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Agro Personal Assistant (A.P.A)

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***Abstract*—In this paper, investigation is done on developing a mechanism to extract water from the agricultural fields whenever there happens a situation of over flooding or excess water being held at the fields. The system also provides the same water for irrigation purpose whenever there are situations like drought or water crisis Overall, system is being designed to eliminate the negative impacts of the three major natural phenomena's being temperature fluctuation, heavy rain and unseasonal rain on agricultural fields. Furthermore, this system is completely designed with respect to developing country's context.**

***Index Terms*—Crop failure due to natural phenomenon, electronic based automated system, dynamic cover..**

I. INTRODUCTION

There are lot of technological development in the agricultural sector but none of them focuses on the safety of already grown crops from the natural phenomenon. There is huge crop failure across the globe due to unwanted random rains during harvesting period and heavy monsoon rain which floods the field excessively [1][3]. Crop failure due to temperature fluctuation during summer season has also been reported from different regions of the world [2][4]. Agro Personal Assistant is an electronic based automated system designed to eliminate the negative impacts of natural phenomenon's being-heavy monsoon rain, summer temperature fluctuation and unseasonal rain. A.P.A deals with natural phenomenon through the dynamic action of an electronically automated smart cover. Smart cover is designed with cheap water resistant material and it is solar painted.

II. GENERAL LAYOUT AND ELECTRONIC CIRCUITRY OF AGRO PERSONAL ASSISTANT

The prototype version of A.P.A is designed scaling one hectare field into 100 cm square field considering one hectare as the standard size of agricultural field. The field is bounded by interconnected smart pipes with solenoid valves and water from reservoir enters into the pipe through proper connection in one of the sections. Rods on four corners of field and two rods mid-way along the length has been provided to support the C-section slider on which the smart cover dynamic movement takes place.

This system has been developed with the support and financial help from IEDC CUSAT.

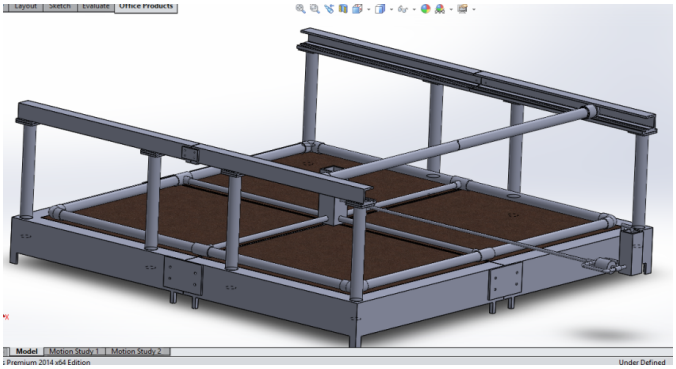

Fig. 1. 3D model generated on CAD and simulation

Smart cover is foldable and in idle state rest on the two extreme corner rods. There is a hole in the smart cover exactly at the center and smart cover slants 15 degrees towards the center when it is closed. Directly below the center on the ground resides a temporary buffer to collect rain-water from the center hole. Water is transferred into proper reservoir from temporary buffer through pipes due to gravity. Rain-drop sensor is attached at the top of extreme corner rod. Soil moisture sensor is kept at the most undisturbed position on the ground. Flow sensor is connected at a position where water enters into the pipe from reservoir.12V DC motor and L293D motor driving IC is used for the movement of smart cover. Micro-controller along with power source is kept in a water-resistant box. The layout and 3D model is generated on CAD and simulation is carried out as shown in fig 1 and fig 2.

III. RESPONSE TO HEAVY DOWNPOUR DURING MONSOON

During monsoon season, A.P.A monitors the water content in the field through soil moisture sensor. Soil moisture sensor is interfaced with analogue pin of micro-controller.

When the field is saturated with water, that is, moisture content is more than 90

Smart cover is designed with water resistant material and necessary strength is incorporated into the design so that smart cover can withhold the heavy downpour. Rain-drop sensor

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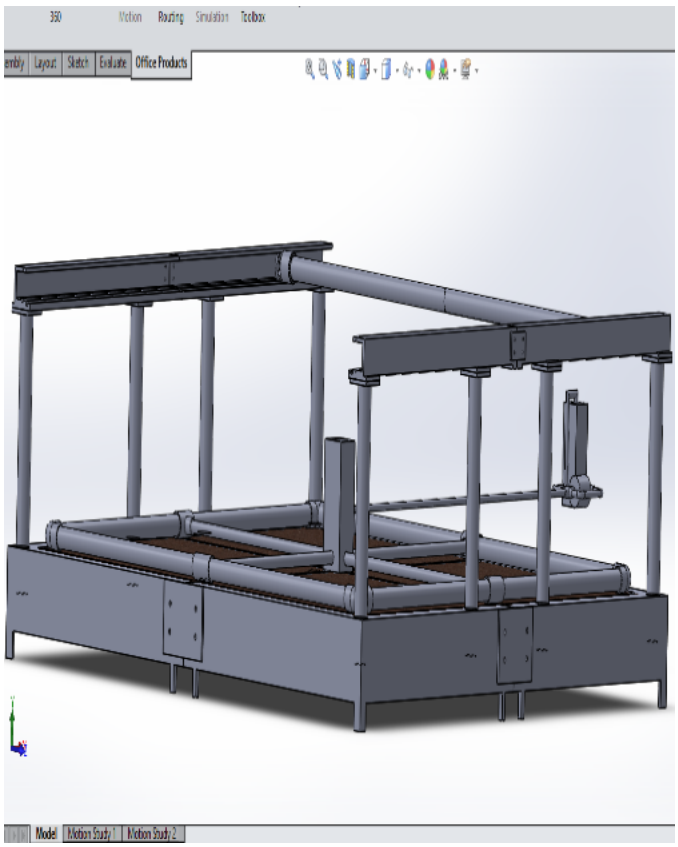

Fig. 2. 3D model generated on CAD and simulation

is utilized to inform system about the downpour and micro-controller also incorporates cloud platform to gather local weather reports.

