which can not be neglected.

1.1 Agriculture systems and frameworks

As digitalisation hit the whole world, In every sector from banking to agriculture there are tons of new technologies in the market . The latest technology that fully utilise the concerned need is to develop an application to handle heterogeneous data , perform data analysis and offer personalise interfaces . In this section the author presented the evolution of agriculture system through time, starting from simple rules and ending up to data-driven approaches.

2. A RESEARCH PAPER ON SMART AGRICULTURE USING IOT

Ritika Srivastava et. al.[01 | Jan 2021]

In this paper the author focused on Precision agriculture with respect to IOT and wireless sensors network where they have designed automated Precision agriculture system which lower the rate of time and resources as compared to manual way. This paper show the cancer on the use of the IOT technology and its use . The gizmo also

measure moisture of soil and level of water for health irrigation. The system perform good in ideal conditions and give real time outputs.

2.1 Implementation of IOT in the field of smart agriculture :

The system is built for monitoring the field and providing the real time solution , due to various negative environmental externalities like extreme weather conditions , rising climate change have impacted the whole conventional way of farming.

2.2 Implementation of Soil moisture sensor in smart agriculture:

The volumetric water content in soil is measured by the soil moisture sensor. soil moisture is affected by the reflected microwave radiation and use of remote sensing in hydrology can overcome it.

Good irrigation administration gives healthy crops, use less inputs, and rise the productivity. Soil dampness sensors offer assistance irrigators to get it what is happening within the root zone of a crop.

3. A Systematic Review of IoT Solutions for Smart Farming

Emerson Navarro et.al [2020]

This research paper focuses on the semantic review adaptation of IOT in the agronomic sector identified the main applicability of IOT as an emerging technology . This paper shows different protocols which may be used in stimulations in IOT for smart farming. review paper states the comparison between types of network connections used in IOT for smart farming i.e wired networks for Indoor scenario and wireless for outdoor scenario. Wired network connection are generally used on indoors as the physical components are less used as climate is less influenced whereas in wireless network connection external factors influence the crop, In fact wireless can be used in both the scenarios(indoor and outdoor). in present scenario Wi-Fi is the most ubiquitous protocol. Moreover the power consumption can limit wi-fi in large projects. To overcome this protocols such as LoRa comes handy.

4. LoRaFarM: a LoRaWAN-Based Smart Farming Modular IoT Architecture

Gaia Codeluppi et.al. [2020]

This paper presents internet of things (IoT) in smart farming aiming on collection ,monitoring and employment of relevant data for agriculture operations, for sustainable agriculture . This paper shows cost efficiency , modular and Long-Range Wide-Area Network (LoRaWAN)-based IoT platform, denoted as “LoRaWAN-based Smart Farming Modular IoT Architecture” (LoRaFarM) and focuses on upgradation on the management of farms in a sustainable way and which can be customisable . This paper gives an outline of farm management systems through the implementation of heterogeneous IoT technologies such as, communication protocols and enabling the collection, exchange, processing, and visualization of relevant farm data.

5.Smart agriculture: IoT based precise and productive farming approach

Arunlal K. S. et.al. [2018]

Farmers use an unavoidable decision-support system to optimize water use. The summation of contest is the real-time supervision of microclimatic conditions arena one and only method to know the need. Wireless sensor networks play a crucial role as it focuses large projects. The agriculture sector is adapting in the area of information and communication technology hence many technologically oriented companies are preying on it with emerging technologies like machine learning , IoT , data science ,cloud computing and artificial intelligence so on and so forth paving the lifestyle of people.This paper elaborates the fact that in near future the farming practices will be very sophisticated with emerging farm management technologies.

PROPOSED MODEL

The main ideology of our effigy is to automate the farming practices using the principle of mechanisation and communication . We incorporate mechanical machinery ,sensors and electronic devices. We have passed down two modules smart farming sensing and irrigator respectively .

