Abstract country's total exports. according to a

ABSTRACTA Polyhouse is abuilding where plants are grown.

Polyhouses are often used for growing flowers, vegetables and fruits plant. Basic factors affecting plant growth are humidity, water content in soil, temperature, etc. These physical factors are hard to controlmanually inside a Polyhouse and a need for automated design arises. Polyhouseautomatic control is necessary for the plants to grow properly in thecontrolled manner. To monitor the greenhouse environment parameterseffectively, it is necessary to design a control system.

It communicates withthe a variety of sensor modules in order to control the temperature, humidityand soil moisture efficiently inside a greenhouse by actuating a cooler, fogger, dripper and lights according to the necessary condition of the crops. Many different techniques have been proposed and implemented for this purpose. Thispaper mainly reviews different presentGreenhouse Monitoring and control systems. 1. INTRODUCTIONEven in the modern eraof industrialization, agriculture plays a Very significant role on the overallsocio-economic development of India.

The backbone of Indian Economy isAgriculture. 43% of India' s territory comes under agricultural lands. Around52% of India' s population is getting employment only because of agriculturealong with other related fields likeforestry and logging . Agriculture also accounts for 8. 56% of the country' stotal exports. According to a survey made in 2007, agriculture accounts for16.

6% of India' s Gross Domestic Product. In India, the most influential fieldas compared to others is agriculture, which perhaps needs more emphasis

onbetter agricultural practices. Crop growth is mainly influenced by thesurrounding environmental climatic variables, the amount of water supplied andthe fertilizers used for irrigation. By proper monitoring of the soilconditions and environmental conditions the quality of agriculture can beincreased. Polyhouse is ideal for proper plant growth and high yield of thecrop, where the climatic parameters can be controlled automatically. Polyhousecultivation is the modern, one of the most intensive, is considered highlyproductive and environment friendly agriculture practice. Polyhouses areconstructed using an ultraviolet plastic sheet of thickness 1501m which lastsfor a minimum of 5 years.

It is built using bamboos or iron pipes. In generalthe length of polyhouses is 25-30 feet and width of 4-5 feet. The size of thepolyhouse may vary according to the requirement. Mostly the polyhouses arealways directed towards East to West which allows the polyhouse to utilize themaximum sunlight. Irrespective of the season the temperature and humiditylevels can be a-utomatically controlled in the polyhouse thus resulting inproper plant growth and high yield of the crop. The existing variations in thedemand and supply of off-season for vegetables and fruits can be lowered byadopting modern technology. 2.

ProposedTechnologies2. 1 Wireless Solutionfor Polyhouse Cultivation Using Embedded System2. 1. 1 INTRODUCTIONIn this, the continuousmonitoring and control of environmental parameters inside the polyhouse usingmobile communication is proposed.

To fulfill this requirement of providingoptimum temperature inside the polyhouse, the environmental parameter sensorssuch as temperature sensor and humidity sensor are used. These sensors providesthe information about temperature and humidity inside the polyhouses, thesesensors are interfaced with AT89S52 microcontroller which continuously receivethe data from sensors and whenever the received values goes beyond the giventhreshold value, cooling fans will be turned on to lower the temperature andincrease humidity and vice versa as the system is programmed accordingly. Thesame information is conveyed to the farmer and central monitoring and controlunit of PC using Global System for Mobile Communication (GSM). The architectureof the proposed system has been shown in Fig 1.

2. 1. 2 ADVANTAGES·   By short message service (SMS) thestatus of environmental parameters and varying threshold values of polyhousecan be controlled from any remote location using the farmer mobile phone.·   The reduced human effort and ideal stateof environmental parameters inside the polyhouse can be observed in itsresults.·   By using the proposed system, the farmercan easily keep the desired crop's environment conditions. 2. 1. 3 DISADVANTAGES·   It does not check the soil moisturewhich is an important aspect on which the production of crops matters.

·   It does not measure the intensity oflight inside the polyhouse , proper control of light is important as light isvery important for photosynthesis.·   It does not have any technology toutilize the rain water. 2. 2 Design andDevelopment of Embedded System for Measurement of

Humidity, Soil Moisture andTemperature in Polyhouse using 89E516RD Microcontroller2.

