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Research paper



Agri-Iot: a Sustainable Environment for Improvement of Crops Revenue in the Field of Agriculture Using Iot

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Abstract

Agriculture is a field where farmers experience less income because of natural disorders like less rain fall, floods, lack of weather forecasting at the farmers end, unaware of technology to use for their crop benefit, lack of automatic functioning of equipment, lack of interconnection among the components involved in the process and most of other bad experiences. To lift the farmers life not only in the state's economy and also in any nation's economy, a technology to be needed that will help the crops to get yielding's in time without any delays, and also make merchants to contact the farmers directly by offering the high prices for the quality crop yielding's. The proposed technique called Internet of Things (IoT) is a new technology which is adapted for the agriculture field for increasing the farmers crop revenue. This developed IoT design in which components required such as sensors, motors, transmitters, and other required devices to function in the integrated collaboration of internet. The expected results are noted in the Results chapter and are found necessary for future generations of farmers. This design and functioning of the IoT for the agriculture is proven the best approach to follow in this modern world.

Keywords:*Internet Of Things (IoT), sensors, software, crop yielding, results, process.*

1. Introduction

In traditional culture, agriculture is one field where most of countries people survive their families with the revenue generated by their seasonal crops yielding. The most traditional crops the farmers crop are sugar cane, papaya, ground nut, rice, wheat, mango, bananas, lemon, musombi, coconut etc. In this traditional agricultural approach in earlier days, there is least number of new viruses which could damage the crop at the levels of crop growth. To strengthen the crop, traditional method follows supplying of cows, goats, sheep dungs, and some plants ashes like neem, and other trees leaves. In those old days, viruses are less and strength supplied to the crops is withstanding and expected what the farmers dreaming in their mind. But the world moving towards modern technology, new and new viruses are generating because unexpected nature which are mutable in nature cause damaging the farmer's crop. This results less income experienced by the farmers. In the agriculture field, so far less research is occurred. This research won't be helpful to the old generation of farmers' community. Now-a-days, enough research on agriculture crops is happened, new rules and regulations are framed for each kind of crop for increasing the crop's revenue. People also realized the value of horticulture. Now-a-days, there is enough staff available in the horticulture to help and guide the farmers in the growth of crops. New medicines are also invented and new seeds also invented for welfare of crops so that farmers can get the yielding are in time without any delays.

But still there is no generation of good income because of poor marketing and its direct price. To provide good revenue and income to the farmers in the field of their crop growth and selling its yielding in the global market, A new technology Internet Of Things(IoT) is required which is an essential technology required for the farmers now-a-days. This IoT is to be explained in Proposed Chapter with its detail functioning, communication between the farmers and nearest agricultural office hubs having officers called specialist experts about weather changes and supply of enough agricultural medicines to the crop growth, communication about the their farmers crop to the their cell phones, duration of exact cutting of crop, and outputting of good revenue to their crop in the global market. The technology IoT benefits the farmer community a better compared to traditional or semi-traditional agriculture. How the benefits will be achieved is to be discussed through Proposed Chapter. The traditional agriculture is to be functioned based on following architecture. The architecture describes about inputs to be given for the type of crop like soil prepared to be ready based on season, water supply at right times, complexes to be supplied for crop growth, and other factors like external animals like birds, monkeys, pigs to spoil the crop at the cropping time and etc.

This traditional agriculture architecture is dependent more on man knowledge and nature smoothening. This will yield worst crop if natural hazards occurred, delays in supplying right proteins and lack of right supply of water. To overcome these problems in traditional agriculture, modern agriculture using Internet Of Things (IoT) is preferred. The detail explanation about IoT is discussed in Proposed Chapter.

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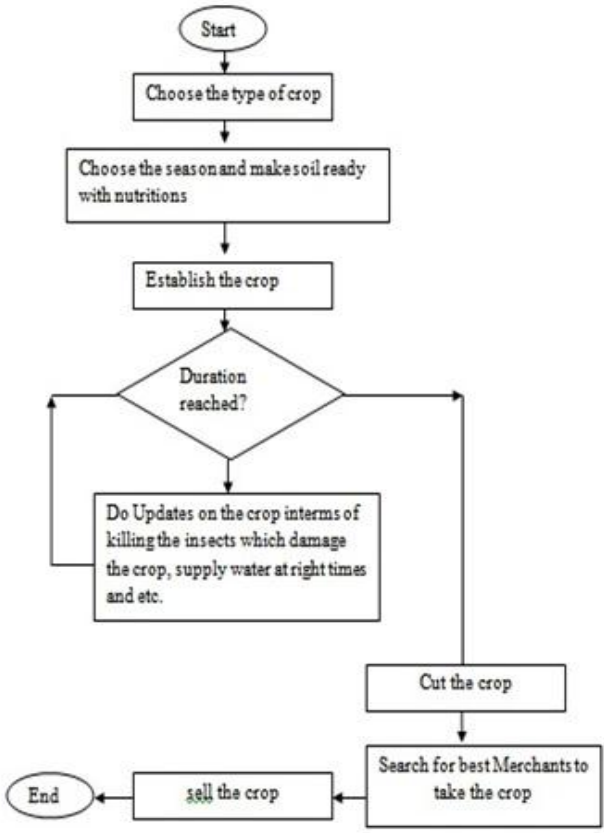


