Smart Agri – Future of farming

With the exponential growth of world population, according to the **UN Food and Agriculture Organization**, the world will need to produce 70% more food in 2050, shrinking agricultural lands, and depletion of finite natural resources, the need to enhance farm yield has become critical. Limited availability of natural resources such as fresh water and arable land along with slowing yield trends in several staple crops, have further aggravated the problem. Another impeding concern over the farming industry is the shifting structure of agricultural workforce. Moreover, agricultural labour in most of the countries has declined . Still many of the local or rural farmers who are completely depending upon farming as their only income, due to their lack of knowledge and unpredictive climate change, low availability of labour worker pushing them to face huge loss and huge production losses.

Smart-Agri is a proposal of bringing technology in the field, amid climate change, dwindling resources and increasing population, the global farming industry has come under significant pressure. As the unpredictability intensifies, it's no surprise that growers are turning to advanced technologies to boost production efficiency and crop resilience. In agriculture, the Internet of Things (IoT) is more present than ever before, and **SMART-AGRI**(a prototype greenhouse farming) is a stellar example. **SMART-AGRI** provides a controlled environment customized to the vegetation needs cultivated inside. Traditionally, micro-climate and agronomic parameters have been recorded in a rather manual and inconsistent manner. There's a limit to what can be measured, and farming practices are executed on a pre-defined, speculation-based schedule. On the other hand, weather changes throughout the day and "invisible" conditions like open doors or early-stage infection constantly influence the greenhouse environment and threaten to damage crops.

Equipped with modern sensor and communications technologies and appliances, **SMART-AGRI** automatically capture and deliver the farm information to the farmer 24/7 on the surroundings and crop along with the local outside weather parameters. Collected data is fed into IBM Cloud where analytical algorithms turn it into actionable intelligence to uncover bottlenecks and abnormalities also to detect and predict some informative value depending upon past 10+ years analytics which includes, Crop-Yield, Best crop under that particular condition, Disease checking and pesticides recommendation, Rain prediction, best fertilizer and each of the appliances and conditions can be controlled anytime from anywhere just with the use of our APP, which is further equipped with notification facility to choose among the 7+ parameter which is to be informed and with 2 alarm timing to be set by the farmer, to let the system know when to be informed through SMS notifications.

SMART-AGRI is also equipped with a special water tank to load the ground water when ever needed to save more energy, water. Water nutrients and optimum water temperature is very necessary for the best production of the crops. So we had an automated water heater and cooler with nutrients detection of the water to take care of every little things. Also the farmer can access the past sensors values loaded in the IBM cloud for any reference or knowledge of the farmer. Our system is built with 20+ sensors, 5+ appliances and in Raspberry Pi using Python3 as the coding language and Node-Red services for giving the user with best possible interface with the system further implemented to MIT-APP-INVENTOR.

By unlocking massive crop insights, the **SMART-AGRI** allows growers to minimize labour work, improve efficiency in resource and chemical use while optimizing yield rates.
Main Unique points of SMART-AGRI, it is environmental friendly, low energy consumption using maximum energy from solar power(Natural resources) and rain water, reliable, cost effective and with extra safety and security, running night vision camera 24/7 for surveillance of the greenhouse system directly storing any suspicious moves in the IBM Object Storage for any future use. Most importantly it supports 7+ Local Indian language(more can be implemented) along with English to make it easy for anyone to understand and operate the system.