Whitepaper

IoT Solutions for Agriculture

Website: www.mobodexter.com
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The farming industry will become arguably more important than ever before in the next few decades. The world should produce 70% more food in 2050 than it did in 2006 in order to feed the growing population of the Earth, according to the UN Food and Agriculture Organization. To meet this demand, farmers and agricultural companies are turning to the Internet of Things for analytics and greater production capabilities. Technological innovation in farming is nothing new. Handheld tools were the standards hundreds of years ago, and then the Industrial Revolution brought about the cotton gin.

The IoT is set to push the future of farming to the next level. Smart agriculture is already becoming more commonplace among farmers, and high tech farming is quickly becoming the standard thanks to agricultural drones and sensors. IoT device installations in the agriculture world will increase from 30 million in 2015 to 75 million in 2020, for a compound annual growth rate of 20%. The U.S. currently leads the world in IoT smart agriculture, as it produces 7,340 kgs of cereal (e.g. wheat, rice, maize, barley, etc.) per hectare (2.5 acres) of farmland, compared to the global average of 3,851 kgs of cereal per hectare.

Considering the growth of Internet of Things Since the year 2000, we will find the following shift in use of sensors over the period:

- Year 2000 – Globally there were 525 Million farms on record out of which not a single farm was connected to Internet of Things
- Year 2025 – With same base of 525 Million farms there were 600 Million in use at these farms. This is a major shift of technological advancement in Agriculture Internet of Things.

**IoT and farmers, better together:**

- Monitor and analyze soil moisture and control irrigation equipment.
- Use precision agriculture to measure and respond to inter and intra-field variability in crops.
- Determine which seeds to plant and when to harvest
- Control pests and utilize organic farming techniques such as pheromone delivery to disrupt mating patterns.

**Benefits of IoT for agriculture include:**

- Increased productivity
- Improved water utilization
- Resource optimization
Available IoT Solutions for Agriculture

**IoT Device** enables the plant breeders to evaluate the performance of differentiated varieties of wheat with help of measurements taken from remote sensors. These Sensors are capable of monitoring various factors like soil temperature, humidity, air temperature and so on.

- It helps to improve the quality and helps the plant breeders to monitor growth of plants under various climate conditions.
- It measures on field environmental & plant physiology parameters resulting in improvement of quality.

Agriculture Internet of Things equipment’s can be operated on autopilot and farmers can receive advice on ways to improve crop productivity and reduce grain losses.

- IoT in Agriculture is used to facilitate the service to farmers using which farmers can manage and control their agricultural plotting’s via a computer or smartphone.
- It collects important piece of information for further analysis and utilization of such information in field mapping, various planning program like fertilization planning and nutrient.

**Unmanned Aerial Vehicles (UAV) Sensors** are efficient in collecting superior quality data and sensing and analysis of data collected for facilitating farmers with relevant piece of information like wind speed, air pressure etc. using artificial intelligence. This platform can be used in easing civil service like surveying, mapping & imaging of agricultural plots.

IoT devices for making the quick measurement of concentration of ions in a given liquid. In other words the device measures the various nutrient levels present in a given liquid on field. A transuding layer in the sensors is used that enables the measurement or test for multiple ions in a solo device. This has also lead the meter to provide instant feedback to the user.

Wireless sensor monitor device acts as a safety measure against hazards like fire, overloading etc. in Grain elevators by way of slowing down or stopping the operation of conveyor belts in situation of overloading or overheating to avoid any possible damage.
Build IoT for Agriculture Using PAASMER IoT Platform

PAASMER defines building IoT for agriculture in two approaches.

**Approach 1**

We use a Three-step process to build a Smart Agriculture solution using IoT.

1. Choose your low processing TI C3200 based connectivity module with required sensors.
2. Choose a connectivity option like GSM, GPRS, 2G, 3G, 4G, 5G.
3. Choose a plan and connect to PAASMER Cloud to use web applications and mobile applications.

In this approach, every module communicates the data to the cloud for processing and analysis.

**Approach 2**

We use a Four-Step process to build a Smart Agriculture solution using IoT.

1. Choose your low processing TI C3200 based connectivity module with required sensors.
2. Choose an IoT gateway to connect and aggregate the data from all the sensors in a farm to one gateway.
3. Choose a connectivity option like GSM, GPRS, 2G, 3G, 4G, 5G.
4. Choose a plan and connect to PAASMER Cloud to use web applications and mobile applications.
Build Smart Greenhouse Using PAASMER IoT Platform

In this approach, a group of modules communicate with the gateway and the gateway communicates with cloud for processing and analysis. Reduced communication overhead and cost optimization. PAASMER MISTY Operating system and Firmware can be used to perform certain compute operation with Edge intelligence software and then Intelligent Edge can be made to complement the cloud.

