IJAMSR 2 (3) www.ijamsr.com **CrossRef**: https://doi.org/10.31426/ijamsr.2019.2.3.1315

International Journal of

Large Scale Farming Analysis With The Help of IOT & Data Analytics

G.Pandu Ranga Rao[1], V.V.S.Indira[1], P.Manikanta[1], Dr.M.Srinivas[2]

[1]Students, Dept.of.Computer Science and Enigneering, K.L.University,A.P., India
[2]Professor, Dept.of.Computer Science and Enigneering, K.L.University, A.P., India

Email: pandu.gandham111@gmail.com

DR.M.SRINIVAS

G.PANDU RANGA RAO

V.V.S.INDIRA

P.MANIKANTA

A B S T R A C T

India is a country of Agriculture.18% of the Indian economy GDP was contributed by Indian agriculture sector. Many problems are faced by Indian farmers. Among them Mainly Two key problems facing by Indian agriculture. They are inability to maintain domestic food qualities, i.e., maintaining nutrition level correctly. and the inability to export in a market with profits. Mainly farmers are facing many problems while distributing crops to respective Market. We can resolve these problems by using internet of things (IoT) and data analytics (DA). So with the help of it, we will analyze how a farm is growing to yield by Wireless sensor Network, which connects all sensors and with the help of Data analytics we will get complete analysis on farming. Mainly in this paper, we are going to describe centralized system and data Analysis on sensor data which helps for prediction.

Citation: *G.Pandu Ranga Rao, V.V.S.Indira, P.Manikanta, Dr.M.Srinivas, (2019). Large Scale Farming Analysis With The Help of IOT & Data Analytics: International Journal of Advanced Multidisciplinary Scientific Research (IJAMSR) ISSN:2581-4281, 2 (3), March, 2019, # Art.1315, pp 27-39*

Keywords*: Agriculture, IoT, Data Analytics, Sensors,Temperaturei-*

IJAMSR 2 (3) www.ijamsr.com CrossRef: https://doi.org/10.31426/ijamsr.2019.2.3.1315

International Journal of
Advanced Multidisciplinary Scientific Research (IJAMSR) ISSN:2581-4281

Introduction

1. 1 IOT in Agriculture

By the year 2050 world population meats 9.7 Billion. In order feed these 9.7 billion, agriculture methods should be modernized. The modernized cultivation can achieve by IOT Precision agriculture will enable farmers to reduce the waste usage of fertilizers to grow crops. IOT helps the farmer with live updates by informing about crop with the help of wireless network.

With the help of IOT we can implement new techniques which can make farmer's work easy. IOT means internet of things which will connect all physical

Objects which leads to form an embedded system. We can connect various sensors like Temperature sensor, moisture sensor, water level sensor, rain detector sensor. With the help of these various sensors which can inform the farmer with live updates, i.e., what is happening in yield. For IOT if we use more sensors to improve the accuracy of data collection. It might lead to more power consumption. Here we will overcome this problem by making a centralized unit for sensors which are connected by wireless sensor network (WSN)

1.2 Data Analytics in Agriculture

With the help of IOT we will collect data from various yields. Mainly the information is about how the yield is growing in favorable conditions. i.e., we can get large volumes of data from various yields. With the help of DATA ANALYTICS we will examine the large data sets so that we can draw conclusions about the favorable conditions of yield in order to grow. With the help of DATA ANALYTICS we will collect data from farmers in intermediate stage of the crop, DA (DATA ANALYTICS) will analyze all the data and conclude the price which gives profit to the farmer. DA will help to predict future risks for crops. Data from DA will help to take real-time decisions and helps to build profit business model for farmers.

In Future Government also uses big data analysis in order to solve farmer problems and reduce field risks. Data Analysis Algorithms will help to predict. The prediction will help to fix the farmer market price in a profitable manner to the farmer.