Fig.1. Traditional Agriculture Architecture

2. Proposed Work

IoT is a proposed technology adapted to farming in the present generations which benefits good or expected revenue from the crops cutting. IoT is a combination of many sub elements in order to achieve the right intention depending on the right application.

The following is description diagram about IoT. IoT includes integration of elements such as software applications, Communication Systems like cell phones, Positioning Technologies, Hardware and Software Systems, Sensing Technologies and Data Analytics.



Fig.2. Sub Technologies in IoT

The major benefits of using IoT are listed as below:
It is used beyond the applications than M2M which is to provide Machine to machine communication. In IoT, the elements communicate with each other indicating the location and conditions to the owner.

First benefit is, IoT is combination of multiple technologies helpful to a person or a society or business. It saves time and money with delivering output faster and accurate with minimum utilization of energy. Another benefit is IoT is used in various applications such as patient monitoring, home security, asset and individual tracking, energy conversation, inventory control, shipping etc. other than smart farming (IoT for agriculture).

The following is the table represents the applications of IoT:

Application areas of the reviewed literature on agriculture and food in Scopus

Application areas	2010	2011	2012	2013	2014	2015	TOTAL
Agriculture in general	2	4	3	1	7	9	26
Arable farming	1	5	10	6	9	2	33
Fishery and aquaculture	0	0	1	1	1	0	3
Food consumption	0	0	0	3	2	0	5
Food supply chains	2	9	10	14	17	16	68
Greenhouse horticulture	0	0	3	6	3	2	14
Leisure agriculture	0	0	0	0	3	0	3
Livestock farming	0	0	1	1	1	5	8
Open air horticulture, including orchards	0	0	3	2	0	3	8
Total	5	18	31	34	43	37	168

Fig.3. List of applications that need IoT

There were many other applications, which may adapt IoT for their better functioning and save time and money. Although IoT has many benefits, its main disadvantage is multiple technologies usage from multiple vendors. It can be easily overcame by bringing vendors agreeing to a well standard solves technical issues and compatibility issues. The architecture of smart farming also called Sustainable Environment for improvement for crops revenue in the agriculture field.

The Components involved in the Smart Farming using IoT are as follows:

A) Mobile Device: The farmers must use cell devices in order to get status information of the crop. The farmer can also be monitored by the specialist expert from the local office which is connect to central office.

B) Sensors: These are the devices used to sense the condition of the crop and communicate to the server which in turn send the same information to the client.

C) Equipment: These are the devices necessary to monitor the crops growth, and in which few are useful for cutting the crop. The last variety sensing device at last communicates to the merchant market app about the crop, approximate weight of the crop and minimum biding quotation.

This smart farming working procedure is depicted in the following flowchart and this flowchart may differ with respect to the other applications:

