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Real Time Soil Monitoring and Crop Production Using Internet of Things

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ABSTRACT: Agriculture is the backbone of India and it is the primary source of livelihood .Theprocessofsoilmonitoringhasanimportantparameters whichdecidesthesuitablecropsforthe barren lands. Monitoring the agricultural environment for thefactors such as moisture,temperatureandhumidityhaveagreatsignificance.The maininterestof thispaperistoinvestigate the soil with parameters using varioussensors such as Temperature and HumiditysensorandMoisturesensor.Usingthesesensorthedataarecollectedfromthecollectedsoilandtheyaresendwirelesslythrough ESP8266tothecloudserver,theseservercollectdataandstoresitandtobeanalyzed.Thedatacan bedisplayedin thewebsiteofmobileandlaptop with suitable crop for the land using Internet of Things we can send data to the cloudserverwhichisreliabletransmissionofData.

Keywords: Temperaturesensor,Humiditysensor,Moisturesensor,InternetofThings.

I. INTRODUCTION:

Farmers and ranchers produce the food and fiber we use every day. Agricultural sectorplaysastrategicroleintheprocessofeconomicdevelopmentofacountry.Agricultureprovides employmentopportunities for rural people on a large scale in underdeveloped anddevelopingcountries.Soil is acritical part of successful agricultureandis theoriginal sourceof the nutrients that we use to grow crops. The healthiest soil produce the healthiest and mostabundantfoodsupplies.Soilservesasamediumforplantgrowth.

The Internet of thingsis the network of devices such asvehicles, and home appliancesthatcontainelectronics,software,sensors,actuators,andconnectivitywhichallowsthesethings to connect, interact beyond traditional devices like desktop and laptop computers andexchangedata.TheInternetofThingsextendsinternetconnectivity,smartphonesandtabletstoadiverserangeofdevicesandeverydaythingsthatutilizeembeddedtechnology tocommunicateandinteractwiththeexternalenvironment, allviatheInternet.Itistheevergrowingnetwork of physical objects thatfeature an IP address forinternetconnectivity,andthecommunicationthatoccurs between these objects and otherInternetenableddevicesandsystems.

Monitoringtheagriculturalenvironmentfactorssuchasmoisture,temperatureandhumidity havea greatsignificance.Themain objectiveof this paperis toinvestigate the soilwithparametersusingvarioussensorsanddataaresend wirelessthroughESP8266tothecloudserver.Theseserver collectdataandstoresitandtobeanalyzed.Thedatacanbedisplayed in the website of mobile and laptop with suitable crop for the land using Internet ofThingswecansenddatatothecloudserverwhichisreliabletransmissionofData.

Existing System:

The existingsystem was Zigbee. Itconsists of Arduinoas processingunitand WSNbase station.Arduino UNO board controls the processing, and manages the communicationprotocol.Thesensornodecommunicates withthebasestation usingtransceiver.Thebasestationcollectsallthedatasendbysensornode.Thewholesystemismadewiththecollaborationofhardwareandsoftwarecomponents.

The hardware components include Arduino UNO board, soil moisture sensor, DHT11temperaturehumiditysensor,LCDmoduleandZigbeetransceivers.ThesoftwareincludesArduino IDE and X-CTU. It does have limitations in the area of energy use restrictions forcertification, memory size, processing speed of data, and size of bandwidth, short range, lowcomplexity,andlowdataspeed,highmaintenancecost, lackoftotalsolution,slowmaterialization,lowtransmission,lownetworkstabilityandreplacementwithcompliantap

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pliancescanbecostly,Duetosomeofthedisadvantagesofnetworks,itisneedtodesignnewsystem.