1.3. Agriculture in India

Agriculture is one of the important sector in India. Most of the Indian economy depends on agriculture. 18% of Indian GDP (gross

IJAMSR 2 (3) www.ijamsr.com CrossRef: https://doi.org/10.31426/ijamsr.2019.2.3.1315

IJAMSR

International Journal of
Advanced Multidisciplinary Scientific Research (IJAMSR) ISSN:2581-4281

domestic product) is contributed by Indian agriculture. India is one of the largest producers in Pulses, Rice, Wheat, Spices. India's GDP is expected to increase 7.5% in 2018-2019 with the help of Agriculture. India is the world largest milk production for the past 2 decades & contribute around 20% in world milk production.

1.4. Problems

A.-Marketing problems

Due to lack of proper management of marketing system

Farmers are facing many problems, mainly while distributing goods in markets with profits. This is because intermediate agents are playing key role in the marketing price so farmers are

Facing huge losses, while distributing into the market. We can solve this problem by analyzing crop statistics by Data Analysis of past data in the market and analyzing the crop yield

B. -Yielding problems

Farmers are facing problems in yielding. Mainly in the mid of crop cultivations farmers are lack of information about the intermediate stage of crop. This information can transmit to farmers through various sensors which will collect information about climate, water level, soil moisture. The farmer gets alerted through wireless sensor networks about this information and take better precautions to prevent crop from diseases and improve crop growth, i.e. the quality of the crop.

In this paper, we are explaining about how collected data

From sensors is used for Data Analysis. And how data is

Analyzed with the help of Data Analysis Algorithms like

Linear Regression, Artificial Neural Networks, etc.

2. Related Work

Shyi-Ming Chen, Senior Member, IEEE, and Jeng-Ren Hwang:

A drawback of traditional forecasting methods is that they can't deal with forecasting problems in which the historical data are represented by linguistic values. Using fuzzy time series to deal with forecasting problems can overcome this drawback.

IJAMSR 2 (3) www.ijamsr.com CrossRef: https://doi.org/10.31426/ijamsr.2019.2.3.1315

International Journal of
Advanced Multidisciplinary Scientific Research (IJAMSR) ISSN:2581-4281

Sindhu P. Menon, Ramith Bharadwaj, Pooja Shetty, Prajwal Sanu, Sai Nagendra :

The project aims to showcase the effect of urban area or metropolitan area that is significantly warmer than its surrounding rural areas due to human activities using temperature as the independent variable with pollution and population as the dependent factor variables. Using the Time Series analysis, we obtained the trend in temperature, population and pollution.

The work shows that regression is more precise and accurate compared to time series analysis

Fang Liu, Lei Yu, Yan Li, Quan Qi:

The mass data include noises and uncertain information from the monitoring system. Evaluation of monitoring system dealing with noisy and uncertain data becomes the hot spot and difficulty.

To improve the precision of temperature prediction, this paper proposes a new application of relevance vector machine for FBG(Fibre Bragg Gratting) sensors.

Conor Lynch M.IEI, Michael J. O'Mahony M.IEI, Richard A. Guinee M.IEEE, M.AMS :

This paper discusses an accurate temperature prediction model for a 24 hour step ahead time horizon, though the post processing of an existing NWP model output using a 4th order KF model for photovoltaic scheduling operations.

Ibrahim Mat, Mohamed Rawidean Mohd Kassim, Ahmad Nizar Harun, Ismail Mat Yusoff MIMOS, Ministry of Science, Technology and Innovation:

In this study, Precision Agriculture (PA) used WMSN to enable efficient irrigation. In this paper, we describe about Youth and WMSN in agriculture applications, particularly in a greenhouse environment. This paper explained and proved the efficiency of the feedback control method in greenhouse crop irrigation. A test was conducted to see the different these two methods. The methods are irrigated by a schedule or feedback based irrigation. Irrigation by schedule is to supply water to the plant at specific time periods

Yifan Bo, Haiyan Wang* School of Information Science and Technology Beijing Forestry University Beijing, China :

IJAMSR 2 (3) www.ijamsr.com CrossRef: https://doi.org/10.31426/ijamsr.2019.2.3.1315

International Journal of
Advanced Multidisciplinary Scientific Research (IJAMSR) ISSN:2581-4281

In this paper, They analyze the study and application of Cloud Computing and The Internet of Things on agriculture and forestry. Then they put forward an idea that making a combination of the two techniques and analyze the feasibility, applications and future prospect of the combination.