IV. RESPONSE TO UNWANTED RANDOM RAINS DURING HARVESTING

During harvesting, the aim is not to let even single drop of rainwater to reach the field. Micro-controller utilizes cloud platform for rain prediction. Rain-drop sensor is interfaced with digital pin of microcontroller to immediately sense the drizzling. Once, it starts drizzling, micro-controller immediately closes the smart cover without letting the rainwater to reach the crop which is ready for harvesting. Complete rainwater is harvested by the A.P.A. for the time it rains. A.P.A again opens the smart cover once rain is stopped.

V. RESPONSE TO SUMMER TEMPERATURE FLUCTUATION

Crops require optimum temperature for their healthy growth. If the temperature fluctuates beyond a permissible limit, entire crop will get devastated Micro-controller utilizes cloud platform to gather local temperature data and data about variation of temperature throughout the day. DHT22 temperature and humidity sensor can also be incorporated to gather local real time data.

Once the temperature goes beyond the permissible limit, micro-controller closes the smart cover. Since smart cover is

Fig. 3. Solenoid Valve in action.

solar painted, it will not only radiate the heat but also harness the solar energy. The generated solar energy can be utilized to run the A.P.A system which requires mere voltage of 12V for its operation.

VI. RESPONSE TO WATER SCARCITY

The rainwater is harvested in a proper reservoir. The same rainwater is discharged for irrigation into the field.

The moisture content monitored by moisture sensor is grouped in four categories.

(i) When moisture content is more than 75

(ii) When moisture content is in between 50

(iii) When moisture content is below 50

(iv) When moisture is below 25

Thus, farm becomes independent of any water reservoir for irrigation like bore well, canal. River etc. and A.P.A enables the farm to be self-reliable.

VII. CONCLUSION

The problem statement and issues dealt under Agro Personal Assistant, which nobody has yet provided any technical solution for the same. People usually perceive damages due to rain and temperature fluctuations as caused by nature and treat as these damages can't be stopped and issue can't be resolved.

The non-existent of competitor/product proves the innovativeness of idea and proposed solution. With the implementation of A.P.A in the agricultural field, crops can be saved from devastation and productivity will hence increase. Poor economic condition of farmers in developing countries will improve due to increased crop yield.

VIII. RESULT

Snapshots of lower portion of system is as follows

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Fig. 4. Flow sensor interfaced at the junction.

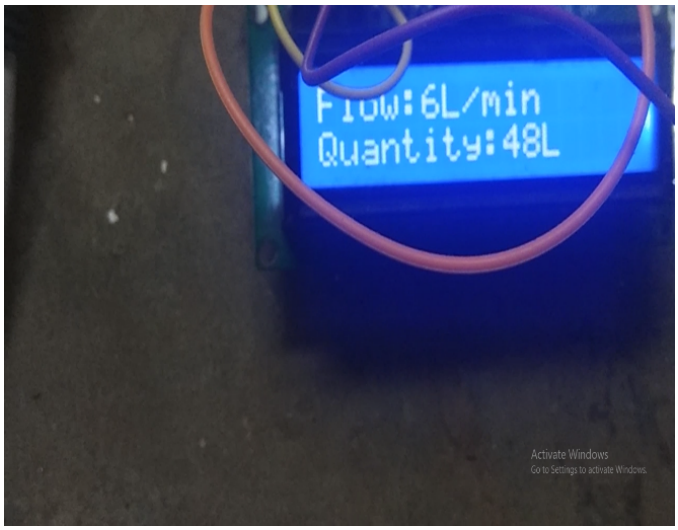

Fig. 5. LCD depicting flow rate and quantity of water discharged into field.

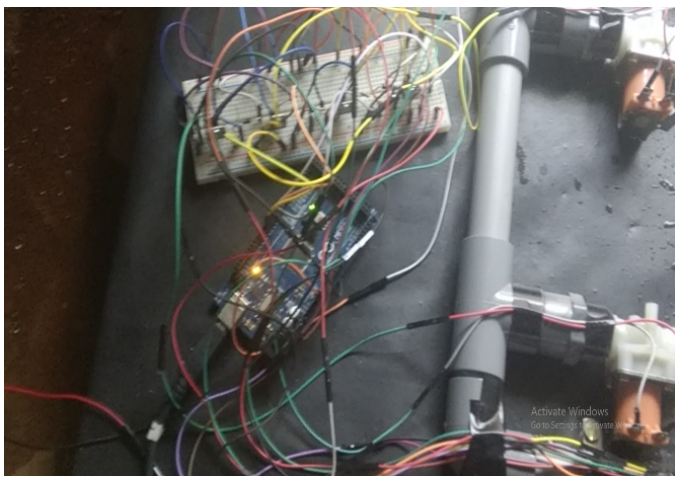

Fig. 6. Arduino Mega and Breadboard connection

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