Proposed System:

Weuse thisopportunity to overcomethe drawbacks of Zigbeeby using ESP8266.TheESP8266 WiFi Module is a self contained SOC with integrated TCP/IP protocol stack that cangiveanymicrocontrolleraccesstoyourWiFinetwork.ThesystemconsistsofNodeMCUastheprocessingunit.
The sensorslike Moisture and temperature sensors are used to monitor soil moisture,temperature and humidity of field and transmit the information. The task of sensor node is toachievetheperception,collection,processingandwirelesstransmissionofcollectedinformation.Thesensornodeconvertsthephysicalquantitytothevoltagesignaland NodeMCU controls the processing, and manages the communication protocol. The sensor nodecommunicateswiththebasestationusingtransceiver. Thebasestation collects all the data sendby sensornode and the updatedinformationwillbeavailableonthewebpage.The wholesystemismadewiththecollaborationofhardware and software components. The hardware components include NodeMCU with inbuiltESP8266, soil moisture sensor, DHT11 temperature humidity sensor.The softwareincludesArduinoIDEandPHPforwebpagefunctionality.BenefitsofProposedSystem,Inexpensive,HighDataTransmission,FlexibleDesignandEnhancedFunction, MoreCompatibleDevelopmentEnvironments.

Software Specification

ARDUINO IDE: Arduinoisaprototypeplatform (open-source)basedon an easy-to-usehardwareandsoftware.Itconsistsofacircuitboard,whichcanbeprogrammed(referredtoasamicrocontroller)and aready-madesoftwarecalled Arduino IDE (Integrated DevelopmentEnvironment), which is usedtowriteanduploadthecomputercodetothephysicalboard.Arduinoprovidesastandardformfactorthatbreaksthefunctionsofthemicro-controllerintoamoreaccessiblepackage.
PHP:PHPisthelatestincarnationofPHP(PHP:Hypertext preprocessor)-a programming,language divised by Rasmus Ledorf in 1994 for building dynamic,interactive Websites. Sincethen,it'sbeenevolvingintoafull-fledgedlanguageinitsownright,thankstothehardworkofallthepeoplewhocontributetoitsdevelopment.Asuresignthat PHPismaturing(OOP)principlesandimprovedsupportforXML.

System Architecture:

The system isimplementedbasedon Internetof Things (IoT) whichin otherwordsknown as system of connected devices. Connected devices are that sensor, actuators and otherembedded devices. Internet of Things is applied in agriculture,industries,home appliances
etc.Inagriculture,InternetofThingsisappliedinordertomonitorthesoiltemperatureandmoisture level for efficient crop growth. Food is more important for human health to live longlife.Asthepopulationhasincreased,thereisscarcityoffoodproduction.
Hencewemonitorthesoilfromthebarrenlandandimplementingthefollowing:Temperatureandhumidity of soil usingtemperatureandhumidity sensor.Moistureof soil using soil moisture sensor.All the data's are collected from various places through varioussensorsandaremonitoreddayby day.Thedata'sareuploadedtocloudserverforfutureuse.Farmerscanbeabletoknowthedetailsfromthewebpage.
All the sensors are connected to NodeMCU 12E Model B. NodeMCUkit holds two USBports where sensors having port connectivitycanbeattachedeasily.TheNodeMCUkitalso consists of 30 pinswhere the sensors are connectedusingbreadboardandjumperwires.Todetect the temperature,humidity,soil moisture C codingis used as itis easyforimplementingthework.
The data's are collected andstored in the databaseforfurtherreferences.Alsothecollecteddata'sare uploadedtothecloudserveraspeoplefromotherplacescanalsobeableto get to know about the corresponding condition and make further process. This work can bedone in large scale by implementing distributed network. Previously this work was done usingZigBeeprocesswhichdeterminedthesoilmoisture,temperatureandhumidity.
Due todataloss, we implementsensors asitdetermines accurate value within fractionof seconds and sends to monitor. Along with temperature, humidity and soil moisture is alsodeterminedasit plays amajorin growth of crops. Each crop has various temperatureandMoisturevalue.Bydeterminingthesevalueofsoil,thecorrespondingcropscanbegrown.