Prathibha S R1, Anupama Hongal 2, Jyothi M P3 1, 2, 3 Assistant Professor, Department of Electronics and Communication Engineering 1, 2, 3 Sambhram Institute of Technology, Bengaluru, Karnataka, India :

The paper aims to make use of evolving technology, i.e. IoT and smart agriculture using automation. Monitoring environmental factors are the major factor to improve the yield of the efficient crops. The feature of this paper includes monitoring temperature and humidity in agricultural field

Prof. K. A. Patil Assistant Professor, Prof. N. R. Kale Head of Department Department of Information Technology MET's BKC, IOE Maharashtra, India :

In this paper, sensor technology and wireless network integration of IOT technology has been studied and reviewed based on the actual situation of agricultural system. A combined approach with internet and wireless communications, Remote Monitoring System (RMS) is proposed. Major objective is to collect real time data of the agriculture production environment that provides easy access for agricultural facilities such as alerts through the Short Messaging Service (SMS) and advices on weather patterns, crops etc.

Jirapond Muangprathuba,*, Nathaphon Boonnama, Siriwan Kajornkasirata, Narongsak Lekbangponga, Apirat Wanichsombata, Pichetwut Nillaorb :

In this paper, we propose developing a system optimally watering agricultural crops based on a wireless sensor network. This work aimed to design and develop a control system using node sensors in the crop field with data management via smartphones and a web application. The three components are hardware, web application, and mobile application

S. RAJESWARI Research Scholar, K. SUTHENDRAN Associate Professor,. K. RAJAKUMAR Associate Professor, Department of Information Technology, Kalasalingam University, Krishnankoil, Srivilliputtur, Tamilnadu, India:

IJAMSR 2 (3) www.ijamsr.com CrossRef: https://doi.org/10.31426/ijamsr.2019.2.3.1315

International Journal of
Advanced Multidisciplinary Scientific Research (IJAMSR) ISSN:2581-4281

In this paper, IoT device is used to sense the agricultural data and it is stored into the Cloud database. Cloud based Big data analysis is used to analyze the data viz. Fertilizer requirements, analysis the crops, market and stock requirements for the crop. Then the prediction is performed based on data mining technique which information reaches the farmer via mobile app. Our ultimate aim is to increase the crop production and control the agricultural cost of the products using this predicted information.

3. Procedure

3.1 Centralised System (IoT sensors):

As stated the problem above, there should be an efficient way is to implement the centralized system which control all sensors in a single system. Which will make easy to farmer to access. Centralized system can be implemented with wireless sensor network. Present many Farmers in Australia are using Wi-Fi for wireless but we can use Zigbee, which is also a wireless network technology.

"Wi-Fi vs Zigbee "

Wi-Fi and Zigbee both are wireless Technologies. WiFi (802.11) and Zigbee (802.15.4) are differing with few

Characteristics

Mainly 3 characteristics to define which technology is useful:-

a) Power
b) 2. Bit-Rate
c) 3. Range

Power:

Wi-Fi battery life time was roughly 2 – 3 days, but while coming to Zigbee it has huge battery life, i.e., nearly 3 to 5 years So Zigbee was used in Smart grid

BIT-Range:

In Wi-Fi wireless technology bits will transfer at the range of max 54 Mega Bits per Sec. This number is not a small count. Zigbee wireless technology bits will transfer at the range of 250 Kilo Bits per Sec.

Range:

Wi-Fi will enable user to access at the max range of 100 meters, which is not a good accessible range for Users mainly farmers because generally cultivated lands are large area sectors. While coming to Zigbee it enables user to access at the max range of 1000 meters. Which is better than Wi-Fi in terms of range.