4.1 Architecture

The consistent adaptation of IoT in different sector is evident .Ojas Savale [9] says IoT, the ideology of incorporating real-world objects connected with each other will switch the way users manage and organise real-time data and monitor it[10]. Network protocols plays very vital role in digital agriculture domain. Currently , Wireless Sensor Network(WSN) is used round the world. WNS is used to build decision support systems. Smart farming is a way to overcome the void between user and the farm , makes farming operation sophisticated. Through network protocol , sensor network and other domain fill the space between farmer and the crop regardless of

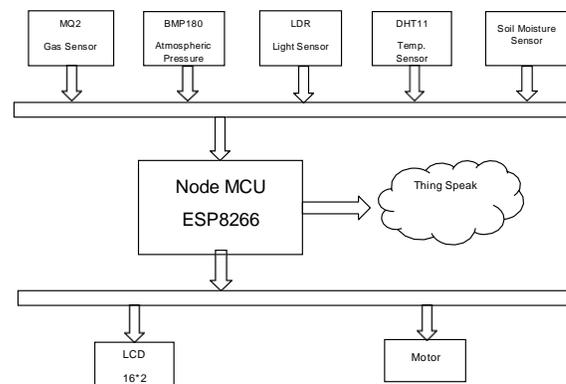


Fig 1: Block diagram

negative environment externalities . Network protocols will optimise the usage of water and analyse arbitrary level of crop to increase the yield.

The schematic circuit diagram of smart farming system is based on the concept of Internet Of Things. The main microcontroller used in the project is called NodeMcu with an inbuilt Esp8266 wifi, an open source IOT platform. NodeMcu has only one analog pin so to resolve this issue, 8x1 multiplexer is used. There are five input sensor embedded with microcontroller which will measure the different readings from the environment as the DHT11 use to measure the temperature and humidity of surrounding air and its GND, VCC is connected respectively and DHT11 sensor will read a bit by bit data, other input sensor is MQ2 sensor which senses the concentration of gases in the air, next one is the BMP 180 to predict the atmospheric pressure, its serial clock line and serial data line pin are connected with the analog signal, LDR measures the light intensity connect with an analog signal and the last soil moisture sensor helps to measure the volumetric water concentration of the soil, its analog output is provided an analog signal and two output sensors also embedded with it, one of them is LCD 16*2 to display the data which will be shown to the user and on the other side , water pump will be activated when the moisture level of the soil is less than its requirement.

grains to legumes, and then to meat, including chicken, pork and beef,” says David Widmar, Purdue University economist. Hence will create imbalance of food chain to overcome it smart farming is viable. It is expected that in early 2035 almost 780 Million Farms would be connected to IoT and this number will increase.

S.no	Years	Data analysis
	1	2000
2	2016	540 Million Farms till Date are connected to IoT
3	2035	780 Million Farms would be connected to IoT

Table 1: the growth of smart faming with IoT in near future[11]

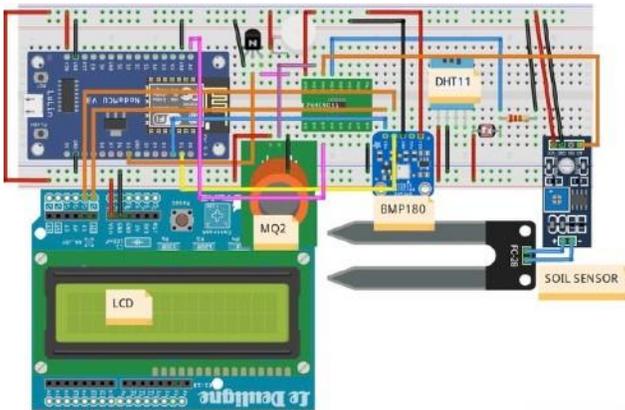


Fig 2: Schematic circuit diagram

RESULT

In the fast growing world technology pave the lifestyle of the people.the novelty of the proposed approach lies in using the knowledge base and multi-agent technology to develop coordinated decisions on management of agricultural enterprises stating smart farming as pave of the current crisis which makes the project feasible .“As incomes rise, consumer preference moves from wheat and

CONCLUSION AND FUTURE SCOPE

Precision farming methods have impacted agribusiness[3] by offering high precision crop control , optimising human labour, data collection and minimising manual tools. The advantages to farmers in implementing IOT or adding a new technology are two folds, as it decrease their cost and increase the crop yield. IOT as a technology is shaping the future of agri tech industry . India is known for its adverse climatic conditions hence a farmer can not predict and plan cultivation activities therefore IOT is more efficient.

Digitalisation of agriculture plays a very vital role to access the quality and the quantity of agricultural production at primary level, hence, it is used for the betterment of agronomical people in India. This project will help farmers to inculcate the up to date information of the crop and external factors affecting it. This project provide a pathway between farmer and agricultural supervisor hence, the advancement of the technology can reduce the labour and human contact in the present scenario of COVID -19 pandemic this project can be revolutionise as compared to the traditional agricultural practices .

Therefore, Smart Farming has a real potential to deliver a more productive and sustainable agricultural production, based on a more precise and resource-efficient approach.

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