RESEARCH ARTICLE OPEN ACCESS

AGRICULTURALINNOVATIONS AND FARMING PRACTICES USING INTERNET OF THINGS(IoT)

T.Aarthi Sri*, M.H Bindu Reddy**, V.Divya***

*(Electronics and Communication Engineering, JNTU/HITAM, and Hyderabad
Email: tadalapallikaraarthisri@gmail.com)

** (Electronics and Communication Engineering, JNTU/HITAM, and Hyderabad
Email: bindureddy247@gmail.com)

*** (Electronics and Communication Engineering, JNTU/HITAM, and Hyderabad
Email: valabojudivya22@gmail.com)

----------**********----------

Abstract:

People used to do all fields work manually in Olden days, they don't know about humidity, water level, particularly about climate condition, fertilizers, etc. Inter of Things has easily reshaped agriculture by monitoring weather conditions, temperature, water level, etc.The paper aim is making use of evolving technologies such as IoT using automation. It monitors weather conditions, water level, humidity, moisture and moments animals which destroys the fields ,these can be avoided by using sensors using Aurdino. In case of any discrepancy send SMS notification and email. It always study the data and perform actions accordingly turning motor ON/OFF, sprinkling water, pesticides, fertilizers.

Keywords **—Smart Farming, Agriculture, Precise Farming, Internet of Things, Automation.**

----------**********----------

I. INTRODUCTION

Agriculture is a most popular and common source of income in India, almost 70% of Indians depends on farming to fulfil their necessities. The method used in these farming is manually, and the expenditure is more than the income from it. so most of the people shows less interest in farming. By employing these technics in agriculture reduces the man power and achieve good profits in it. India got success in trials of 27 villages in karnal district of Haryana, The government of Haryana has decided to expand it for 500 more villages. Zero tillage and line sowing instead of broadcasting of seeds increase rice and wheat yields by 10-15%.

Rice crop reduces water use by 25% and methane emissions by 40%.bed planting of maize and wheat crops use by 30-35%. Indian Council of Agricultural Research (ICAR) decided cover 151 villages across the country.

When the soil moisture is less than the actual limit, the sensor give data to the GSM modem, then it sends SMS and Email to the mobile. Then motor is ON when it reaches to maximum level the motor OFF automatically, it monitors the field condition and sprinkles pesticides, fertilizers.

The farmers do not need to monitor the fields every time.it can be of 2 types

1. Automatically
2. Manually (takes permission of everything by sending SMS and Emails)

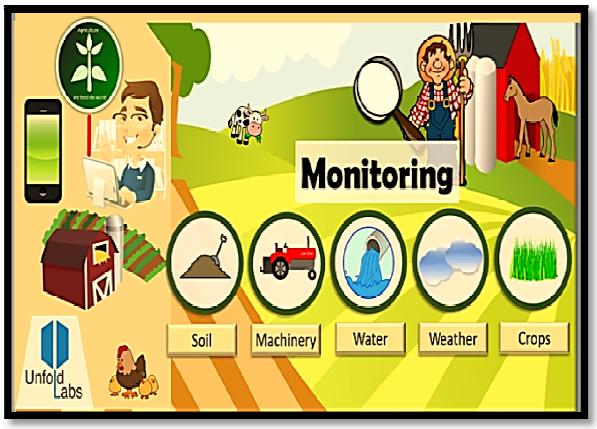

Fig. 1 Smart Farming

Fig.2 Climatic conditions monitoring using IoT

II. APPLICABILITY OFIoT IN AGRICULTURE:

Smart Farming is high tech and successful method for sustainable agriculture and food cultivation. It is application of the collective incorporation into agriculture of linked device and emerging technology Smart Farming relies heavily on IoT, thereby removing the need for the farmers and growers to do physical work and therefore increasing the productivity in any possible way. The Internet of things has brought immense benefits such as productivity with recent agricultural patterns based on agriculture.

IoT based Smart Farming improves the entire agricultural system through real time field monitoring. The Internet of Things in Agriculture, with the aid of sensors and inter connectivity not only saved farmers time, but also minimised the extravagant use of resources such as water and electricity. It holds under control different variables such as humidity, temperature, soil etc. and provides a real time observation that is crystal clear. The following are the advantages of modern technological adoption.

The environment plays very important role in agriculture. And possessing in accurate climate information greatly deteriorates the quantity and efficiency of the crop production. But IoT solutions help you to know weather conditions in real timeWithin and outside of fields of cultivation, sensors are located. They gather environmental data that is used to pick the best crops that can be cultivated and sustained under unique climatic conditions The whole IoT ecosystem consists of sensors that can very precisely monitor environmental conditions such as humidity, flooding, temperature and more in real time. In order to detect all these parameters and customise them accordingly to your smart farming requirements they are various sensors available. These sensors monitor the status of the crops and the atmosphere that affects them. If there are some alarming weather patterns, so an warning is used the need for human action during destructive climate changes is reduced, which is of effectively to increases productivity and allows farmers to harvest more agricultural benefits.