IJAMSR 2 (3) www.ijamsr.com CrossRef: https://doi.org/10.31426/ijamsr.2019.2.3.1315

International Journal of
Advanced Multidisciplinary Scientific Research (IJAMSR) ISSN:2581-4281

With all these characteristics we can conclude Zigbee is better than Wi-Fi. Zigbee will act as a gateway. We can various WiFi's to the Zigbee therefore we can achieve great results.

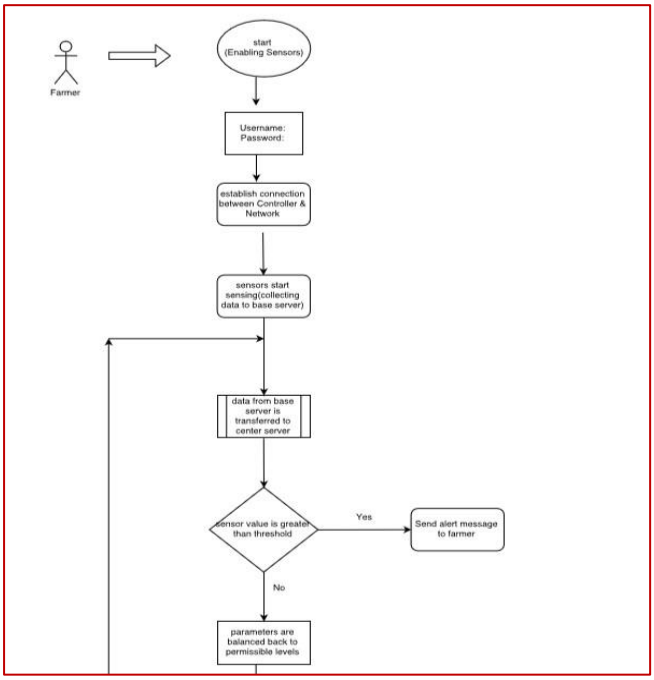
While coming to implementation, we will connect all sensors into one integrated system with the help of wireless network Zigbee. Here we will use various sensors like Temperature Sensor, Soil Moisture Sensor, Water Level Sensor, Rain Detector. We will connect all these sensors with wireless network. Using all these sensors helpful in more accurate data But it leads to more power consumption.

4. Implementation

While coming to implementation initially all sensors are initialized to value Zero. There is a user interface for farmer where he can login with given username and password. If the authentication succeeds. Then Connection between controller and network is Established. And sensors will start sensing, i.e., start collecting data. These data was sent to Base Sensor Station i.e., which is nearer to individual sensor. Base sensor data was transferred to center server station. Center Server will analyze based on the threshold values set for each individual. While in case of emergency immediately, it was intimated to the farmer. Whenever a farmer stops the sensors.

There is an option for the farmer that is, whether want to save the current data (sensor data) or not. If he wants to save data, then the data from Base Server is transferred to Center Server and data was saved in Center Server station.

4.1 Flow Chart for IOT Implementation:-



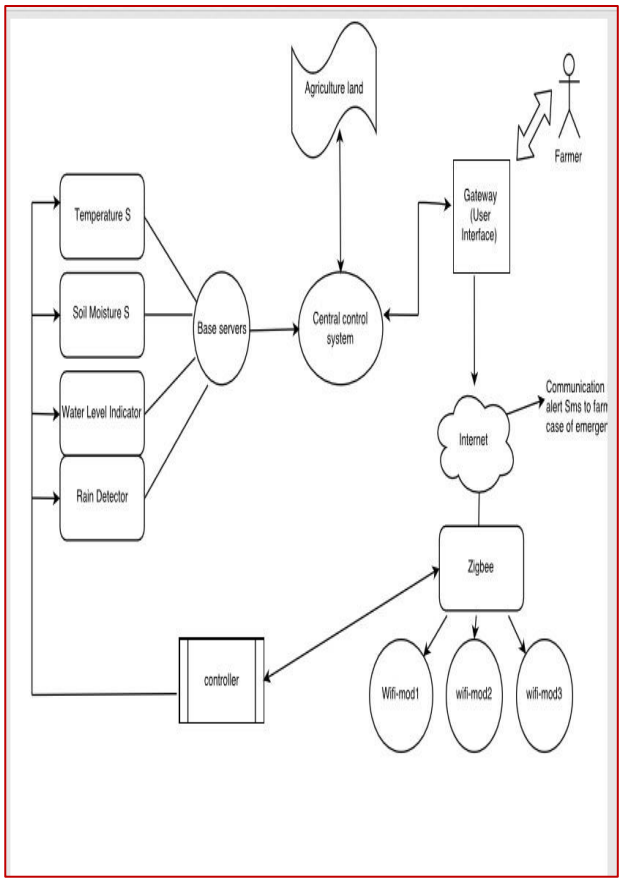
JSON format is used for data encoding to maintain server database. That data is saved in the format of JSON in respective servers, i.e., base server and central server

