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Agriculture at a Click Using PLC & SCADA

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ABSTRACT

The project emphasizes on automation of agriculture and to make farming easy using advanced technologies. Our project focuses on four main aspects of modern farming. Firstly, drip irrigation optimizes the use of water in the field. Automatic tank level control for the storage tank ensures sufficient amount of water storage. Secondly, use of shade net reduces the risk of crop destruction due to external parameters like untimely rain, hailstones or excessive temperature. It also increases the crop yield by temperature regulation in the shade net. Thirdly, a robust controller, PLC is used for the fully automated control. Lastly, agriculture can be done just by one click system developed by us keeping the database required for farming at the back end and SCADA at the front end for a user friendly interface.

Keywords- Recipe Management in SCADA, PLC & SCADA, Real time monitoring, User friendly

INTRODUCTION

In the midst of extreme drought and water scarcity, the farmers in the state plea for help from government. The news of farmer suicide in the state of Maharashtra especially in the Vidarbha and Marathwada region has been splashed across headlines for years. Strangely, people of Maharashtra seem to have become used to the monotony of the situation. The topic has occupied TV debates, Parliamentary fights, editorial discussions, etc. The question “Is Vidarbha the worst place in the nation to be a farmer?”^[1] was eye opening moment for our project team and decided to do something for our state which has been declared as drought hit region for the fourth consecutive year in 2015-16.

“Agriculture is the backbone of Indian Economy” Mahatma Gandhi said five decades ago. Agriculture contributes to about 30 percent GDP and employs about 70 percent population of our country. Still advances in the field of agriculture are quite limited. With limited technologies how are we going to meet the growing demands of ever-increasing population?

This question is surely difficult to be answered if we adopt only the tradition way of farming.

So, we decided to work on a project which not only automates farming but also increases the yield of the crop with a user friendly interface for the farmer.

Idea of Project

WATER CONSERVATION THROUGH DRIP IRRIGATION:

Our initial idea of project in Agriculture started with water problems of farmers. We decided to make a fully controlled irrigation system. Additional feature of this project with drip irrigation was soil moisture detection and supplying the water to the field accordingly.

STANDALONE POWER SYSTEM:

Rather than using electricity, this project provides switching between conventional energy sources i.e. wind energy & solar energy according to their availability.

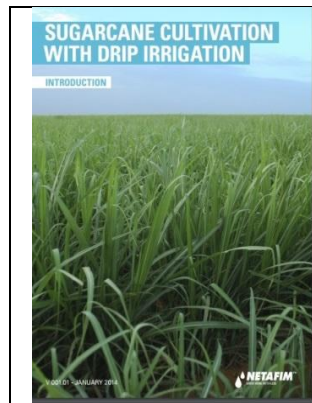
INCREASED YEILD:

To avoid the damage due to uncertainty from climatic parameters like rainfall, temperature, etc.

this project provides a system that regulates temperature inside the shade net.

USER FRIENDLY INTERFACE

We have used a user friendly module SCADA interfaced with PLC to give control to the farmer if he has very little or no knowledge about the technology used. We can also use recipe management for selection of parameters and making farming very easy and accurate.



NETAFIM company provides farmers with semi-automatic irrigation systems. It also provides farmers complete information on the needs of crop for that area.

Some other companies in this field are:

- Harvel Agua India P. Ltd
- Nagarjuna Fertilizers & Chemicals L
- Premier Irrigation Adritec Pvt Ltd

Advanced technologies in our project:

- Automation in agriculture using PLC
- User friendly software
- Real time monitoring using SCADA
- Selection of particular crop using Recipe Management in SCADA

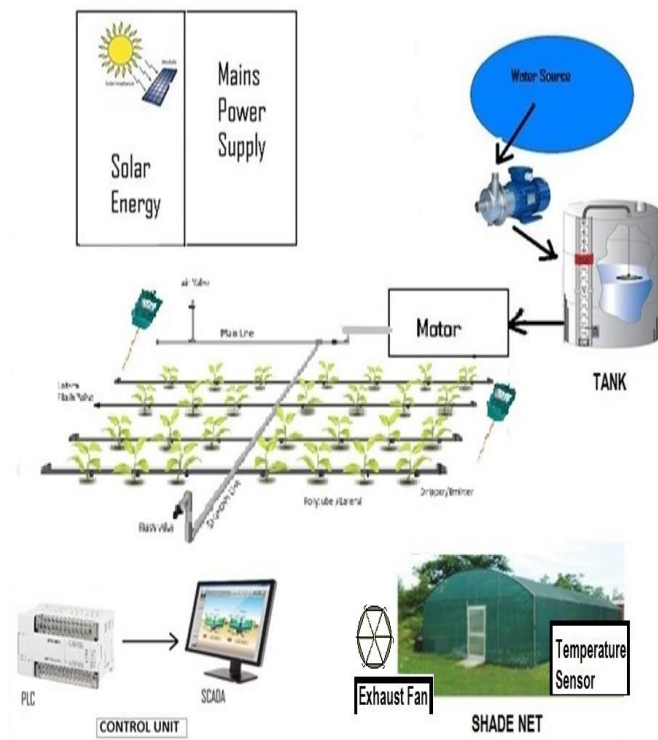


Fig. 1 Project Layout

BLOCK DIAGRAM

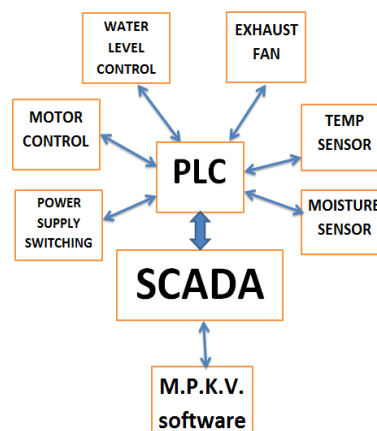


Fig. 2 Block Diagram

MARKET SURVEY

There are a lot of private companies in market providing agricultural products:

Table No.1: About Products in Market

Product in market	Description
	Jain Irrigation a renowned company in this field has a software to select a crop specification according to various parameters total flow, crop type, total slope etc.