2. 1 INTRODUCTIONThis research workmainly consists of design and development of an embedded system for polyhouseapplication. This system includes 89E516RD microcontroller with three sensorssuch as humidity sensor (SY-HS-220), soil moisture sensor (YL-69) and temperaturesensor (PT100) employed inside polyhouse 5, 6, 7. Signal conditioningcircuits of respective sensor, data acquisition system, display unit andcontrolling section have been properly designed.

The software required forsensor data acquisition, display and to control humidity, temperature and soilmoisture inside polyhouse by using suitable hardware of the system is developedby using Keil μ-vision IDE 8. The designed system is used for measurement ofthe mentioned environment condition and results are interpreted. Thearchitecture of this system is shown in fig 2. 2. 2 ADVANTAGES·   This provides accurate measurement ofhumidity, soil moisture and temperature and also provides automated controlaction.

·   This can satisfy more accuracy formedium and large area based polyhouses. 2. 2. 3 DISADVANTAGES·   It does not measure the intensity oflight inside the polyhouse , proper control of light is important as light isvery important for photosynthesis.·   It does not have any technology toutilize the rain water.

2. 3 AUTOMATION INPOLYHOUSE USING PLC   2. 3.

1INTRODUCTIONIn this system threetypes of sensors are implemented . The sensors to be used are photodiodes, atemperature sensor and a humidity sensor. These sensors will be connected to aPLC which will function as the main control unit. The sensors will send signalsto the plc and the plc will translate the signals and determine if the input iswithin the preset range.

For instance, if the preset temperature range is from20°C to 25°C, the plc will make sure that the polyhouse temperature iswithin this range. If the temperatureexceeds the maximum value, the plc will then turn on the fan. If thetemperature drops below the minimum value, the bulb will turn on. As for thephotodiode, if the polyhouse is exposed to insufficient light, it will send asignal to the plc. The plc will then process the signal and turn on theartificial light in the polyhouse. As for the humidity sensor, it will detect achange in humidity levels of soil and send a signal to the plc.

If the humiditylevel is not within the required range, the water supply will be turned on oroff. The plc will be the central processing unit which will translate the inputsignals from the sensors and turn on or off the necessary devices to maintain thepolyhouse at the preset levels. 2. 3. 2 ADVANTAGES·   This ensures that the environment insidethe polyhouse is suitable for productive uses.

·   This helps improve crop quality andquantity. 2. 3. 3 DISADVANTAGES·   It does not check the soil moisturewhich is an important aspect on which the production of crops matters.·   It does not have any technology toutilize the rain water. 2. 4 Design of

RemoteMonitoring and Control System with Automatic Irrigation System usingGSM-Bluetooth2. 4.

1 INTRODUCTIONIn this system both GSMand Bluetooth modules are interfaced with the main controller chip. GSM is usedfor remotely monitoring and controlling the devices via a mobile phone bysending and receiving SMS via GSM network. Bluetooth is used for the samepurpose but within a range of few meters, say when user is inside the peripheryof the building where the system is installed, Bluetooth can be used forcommunicating with the devices thereby eliminating the network usage cost. Themotor pumps and fans are controlled automatically using sensor and the otherappliances are controlled by Bluetooth or GSM network via SMS. The systeminforms user about any abnormal conditions like low water detection andtemperature rise via SMS from the GSM Module   to the user's mobile and actions aretaken accordingly by the user. The architecture of this system is displayed infig 4Fig 4. Block Diagram ofRemote Monitoring and Control System with Automatic Irrigation system usingGSM-Bluetooth2.

4. 2 ADVANTAGES·   There is no network usage cost.·   Efficient utilization of power.

2. 4. 3 DISADVANTAGES·   The farmer has to be educated about howto use the technology.

·   Implementation cost is higher.·   It does not have any technology toutilize the rain water. 2. 5 PIC MicrocontrollerBased Greenhouse Monitoring and Control System2. 5.