IJAMSR 2 (3) www.ijamsr.com CrossRef: https://doi.org/10.31426/ijamsr.2019.2.3.1315

International Journal of
Advanced Multidisciplinary Scientific Research (IJAMSR) ISSN:2581-4281

JSON means “Java Script Object Notation”. It is very common data format used for asynchronous browser server communication.

4.2 Architecture for Centralized system implementation:



Centralized system enables farmers to use IoT system very efficiently. Generally in earlier implementations of IoT systems farmer need to check every individual sensor for data .But in this implementation all sensors are connected and controlled by central control system which helps to farmer to collect data about farming.

Different sensors are placed in the various places in agriculture land according to the farmer. And for every sensor there will be a base server. All these servers are connected through a wireless network (Zigbee). There will be a controller, which has control of all sensors in terms of working. The farmer can collect data from Central Control System where he can get information about all conditions like temperature, soil moisture, water required level.

```
import sys
import RPi.GPIO as GPIO
from time import sleep
import Adafruit_DHT
import urllib2
myAPI = "<your API code here>"
def getSensorData():
   RH, T = Adafruit_DHT.read_retry(Adafruit_DHT.DHT22, 23)
   return (str(RH), str(T))
def main():
   print 'starting...'
   baseURL = 'https://api.thingspeak.com/update?api_key=%s' % myAPI
   while True:
       try:
           RH, T = getSensorData()
           f = urllib2.urlopen(baseURL +
                               "&field1=%s&field2=%s" % (RH, T))
           print f.read()
           f.close()
           sleep(300) #uploads DHT22 sensor values every 5 minutes
       except:
           print 'exiting.'
```

When farmerstartst the process the connection betweenthe networkk and controller will established. And sensor will start working. The data will be updated regularly on a base server. After the time limit the data from base server will be transferred to central control system.

IJAMSR 2 (3) www.ijamsr.com CrossRef: https://doi.org/10.31426/ijamsr.2019.2.3.1315

International Journal of
Advanced Multidisciplinary Scientific Research (IJAMSR) ISSN:2581-4281

When data exceed threshold values through wireless network an SMS was sent to the farmer (emergency alert). In some cases like lack of water, and if the temperature is low, automatic precautions can be taken without the interference of the farmer.

In the paper, we are explaining a prototype of this implementation with the help of few sensors (Temperature Sensor , Humidity Sensor) and Raspberry pi and some Data Analysis Algorithms

Firstly sensors are placed in different areas in farming field and all are connected to common network, i.e., Sensors are connected to raspberry pi in order to collect data of large area, we need to more raspberry pi's and sensors are connected to it and all Raspberry pi's are connected to a common. Now to collect data from Sensors we are using Things peak.

Initially Configure Raspberry pi with the sensors setup and Main task is to Upload sensor data for Things peak

After completion of Things peak configuration Run code to collect data from sensors

Now we can see data on the Things peak website. From Things peak Website we can Download our sensor data and use it for Data Analysis. Here on collecting sensor we can use Linear Regression or Artificial Neural Networks Algorithms for Analysis on it.