A. Precision Farming:

Fig. 3 Precise Farming using IOT

One of the most popular IoT applications in Agriculture is Precision Agriculture/Precision Farming. It allows farming operation more efficient and regulated by the introduction to smart farming applications such as monitoring of cattle, vehicle tracking field Inspection, and monitoring of inventory. The objective of precision farming is to evaluate, to respond accordingly, the data produced by sensors. With the aid of sensors, Precision Farming allows farmers to produce data and evaluate the knowledge to make wise and fast decisions. There are various precision farming strategies that plays a crucial role in increasing the productivity & efficiency, such as irrigation management, livestock management, like vehicle monitoring and many more. To maximise operational productivity, you can evaluate the soil Conditions and other similarity like the parameters with the aid of farming. Not just this, the real time operating conditions of the link instruments for water and nutrient level measurement can also be observed.

B. Smart Greenhouse:

Fig. 4 IoT enabled smart Greenhouse

The IoT has made it possible for weather stations to automatically change climate conditions according to a complex set ofinstructions in order to keep our greenhouses smart. IoT usage in greenhouse has reduced human interference, rending the whole operation cost effective and concurrently increasing precision. Using solar powered IoT sensors, for instance, produces new and cheap green houses. The real time data is obtained and transmitted by these sensors helps to track greenhouse environment very effectively in real time. The water consumption and green house status can be tracked through emails or SMS warnings with the aid of the sensors. With the assistance of the IoT, automated and intelligent irrigation is carried out. These sensors help provide knowledge about the levels of pressure, humidity, temperature and light.

C. Data Analytics:

For the data obtained from the IoT sensors, the traditional data base system may not have an enough capacity. In the Smart Agriculture Framework, cloud based data storage and an end to end IoT platform play an significant part. It is calculated that these devices plays an essential role these devices play an essential role in such a way that improve practises can be carried out. Sensors are the main method of gathering data on a wide scale in the IoT universe. Using analytics software,

the data is processed and translated into useful information.

In the study of environmental patterns, livestock patterns, and crop conditions, data analytics aids. The knowledge gained leverages technical advances and therefore allows smarter choice with the aid of IoT units, by collecting the data from sensors, you can know the real time state of the crop. You will get an idea using predictive analytics to make smarter harvesting related decisions. The pattern analysis enables farmers to consider for the coming weather patterns and crop harvesting. In the agricultural sector, the IoT has helped farmers sustain the quality of crops and the productivity of the soil, thus increasing the amount and efficiency of the commodity.

Fig. 5 Data Analysis using IoT in agriculture

D. Agricultural Drones:

Technological developments have almost revolutionised agricultural activities, and the trend disturbance is the advantage of agricultural drones. Farm and aerial drones are used for crop health evaluation, seed tracking, planting, spraying of crops, and field analysis. Drone technology has offered the agriculture industry a high rise and makeover, with proper strategy and preparation focused on real time results. Drones with thermal or multi spectral sensors recognise the areas in which irrigation changes are needed. Sensors mean their wellbeing and measure their vegetation index until the crops start developing. The environmental risk has eventually been minimised by smart drone. The findings have been such that the groundwater has been significantly decreased and has hit even lower contaminants.

In summer, the temperature will varied day by day. It is monitored daily by temperature sensor. When the temperature is more, the soil becomes dry, so the Data is send to cloud by the soil moisture. Hence it automatically opens the valve and water is fed to the crops. For the above same case, temperature sensor gives data to the cloud, it access the data and ask the permission to the farmer to open the valve by sending the SMS/Email. After that moisture reaches to the maximum value then the cloud again sends the SMS to turn off the valve. Smart Agriculture includes humidity sensors, moisture sensors, motors, GSM modes, sprinklers, LM35, power supplier, Relay, WIFI module, water level sensor. The whole system is wireless and in order to detect the type of disease caused to the crop is detected by using a software called NI Vision and web camera. It notices the health of the crop &scans the leaf and analyse the disease percentage (%). According to that pesticides and fertilizers are sprinkled.

Fig.6 Agricultural Drones using IoT

The farmers have to take care about of 2 conditions they are as follows

1. Availability of water in resource

2. Continuous power supply

Instead of electrical power we can use Solar panels in order to save the power consumption. Today, India ranks second in the world in form output 64% of cultivated land dependent on monsoons. Nearly 60% of water s wasted in irrigation so by using these method we can conserve water. Not even in India many countries like china, japan, Pakistan, Bangladesh, Africa & America.

CHINA: The potential value of china smart agriculture in 2015 is $13.7 billion and in 2020 , $26.8 billion is expected. 44,000 farmlands are cultivated using IoT, the production of rice is increased by 12% and maize by 9%.

AFRICA: The bank climate smart agriculture project in west Africa improves more than 7 million farmers and 4 million hectares were associated with climate smart agriculture. Potential value of Vuna is $32 million in 2015-2018. In Niger, the climate smart village aim is to benefit 500,000 farmers through IoT.