Temperature and Humidity Sensor: The DHT11 is a basic, ultra low-cost digital temperatureandhumidity sensor.Ituses acapacitivehumidity sensorandathermistor tomeasurethesurroundingair,and spitsoutadigitalsignalonthedatapin (noanaloginputpinsneeded).Itis fairly simple to use, but requires careful timing to grab data. The only real downside of thissensor is you can only get new data from it once every 2 seconds, so when using our library,sensorreadingscanbeupto2secondsold.

Data Collection: The data collection is the important part of the every project that become aproduct. Various

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types of soil that present all over the world. The soils collected from variousfieldsaswellthebarrenlands.

SensingtheSoil:Inthismodulethecollectedsoilsaretested usingthesensorsliketemperature&humidityandmoisture sensor.ThisSensorsensesthemoreorlessaccuratevalueof thesoil.Thephysicalvaluescollectedfrom thesensorsareconvertedtovoltagesignals.Thetemperatur eandmoisturevalueofthefollowingsoilandthecropsareco llectedandsensed.

Uploadingthedata

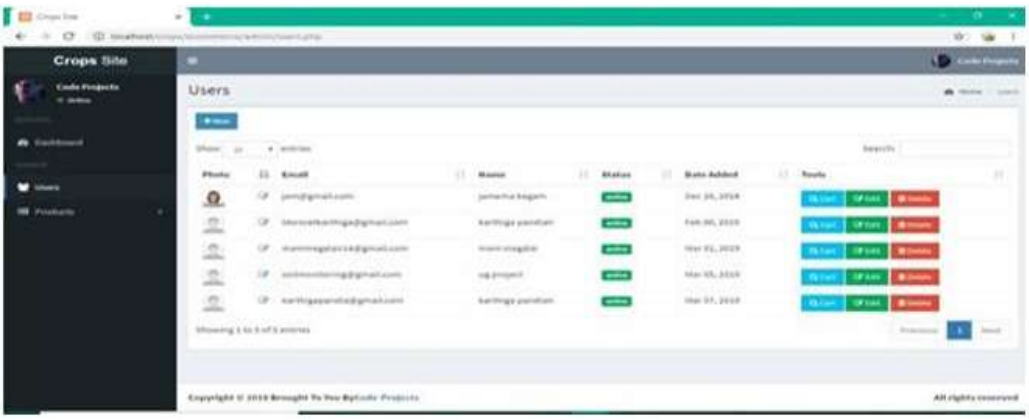
The data are sensedby the sensorfrom the collectedsoil are uploadingto the cloudseverviatheinternetwork.InNodeMCUcontainsES P8266containsmanysecurityalgorithmthattransfers the data tothe cloud.Through the distributedcloudnetworkwe can access the datafromanywhere.

ResultinWebPage: Theuploadeddataforthecollectedsoi laresendtothewebpageandfindtheaveragetemperature,m oisturevaluethatdisplaythesuitablecropforthesoil.Thewe bpagecontainsthefollowingsubcategorie:,loginpage,ho mepage,chart,average,table,flowchart.

Recommendedvaluesofsoilmoisturecontentatwhichirrigationshouldoccur

Crops	Minimumsoiltemperature (%F)	Humidity(%)
Rice	41	48
Wheat	37	46
Potato	45	48
Sugarcane	50	87
Soybean	59	64

TYPEOFSOIL	**CROPS**
Redsoil	Sugarcane,Rice,millets
Blacksoil	Cotton,Oilseeds,Millets,Groundnuts
Aluvialsoil	Rice,Maize,Jute,Sugarcane,cotton,oilSeeds
Laterite	Cashew,Rubber,Tea,Coconut
Claysoil	Lettuce,Chard,snapbeans,Cabbage