1 INTRODUCTIONproposed systemaim is to design a Microcontroller-basedcircuit to monitor and record the values of temperature, humidity, soilmoisture level and Sunlight of the natural environment that are continuouslymodified and it is get controlled in order optimize them to achieve maximum plant growth and yield. Controlling process takes place effectively. Depending upon the application, wewill set particular threshold level for each climatic parameter. When any ofparameters level cross a safety threshold then microcontroller will perform theneeded action by employing relay until the strayed-out parameter has beenbrought back to its optimum level. The block diagram below shows how the inputssection (sensors) is connected into the microcontroller through an arrow, thearrow indicate that data is passing through the microcontroller. The outputsection is connected out of the microcontroller through the arrow.

Furthermore, the input section are assign to their own pins in the microcontroller andprocessed to give an output, while output section are assign to their own pinsin the microcontroller, to archive the construction of greenhouse controldevice. E2PROM is also connected to microcontroller for storing the values ofvarious parameters present at that situation. Fig 5: Block diagram ofPIC Microcontroller based Greenhouse Monitoring and Control system2. 5. 2 ADVANTAGES·   Provides real time application .·   Beneficial for farmers of manydeveloping countries.

2. 5. 3 DISADVANTAGES·   Implementation cost is high.

·   It does not measure the intensity oflight inside the polyhouse , proper control of light is important as light isvery important for

photosynthesis.·   It does not have any technology toutilize the rain water.
2. 6 GreenhouseManagement Using Embedded System and Zigbee
Technology2. 6. 1 INTRODUCTIONThe system modelconsists of sensors,
microcontroller, interface such as relay and actuators. Actuators such as
ventilation fan, sprayer, heater, water pump, artificiallights are used. Our
proposed system aim is to design a microcontroller-based circuit to monitor
and record the valuesof temperature, humidity, soil moisture level and
sunlight of the naturalenvironment that are continuously modified and it is
get controlled in orderoptimize them to achieve maximum plant growth and
yield.

Controlling processtakes place effectively by both automatically and
manually. Depending upon theapplication, we will set particular threshold
level for each climaticparameter. when any of parameters level cross a
safety threshold thenmicrocontroller will perform the needed action by
employing relay(motor driver)until the strayed-out parameter has been
brought back to its optimum level.

Manual controlling process is done byzigbee wireless network whenever
necessary. Whose receiver side of zigbee isconnected to PC in control room .
VISUAL BASIC software is used here, whichhelps us to transmit the data back
through zigbee wireless network tocontroller to perform, needed control
action. Automatic controlling processtakes place in the greenhouse
environment itself as per designingmicrocontroller based circuit to monitor
and control various parameters.   Fig 6 Architecture ofGreenhouse
Management Using Embedded System and Zigbee Technology2. 6. 2

ADVANTAGES·   This has both automatic and manualcontrol of the system.·   When any of input module ie.

, sensorsdoes not work properly required actions is not get performed. At that time , zigbee wireless sensor network based controlling process can be used. 2.

6. 3 DISADVANTAGES·   It does not check the soil moisturewhich is an important aspect on which the production of crops matters.·   It does not have any technology toutilize the rain water. 2. 7 MICROCONTROLLERBASED POLYHOUSE CONTROL SYSTEM 2. 7.

1 INTRODUCTIONThe system provides anability to monitor Temperature, Level, Humidity and Moisture contain in soil. The heart of system is 89CSlmicrocontroller. This is embedded microcontrollerchip which has computer processor with all it support function (clock andreset), Memory (both program and data) and I10 (including bus interface) builtin to device. These built in function minimize the need for external circuitsand devices to be designed in the final application. The system works with5Volt DC power supply. A Moisture sensor, specially designed to sense theamount of water content in the soil, also called the " Gypsum sensor" provides moisture content information in terms of change in resistance. Thischange in resistance is used to provide a proportional change in analog voltagewithin certain voltage limits. The signal can then be covered to digital form, so as to be processed as per the systems requirements with the use ofmicrocontroller.

The software burned within the microcontroller then cancontrol a valve. A set of valves, that in-turn controls the water supply to thefield to maintain the soil moisture condition within present limits, they alsocontrol temperature and humidity within set limit. The block diagram consistsof the sensors and signal conditioning circuit for the Temperature, Level. Humidity and moisture measurement. The sensors and signal conditioning blockwill convert the physical quantity in to analogous voltage.