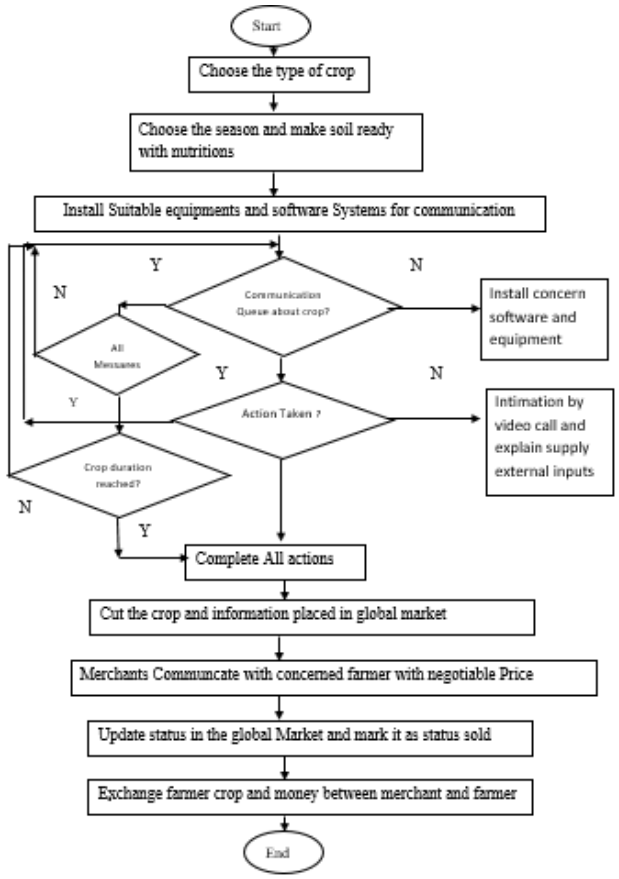


Fig.4. Smart Farming

D) Server: This is a central computer that receives information from all crops sensors which are identified by the farmer phone number. To reduce overhead in giving response for every request from the client, an intermediate computer called Proxy Server is introduced between the server and many clients.

E) Proxy Server: It is intermediate computer that increases speed and saves time in giving the response to the client.

F) Software Systems: These are application software's that are installed on the suitable equipment needed for the communication among the farmers, officers, and other equipment in the integration environment.

G) Merchants Market Website App: It is application software developed about the merchants contact information and farmers crop yielded details. The farmer can approach the right merchant or the merchant can contact the right farmer about their needs.

All these components are inter-connected and communicated among themselves. Every information about the crop is sent to farmer's cell device as a message and is tracked by the local office expert through the server.

3. Results

After the crop is cutted and have a crop yield, the merchant market app receives the information from the sensor or from the farmer about the crop. The merchant who need that goods can approach the farmer directly without any intermediate persons. This leads to direct price paid to the farmer.

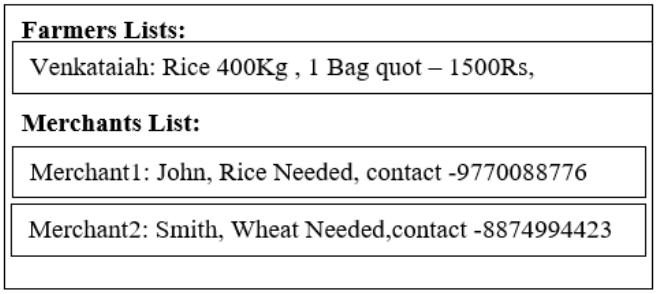


Fig.4. Particular farmer crop details in the app

Now, the educated farmers and merchants can see their details. If farmer crop or goods quotation is satisfies the merchant, merchant will approach the concern farmer. If the particular merchant requirement is satisfying the concern farmer, the farmer will approach the particular merchant. Once they agreed, goods item is marked sold out is attached over the text.

The above screenshot is for one farmer. If there are many farmers whose crops got yielded, their details are automatically appears in the merchant market app. It can appear as follows:

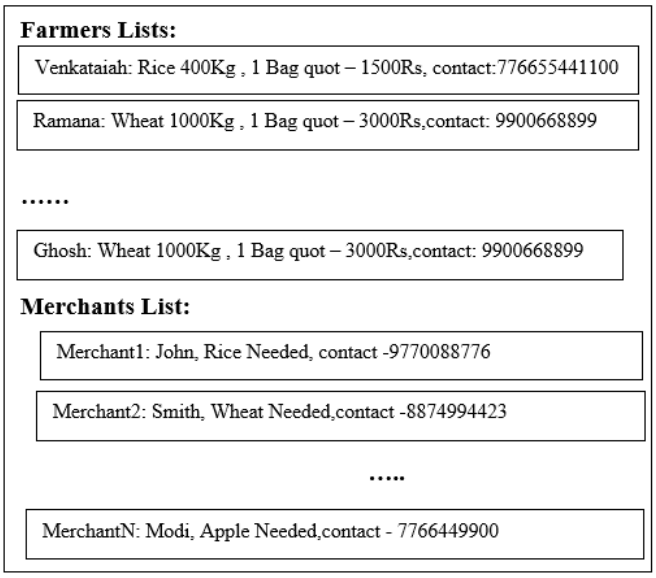


Fig.5. Particular farmer crop details in the app

4. Conclusion

This paper concludes that IoT is a new technology required for the agriculture field in order to get expected revenue for the crops that farmer had grown. This technology may also apply to many other application areas where components needed for their application may be varied compared to agriculture application. This IoT includes interconnection of components such as internet, software systems, and variety of equipment. Many burdens like monitoring of the crop, cutting the crop at right time, and major headache to farmers is marketing are existing in the traditional agriculture. These pitfalls were almost eliminated in using Internet Of Things (IoT) for agriculture where communication about each stage of crop is intimated to the farmer so that necessary action done by the farmer. This IoT enables automatic marketing for the crop yielded for that farmer. Like this, many farmers crops are to be processed at a time using multithreading facility.

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