Role of Data Analytics:-

Data was continuously monitored by the farmer for emergency precautions. Data in the central control was collected and form large data sets. And these large data sets are examined by applying DATA ANALYTICS logarithm's. Analyzing from large data sets we can draw conclusions about the information.

Data from various agriculture lands was collected and stored in cloud servers (AWS, Microsoft, IBM Watson, etc.). Data from previous crop rates and their productions was also collected and stored in clod server. Data from cloud server is used for analyzing and helps in decision making. We apply various DATA ANALYTICS algorithms with the help of (SAS, SPSS, HADOOP, IBM Bluemix). And make the right decision.

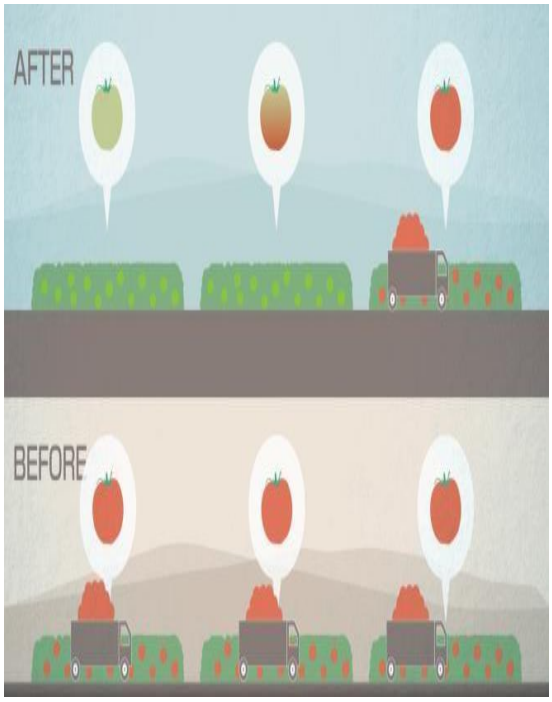
After the decision from Data analysis farmer can able fix the profitable price without any intermediate agent. And with the help of analyzing land with IoT sensors we can able

IJAMSR 2 (3) www.ijamsr.com CrossRef: https://doi.org/10.31426/ijamsr.2019.2.3.1315

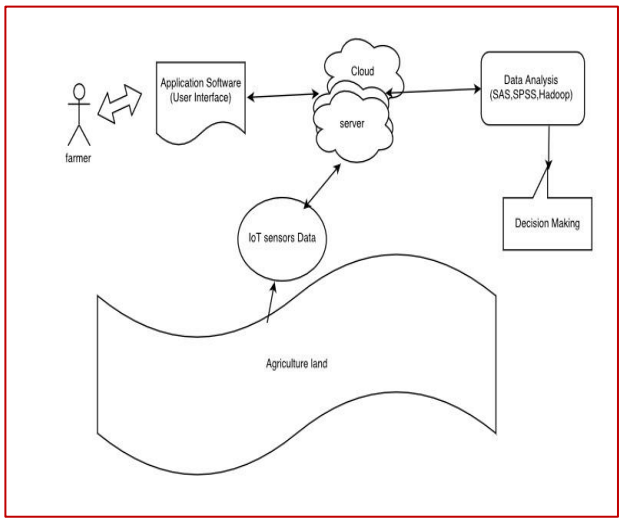
International Journal of
Advanced Multidisciplinary Scientific Research (IJAMSR) ISSN:2581-4281

draw a figure about how a crop is going to yield in respective facilities. So farmer can grow crop in different stages and can sell in market according to need of product with profit. With this farmer need not go into cold storage.

With the help of analysis, we can predict the yield growing and with proper prediction we can grow crops as below picture.



Architecture for Implementing IoT and DA:



Results:

From the sensors data is collected and stored . And the stored data can be collected from Things peak websites. We can Directly download data in required format from the website.