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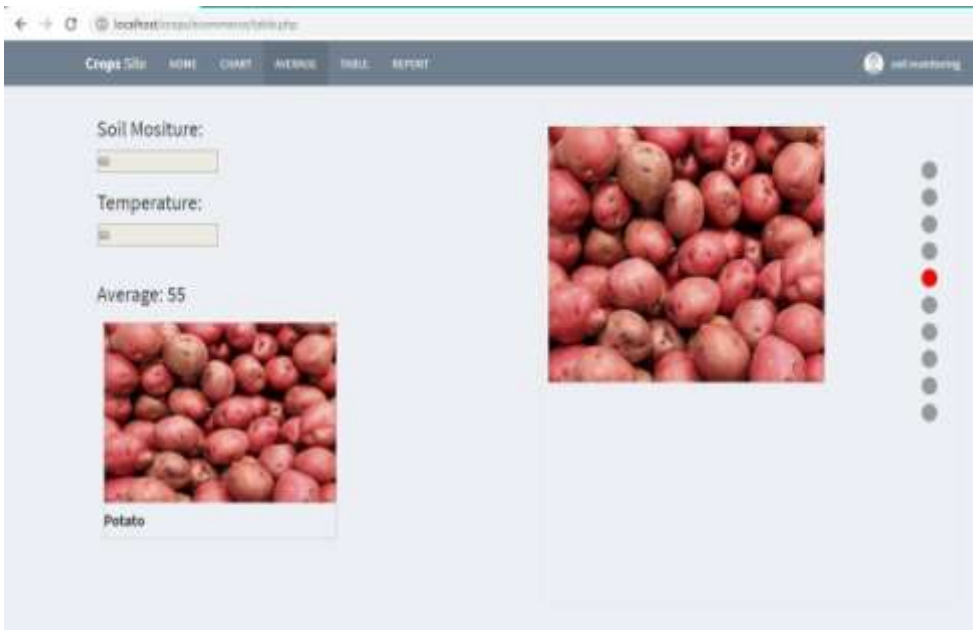