Smart Greenhouse Market is expected to increase to more than USD 1.2 Billion by 2020, growing at a CAGR of 14.18% between 2015 and 2020.

A greenhouse is a structure developed for growing plants in a controlled environment. These structures capture the incoming visible solar radiation and retain heat to provide a favorable environment for plant growth. Traditionally, majority of the greenhouses used soil as the base for growing plants. However, hydroponic or soil-less horticulture has recently started gaining popularity in the greenhouse industry. The smart greenhouse market is analyzed by different types and on the basis of technologies used. The type segments considered for the market estimation of smart greenhouses include hydroponic and non-hydroponic techniques.

Heating, Ventilation & Air Conditioning or HVAC is the technology used for maintaining optimum temperature within a controlled environment. In case of greenhouses, HVAC plays a vital role in maintaining an ideal temperature for plant growth. This technology is needed to nullify the effects of external temperature changes and enable cultivation throughout the year.
HVAC systems are designed taking into consideration the external and internal environment fluctuations in the region in which the greenhouses are setup. LED grow light is costly compared to other grow light technologies owing to which their usage was restricted to applications where urban farming is conducted on a large scale. However, with advancements in technologies and awareness about energy efficiency compared to other lighting technologies, its adoption has increased rapidly.

A Smart Greenhouse needs a device called Environment Controller. Environment controller comprise of sensors attached to a TI CC3220 based module to monitor humidity, temperature, CO2 Gas measurement and light. It also has power sockets into which each of the controllable items like Bulbs, HVAC can be controlled. It also has built-in Wi-Fi or Bluetooth connectivity for transmitted the data to a Cloud. Mobile apps are used to control and monitor the Environment Controller via the Cloud.

**Functional aspects:**

1) The sensor measures the values of temperature, humidity, gas & light levels inside the greenhouse.
2) Best operational threshold for each of these measurements are set on the environment controller using the mobile application.
3) If the status of the measurements is outside the threshold a software algorithm is used to control the power sockets where the lights and HVAC are connected.

By this way, the smart greenhouse is designed to ensure the operating conditions of the greenhouse remains constant based on the threshold value set. This threshold value can be set by the user depending on the weather and climatic conditions of the location where the smart greenhouse is installed.
Conclusion

IoT can help farmers in a number of ways. At its most basic level, sensors can be deployed across farm and farming machineries in order to enable farmers to gain an abundance of insightful data, such as the temperature of stored produce, the amount of fertilizer used, the amount of water in the soil, the number of seeds planted, storage conditions, the status of farming equipment and machinery in use, etc. Once an IoT-enabled smart system is in place, farmers can easily track a variety of environmental variables and take informed decisions.

Rather than just an enhancement, smart farming is a necessary innovation, which if correctly implemented could help farmers to deal with all the challenges they face in farming. Moreover, the rich insights derived from smart sensors could help farmers be more precise in their use of pesticides and fertilizers, thus mitigating some environmental impacts.

IoT deployment in agriculture can address many challenges and increase the quality, quantity, and cost-effectiveness of agricultural production.
MoboDexter, Co-Founded by Ex-Intel veterans in 2013 is based out in New York, Bangalore and Singapore. We are rapidly establishing itself as an innovative platform leader in the world of enterprise Internet of Things. In the booming and evolving Internet of Things market, MoboDexter has created a unique IoT platform to enable businesses to build their IoT products and solutions. **PAASMER is a software suite that bundles all the elements needed to connect sensors, gateways, mobile application, cloud and analytics to develop, build and deploy connected IoT products quickly and efficiently.** PAASMER’s end goal is to enable Artificial intelligence to “Things” so that Things are enabled with their own intelligence to act in the best interest of the user. Hence Machine learning and Deep learning are integral choices in the platform for our clients to leverage.

The unique aspects of PAASMER platform that differentiates our platform from other IoT Platforms in the market are

- **Best In Class High Speed Edge Database**
- **Innovative Edge Analytics**
- **Modular Edge OS**
- **Innovative Edge & Cloud Security**
- **Dynamic Cloud Management**

MoboDexter is advised by Gartner Inc. In a recent Gartner survey, top 4 verticals seeing steep growth in IoT implementations are HealthCare, Connected Home, M2M & Retail. These are the same 4 verticals that are growth focus for PAASMER and has signed up clients across the world in each of these verticals. Our client implementations case studies are [here](https://mobodexter.com/).

**Raconteur Online wrote** - “MoboDexter’s IoT Platform as a Service, named PAASMER, and has been built with an inside-out approach from gateway upwards or downwards that makes it more versatile and flexible to integrate than existing platforms”

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