Collected Data from Sensors:

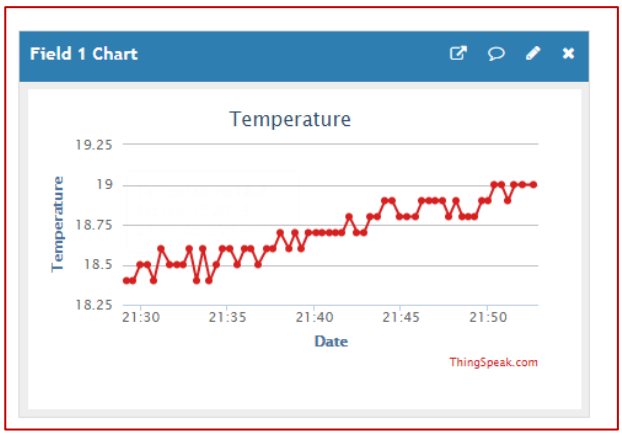
Data Visualizing:

Data can be visualized in Things peak website or we can use google colabs for large data Analysis and visualizing.

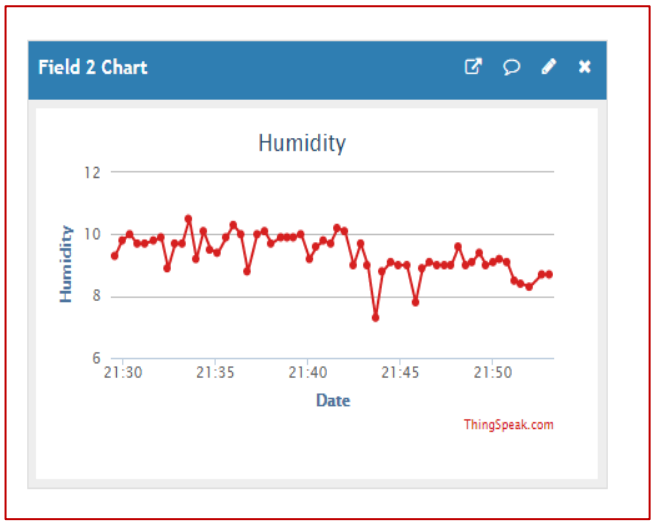
IJAMSR 2 (3) www.ijamsr.com CrossRef: https://doi.org/10.31426/ijamsr.2019.2.3.1315

International Journal of
Advanced Multidisciplinary Scientific Research (IJAMSR) ISSN:2581-4281

a) Temperature



b) Humidity



Above we can see the data visualization of Temperature, Humidity. With the data sets we can train and do data analysis with help of some Data Analysis Algorithms like Linear Regression and Artificial Neural Networks etc., .

Future Work:-

In above model we have fewer problems like handling large amount of data from various sensors of various crop yields because collecting data from various yields are leads to Mismatch data storing i.e, data parameter's from crop to crop will change so in future We should use cloud as OLAP because in market there are many ELT (Extract Transfer Load) tools are present such that we can overcome that problem. And in future for Data Analysis upgraded algorithms should be used for better results like present Artificial Neural Networks will predict and give better results.

Conclusion:

In present society various problems are solved by Latest Technologies. Mainly in our country (India) formers are facing major problems. In this paper one possible solution for Large scale farming was discussed. IoT and Data analysis are two different trends in present days . But efficient use of both will lead to Great solution for problems. Sensors are connected to common network, which leads to centralized system which will help to collect total data of crop yield and data analysis on collected data will predict and help's farmer to take a decision easily.

IJAMSR 2 (3) www.ijamsr.com CrossRef: https://doi.org/10.31426/ijamsr.2019.2.3.1315

International Journal of
Advanced Multidisciplinary Scientific Research (IJAMSR) ISSN:2581-4281

References

1) *Ibrahim Mat, Mohamed Rawidean Mohd Kassim, Ahmad Nizar Harun, -" IoT in Precision Agriculture Applications Using Wireless Moisture Sensor Network " - Ismail Mat Yusoff MIMOS, Ministry of Science, Technology and Innovation, Kuala Lumpur, MALAYSIA {ibm, dean, nizar.harun, ismail}@mimos.my*