Fig 7 Block Diagram ofMicro-Controller Based Poly House Controller2. 7. 2 ADVANTAGES·   Works satisfactory as per therequirement·   Helps in optimum utilization of waterfor irrigation2. 7. 3 DISADVANTAGES·   It does not measure the intensity oflight inside the polyhouse , proper control of light is important as light isvery important for photosynthesis.·   It does not have any technology toutilize the rain water. 2. 8 Controlling andEnvironmental Monitoring Of Polyhouse Farm Through Internet2.

8. 1INTRODUCTIONThe parameterstemperature, Humidity, Soil moisture, are monitored and controlled using ARM processor , transmitted throughthe RS232 to the VB based monitor unit and then to the android mobile phone viaa Wi-Fi or internet connection. Allsensor values that are collected from the greenhouse were displayed on the LCDscreen. Development process of hardware is a structure imposed on thedevelopment which including Printed Circuit Board (PCB) design using DIPTRACEsoftware.

In this system, C Compiler software is used for programming. Thisprogram can receive data with microcontroller and stored in database. By usingC Compiler software, Temperature sensor, humidity sensor, rs232 device and

alsoLCD display were interfaced with the microcontroller. This program will startfrom the greenhouse where the sensors will collect the environmental data inanalog form. By using KEIL software sensor data collected are in analog formand will be converted to digital form using ADC converter in themicrocontroller. Then, the data were transmitted through RS232 to PC. The datareceived was displayed on the LCD screen shows the interfacing between the LCDdisplay and a ARM7 microcontroller. Overall, in the polyhouse the systemmonitoring temperature and humidity then transmitted through wireless WIFI andthe data are monitored on the LCD display.

2. 8. 2 ADVANTAGES·   Useful in hazardous applications ·   Quick response time·   Whole system is Fully automated ·   Robust system, require low power2. 8. 3 DISADVANTAGES·   It does not measure the intensity oflight inside the polyhouse , proper control of light is important as light isvery important for photosynthesis.·   It does not have any technology toutilize the rain water.   S. No.

S. No.	PROPOSED SYSTEM	LIGHT SENSOR	HUMIDITY SENSOR	MOISTURE SENSOR	TEMPERATURE SENSOR	RAINWATER HARVESTING
1	Wireless Solution for Polyhouse Cultivation Using Embedded System	NO	YES	NO	YES	NO
2	Design and Development of Embedded System for Measurement of Humidity, Soil Moisture and Temperature in Polyhouse using 89E516RD Microcontroller	NO	YES	YES	YES	NO
3	AUTOMATION IN POLYHOUSE USING PLC	YES	YES	NO	YES	NO
4	Design of Remote Monitoring and Control System with Automatic Irrigation System using GSM-Bluetooth	NO	YES	YES	NO	NO
5	PIC Microcontroller Based Greenhouse Monitoring and Control System	NO	YES	YES	YES	NO
6	Greenhouse Management Using Embedded System and					

Zigbee Technology YES YES NO YES NO 7 Microcontroller Based Polyhouse Control System NO YES YES YES NO 8 Controlling and Environmental Monitoring Of Polyhouse Farm Through Internet NO YES YES YES NO   3. CONCLUSIONVarious climaticparameters have to be monitored andcontrolled to improve the crop productivity. To monitor these parametersvarious sensors like temperature sensor to monitor the temperature, Humiditysensor to monitor the air moisture content, Soil moisture sensor to monitor thesoil moisture content, light intensity sensor to monitor the amount of lightinside the polyhouse are used. The required climatic parameters information canbe acquired from the polyhouse environment using these sensors.

In order tomonitor all the above said parameters require large number of sensors andwires. These sensors obtain the data and various steps are taken to achieve thetarget conditions inside the polyhouse. These conditions are achieved usingfans, foggers, coolers, heaters, etc. There are two common disadvantages in the proposed technologies. First none ofthe technologies have all the four sensors i.

e. humidity sensor, temperaturesensor, light sensor and soil moisture. Second none of the systems have atechnique to utilise rain water for irrigation of the crop inside thepolyhouse. Thus new system has to bedeveloped which has all the sensors and a technique to utilise rainwater forirrigating the crop inside the polyhouse.