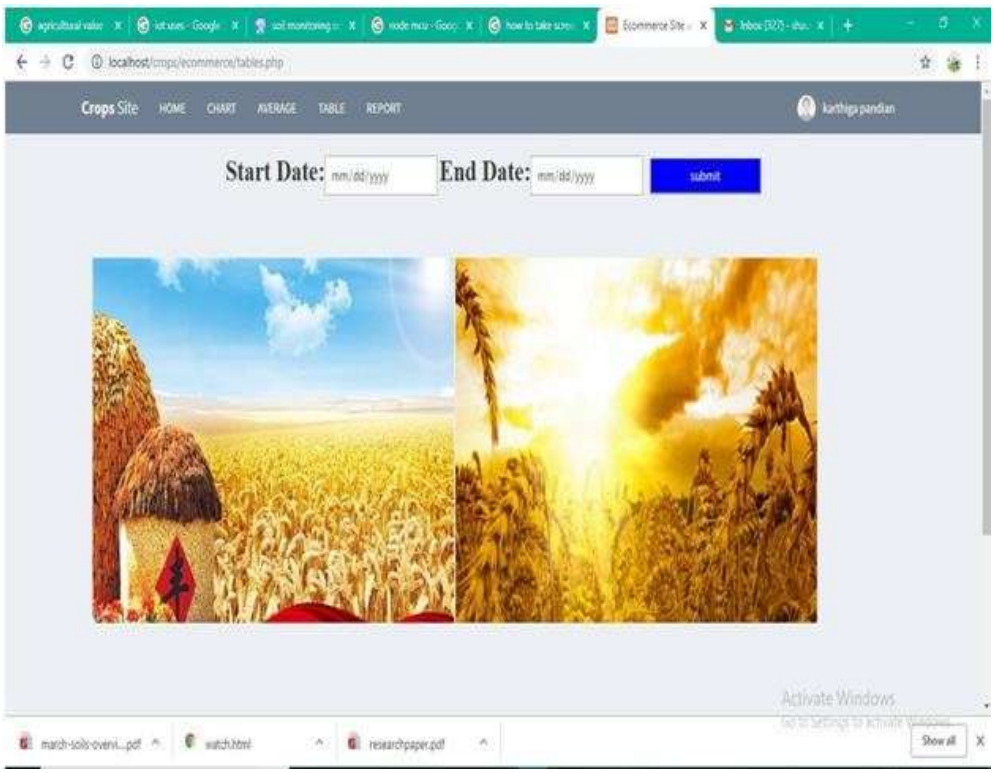

RealtimemonitoringandcropproductionusingIoTcan bemadewithmoreaccurateandefficientwith IoTenabledtechnologies.This tellsaboutwhatall the problems farmer is facing with soil according to the climate change, aspectsthataffecttheevapotranspiration,plantgrowthfactors,soilproblems,howtoconnect different sensors to the controller, how to collect sensor data, how to storedata in cloud,how toanalyze data and whatall thebenefitsfarmergoingtoget.Withthehelpofsoilmoisturelevels,soiltype,soilquality

II. CONCLUSION AND FUTURE WORK

Thesystemisbasedonlowcostandpowerand provisionalrealtimemonitoring.Itisalsoeasytouseand provideaccuratevalues usinggraphicalrepresentation.In future, the system can be improved by additional feature of ImageProcessingwithMobileApplication.Ourprimarygoalistodesignthewearable/handheld device in which the farmer can get all information in a singleportabledevice.Adeviceinthefuturewillbehelpful totheperson withzeroknowledgeaboutthetechnology

REFERENCES

[1]. AqsaMahir,TanmayBanavalikar,MayureshBudukh,SohamDhodapkar,Prof. Amol V. Dhumane," Soil Monitoring System using Zigbee for SmartAgriculture",IEEEConference,January 2018

[2]. EzhilazhahiA.MandBhuvaneswariP.T.V,"IoTEnabledPlantSoilMoistureMonitoringUsingWirelessSensorNetworks",April2017.

[3]. HarshaniP.R,UmamaheswariT,TharaniR,RajalakshmiS,DharaniJ,"Effective Crop Productivity And NutrientLevel Monitoring In AgricultureSoilUsingIot",IEEEconferenceApril2018.

[4]. Lily PuspaDewi, Justinus Andjarwirawan, Robin Putra Wardojo," AndroidApplicationforMonitoringSoilMoistureUsingRaspberryPi",IEEEConference,April2017

[5]. Matti SatishKumar,RiteshChandraT,PradeepKumarD,".Monitoringmoistureofsoilusinglowcost homemadeSoilMoistureSensorandArduinoUNO,April2016.

[6]. NoorimanV.M,AbdullahA.H,AbdulRahimN, KamarudinK,"Development of Wireless Sensor Network for Harumanis Mango Orchard'sTemperature,HumidityandSoilMoistureMonitoring",IEEEConferenceApril2018.

[7]. TamilNaduAgriculturePortal,"www.tnagri.edu"

[8]. M.UshaRani,S.Kamalesh,WebBasedServicetoMonitorAutomaticIrrigationSystemfortheAgricultureFieldUsingSensor.

[9]. G.Nisha ,J.Megala,Wireless SensorNetwork BasedAutomatedIrrigationAnd Crop Field Monitoring System, 2014 Sixth InternationalConference onAdvancedComputing(ICoAC).

[10]. P.DivyaVaniandK.RaghavendraRao,MeasurementandMonitoringofSoilMoistureusingCloudIoTandAndroidSystem,IndianJournalofScience and Technology, Vol 9(31), DOI:10.17485/ijst/2016/v9i31/95340,August 2016.

[11]. FatihabintiAbdullah,NinakorlinaMadzhi,FaridatulAimaIsmail,Comapartiveinvestigation ofsoilmoisturesensorsusingthreesoiltypes2015IEEE3rdInternationalConferenceonSmartInstrumentation,MeasurementandApplications (ICSIMA2015),24-25November2015,putrajaya,Malaysia.

[12]. www.losant.com