EXPLANATION:

The system contains the following blocks:

1. PLC controls all the sensors and devices
2. SCADA is a real time monitoring software which can control PLC. It uses graphical programming to link with PLC.
3. Moisture sensor senses moisture content in the soil.
4. level sensors are used to control water level in the tank

5. Power supply switches appropriately between solar and mains as per availability.
6. Temperature controller is used to maintain a particular temperature in the shade net.

Phule Irrigation Scheduler software (MPKV, Rahuri) provides a complete database for recipe management in SCADA.

WORKING

As we select a particular crop in the SCADA, all the parameters are loaded on the PLC. Eg if we select capsicum, Days of crop = 90, Irrigation Interval = 24hrs, required temperature = below 40°C gets loaded on PLC. PLC will send commands to all the modules.

Initially, Water is drawn from the source (e.g. Well, Dam, Reservoir) by motor and is stored in the water tank. To fill the tank with sufficient amount of water, a level sensor is provided.

Level sensor senses the water level in the tank. If the level in the tank is below a Mid level, level sensor signals the PLC and motor is turned on. When the water level is reaches high level, motor is automatically turned off. The water in the tank is always maintained at the High level. The amount of water given to the field is determined my the Mid level which is adjustable.

The temperature controller circuit is used for maintaining temperature to a desired value as per the crop requirement. The relay is turned ON if the temperature exceeds a set point. The normally open contact of relay gives a signal to PLC. The cooling fan automatically turns ON after receiving a proportional output signal from PLC.

Power supply switching is done by the availability of energy source either mains supply or solar energy. For this we will be using switches which will switch according to the energy available. Firstly availability of solar energy will be checked, then the wind energy and in absence of both mains power supply will be used. This is controlled by PLC.

It is impossible to keep control and supervision on all agricultural activities manually. Some automated tool is required which can control, supervise, collect data, analyze data and generate reports. A unique

solution is introduced to meet all this demand is SCADA system. With this we can easily monitor our fields just by sitting at home.

ALGORITHM:

Step 1: START

Step 2: Check power supply availability for solar energy.

Step 3: If Solar is unavailable, operate the system by mains supply.

Step 4: Check for the moisture sensor output. If moisture is above a setpoint, go to step 16.

Step 5: Select a crop from SCADA screen

Step 6: Load all the parameters on PLC.

Step 7: Check the water level in the tank.

Step 8: If water level is below Mid Level, start the well pump (say P1).

Step 9: After water reaches high level, turn off the pump P1.

Step 10: Start the irrigation pump (P2).

Step 11: Stop P2 when water reaches Adjustable Middle Level and start the timer of 24hrs (for capsicum).

Step 12: The instant middle level is crossed, turn P1 on to fill the tank up to H.L.

Step 13: The Irrigation Pump will start after 24hrs (as taken from SCADA)

Step 14: Check the signal from the temperature controller.

Step 15: If temperature exceeds a set point, PLC turns the cooling fan ON.

Step 16: STOP

Recipe Management in SCADA



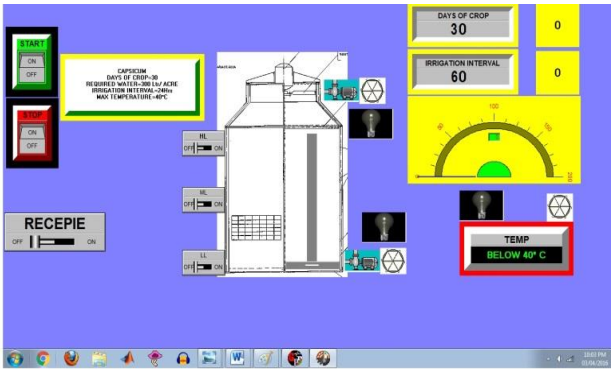


Fig. 3 Screen of Recipe Management in SCADA

CONCLUSION

1. This project effectively promotes real time monitoring using PLC & SCADA on a personal computer or laptop.
2. It provides user friendly GUI for farming which can be used by anyone with little or no technical knowledge.
3. It saves water, energy and efforts of a farmer
4. Higher monetary gains due to optimization of the system as a whole.
5. Decreases losses due hailstone, wind and untimely rain and extreme temperature by use of shade net.
6. Required amount of water is given to the field just by one click reduces the efforts of farmer drastically.
7. Reduces the risk of manual fault or faults due to human error.

FUTURE SCOPE

- Furthermore, we can increase the automation in farming by including technologies for seeding, harvesting, threshing, winnowing etc.
- We can check more parameters which are required for agriculture like evaporation method, crop coefficient, quality of soil, type of drippers, etc. and can make the system more accurate for market use.
- We can include security measures for overall system.
- We can interface this system with regional climate department for monitoring the field according to the weather forecast.

- We can include a GSM module for remote monitoring of the field.

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