2) *Yifan Bo, Haiyan Wang* - "The Application of Cloud Computing and The Internet of Things in Agriculture and Forestry " - School of Information Science and Technology Beijing Forestry University Beijing, China wanghaiyan76@126.com*

3) *Prathibha S R1, Anupama Hongal 2, Jyothi M P3 1, 2, 3 Assistant Professor, Department of Electronics and Communication Engineering 1, 2, 3 – "IOT BASED MONITORING SYSTEM INSMART AGRICULTURE" - Sambhram Institute of Technology, Bengaluru, Karnataka, India prathi52@gmail.com,anupamahongal @gmail.com, jyothimp.2007@gmail.com*

4) *Prof. K. A. Patil Assistant Professor Prof. N. R. Kale Head of Department – "A Model for Smart Agriculture Using IoT" - Department of Information Technology MET's BKC, IOE Maharashtra, India kirti.patil2004@gmail.com*

5) *Alexandra Moraru1, Marko Pesko1,2, Maria Porcius3, Carolina Fortuna1, Dunja Mladenic1,3 1J. Stefan Institute, Jamova 39, 1000 Ljubljana, Slovenia 2MOBITEL – "Using Machine Learning on Sensor Data" - Telecommunication Services Inc., Vilharjeva 23, 1537 Ljubljana Slovenia 3J. Stefan International Postgraduate School, Jamova 39, 1000 Ljubljana, Slovenia E-mail(s): firstname.lastname@ijs.si*

6) *K. VivekBabu, K. Anudeep Reddy, CM. Vidhyapathi and B. Karthikeyan – " WEATHER FORECASTING USING RASPBERRY PI WITH INTERNET OF THINGS (IOT)" - School of Electronics and Communication Engineering, Vellore Institute of Technology, Vellore, India E-Mail:vidhyapathi.cm@vit.ac.in*

IJAMSR 2 (3) www.ijamsr.com CrossRef: https://doi.org/10.31426/ijamsr.2019.2.3.1315

International Journal of
Advanced Multidisciplinary Scientific Research (IJAMSR) ISSN:2581-4281

7) *Yanping Wang , Zongtao Chi - " System of Wireless Temperature and Humidity Monitoring Based on Arduino Uno platform " - School of Electronic and Information Engineering Qingdao University Qingdao, China Email: 805955786@qq.com*

8) *[8]. Ramith Bharadwaj , Pooja Shetty , Prajwal Sanu , Sai Nagendra – " Prediction of Temperature using Linear Regression " - Dept. of CSE, Global Academy of Technology, Bengaluru*

9) *Temperature Prediction Using Fuzzy Time Series Shyi-Ming Chen, Senior Member, IEEE, and Jeng-Ren Hwang*

10) *.Gaurav Chavan,Dr. Bashirahamad– " An Integrated approach for Weather Forecasting over Internet of Things" - Dept. of Computer Science and Engineering, Walchand College of Engineering, Sangli, India,*

11) *IoT and agriculture data analysis for smart farm Jirapond Muangprathuba,* Nathaphon Boonnama , Siriwan Kajornkasirata, Narongsak Lekbangponga , Apirat Wanichsombata Pichetwut Nillaorb a Faculty of Science and Industrial Technology, Prince of Songkla University, Surat Thani Campus, Surat Thani 84000, Thailand.*

12) *S. RAJESWARI , K. SUTHENDRAN , K. RAJAKUMAR – " A Smart Agricultural Model by Integrating IoT, Mobile and Cloud-based Big Data Analytics" - Research Scholar, Department of Computer Applications, Kalasalingam University, Krishnankoil, Srivilliputtur,Tamilnadu,India.s.rajeswari30@gmail.com*

13) *An Overview of Internet of Things (IoT) and Data Analytics in Agriculture: Benefits and Challenges Olakunle Elijah , Student Member, IEEE, Tharek Abdul Rahman, Member, IEEE, Igbafe Orikumhi, Member, IEEE, Chee Yen Leow , Member, IEEE, and MHD Nour Hindia, Member, IEEE*