INDIA: Two Students from Punjab introduced AI based smart agriculture using IoT to increase the productivity.2400 acres of Haryana has been endorsed for smart agriculture, among the 900 acres are basmati forms.

A new generation of CSA project is on the way, one of them is Maharashtra project ,which is of $420 million ,the agricultural practices are adopted in fields and water shed level.

Fig. 7 IoT in Agriculture

III. CONCLUSIONS

Farming becomes a major risky job for farmers a few years ago because the loss from it is more than the gain. Because of this, most farmers have been turned into slavery to fulfil their basic needs. Thus, theshortage of producers, demand is reduced, since the price of food,goods has risen day by day, but it is not adequate, since of these items, false goods on the market have decreased rapidly because of the Indians' wellbeing of these products.

The only solution to all these problems is smart agriculture, which will increase productivity and add benefits to farmers. Smart agriculture is yet to be developed by just 20%globally, WAACis trying to bring smart agriculture around the world and educate people. They are driving farmers in to clever, basic technologies.

IoT enabled farming has contributed to the development of new technicalsolutions to time tested knowledge. This has tested knowledge. This has close difference between production and efficiency between production yields in quantity. Data Consumed for real-time use or storing in a database by collecting and importing data from several sensors guarantees quick. Intervention and less crop loss. With smooth end to end With intelligent activities and stream lined execution of business processes, output is handled quicker and hits supermarkets fastest time possible.

REFERENCES

[1] Anand&Puri, Nayyar, Vikram. (Year 2016). Smart farming: smart agriculture sensors based on IOT stick for live temperature and humidity control using Arduino, cloud storage & solar technologies, International Connectivity and Storage Conference (ICCCS-2016)

[2] M.HimaBindu,P.SaiPraneeth,R.V.N Sai Sravani, Internet Of Things - A Revolutionary Approach For Future ,International Journal of Creative Research Thoughts (IJCRT), ISSN:2320-2882, Volume.8, Issue 6, pp.1808-1811, June 2020

[3] Ravi, Gorli&Yamini G .(2017) Smart Farming 's future with the Internet of Things.Information Technology Journal and Its Applications.Volume 2, Issue 1,Page 27-38 Page 27-38 .

[4] S. Dr.G. Jegadeesan, k.d.Smart cow health tracking, farm environmental surveillance and wireless sensor network control system, Prasannavenkatesan, International Journal ofEmerging Engineering Science, Jan-March 2016, page 334-339.

[5] M. HimaBindu, Ch.ShanthiPriya and K.Usha,Internet of Things Protocols for Heterogeneous Devices and Cloud Services: Layered IoT Architectures,JXU,PageNo:1200–1207

[6] IOT based control of agriculture and smart agricultureand smart raspberry pi irrigation system, International Academic Journal of

Engineering and Technology (IRJET),Volume: 05(01),Jan-2018, Page 14-17.

[7] M.H Bindu Reddy, R.Pravalika, R.Krishnaveni,A Journey From Internet of Things (IOT) to Internet of Everything (IOE), International Journal of Scientific Research and Engineering Development (IJSRED), Volume-3 Issue-5,2020,Page No: 345-348, IJSRED-V3I5P48

[8] JirapondMuangprathub, NathaphonBoonnametalComputers and electronics in agriculture, computers and electronics in agriculture original papers IOT and agriculture data analysis for smart farm, volume 156, January 2019, pages 467-474.

[9] MeghaDangi, M. H Bindu Reddy and PushadapuNavya Sri - Security and Connectivity : Vulnerabilities in the Internet of Things (IoT),.PageNo:89-97, DOI:16.10089.IJMTE.2020.V10I06.20.4009

[10] MohanrajaKirthikaAshokumarb and J. Narenc, Procedia Computer Science Field Monitoring and Automation Using IOT in Agriculture Domain, Procedia Computer Science Volume 93, 2016, Pages 931-939.

[11] Anushree M K & Krishna R. (2018). Intelligent farming with Arduinobased technologies. Advance Studies, Concepts and Advances in Technology International Magazine. Page 850-856 Volume 4, Issue 4,

[12] S. J. Siddiqui, S. Sohail, a ndR."Ali," An OWA based ratingapproach to the evaluation of university books, "Int. Intel. J. Intell. Syst.,volume33, no. 22018, pp. 396–416.

[13] K. Ashton, RFID J., vol., "The 'Internet of Things' Stuff," 22, no. 7, 2009, pp. 97-114.

[14] F. S. and Bader. "Jagtap," Internet of Things Related Wearable Devices in the Healthcare Sector for Handling Food Safety, "2019.

[15] P. Aswale, P. Bharati, A. Shukla, S. Bharambe, and S. Palve, 'An Internet of Things Overview: Design, Standards and Problems,' in Intelligent Network Information and communication Technologies, Springer, 2019, pp. 299-308.

[16] F. Cicirelli, A. Guerrieri, G. Spezzano, C. Mastroianni, and A. Vinci, Smart Urban Ecosystem's Internet of Things.

