Project Design Phase-II
Solution Requirements (Functional & Non-functional)

Date	03 October 2022
Team ID	PNT2022TMID34083
Project Name	Smart Farmer - IoT Enabled Smart Farming Application
Maximum Marks	4 Marks

Functional Requirements:

Following are the functional requirements of the proposed solution.

FR No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-1	Moisture Detection	Dielectric sensor measures moisture levels in the soil. The moisture sensors use in connection with rain check locations throughout the farm. This allows for the observation of soil moisture conditions when vegetation level is low.
FR-2	Temperature and humidity detection	DHT11 is a Humidity and Temperature Sensor, which generates calibrated digital output. DHT11 can be interface with any microcontroller like Arduino, Raspberry Pi, etc. and get instantaneous results. DHT11 is a low cost humidity and temperature sensor which provides high reliability and long term stability.
FR-3	Livestock monitoring	Iot-enabled livestock management solutions take the guesswork out of herd health. Using a wearable collar or tag, battery-powered sensors monitor the location, temperature, blood pressure and heart rate of animals and wirelessly send the data in near-real-time to farmers' devices
FR-4	Airflow Detection	Airflow sensors are used to record the number of gaseous substances present in the soil at a particular landscape after irrigation or to get an overview of the land that is to be cultivated before the seeding process. It determines the optimum pressure required to pump air to aerate the soil and make it more fertile. It is also used to determine the properties of the soil, its compaction, moisture-holding capacity, and more.
FR-5	Soil Nutrient Detection	Electrochemical sensors provide information for soil nutrient detection. Soil samples are sent to a soil-testing lab. Specific measurements, especially the determination of pH, are performed utilizing an ion-selective electrode. These electrodes sense the activity of particular ions, such nitrate, potassium, or hydrogen.
FR-6	Location Detection	Location sensors determine the range, distance and height of any position within the required area. They take the help of GPS satellites for this purpose
FR-7	Equipment Function detection	Electronic sensor installed on tractors and other field equipment to check equipment operations. Then, cellular and satellite communication systems used to convey the data immediately to computers or e-mail it

		to people. The field executive can then recover the information on their office computer or cell phone.
FR-8	Field Surveillance	Drones are equipped with sensors and cameras for imaging, mapping, and surveying purposes. There are ground-based and aerial drones. Ground-based drones are bots that survey the field on wheels. Aerial drones are flying robots that are either remotely controlled or can fly automatically through software-controlled flight plans. Insights about crop health, irrigation, spraying, planting, soil, and field can be drawn from the data collected from the drones. After the drones survey and collect the data, they are taken to a nearby lab to be analysed.
FR-9	Farm Remote Access by Farmers	Farm management software centralizes, manages, and optimizes the production activities and operations of farms. With farm management software, farmers can become strategic and efficient in their daily farm-related tasks and responsibilities.

Non-functional Requirements:

Following are the non-functional requirements of the proposed solution.

FR No.	Non-Functional Requirement	Description
NFR-1	**Usability**	Usability can be described as the capacity of a system to provide a condition for its users to perform the tasks safely, effectively, and efficiently. IoT in agriculture uses robots, drones, remote sensors, and computer imaging combined with continuously progressing machine learning and analytical tools for monitoring crops, surveying, and mapping the fields, and providing data to farmers for rational farm management plans to save both time and money.
NFR-2	**Security**	Potential attacks in various different smart farming systems can lead to serious security issues in the dynamic and distributed cyber-physical environment. These types of threats and attacks can result in severe disruptions of interconnected businesses. These threats are mostly related to cybersecurity, data integrity and data loss. In addition, because of the utilization of heavy machinery connected online, there are many emerging vulnerabilities that can potentially lead to disastrous consequences
NFR-3	**Reliability**	Reliability Means Consistency and Accuracy. Reliability ensure that a farmer can get a field task accomplished in a timely manner, it also reduces lost time and productivity. It is also reliable to

		environmental conditions but can be affected due to environmental disasters
NFR-4	**Performance**	Performance is high. Smart farming helps farmers to better understand the important factors such as water, topography, aspect, vegetation and soil types. This allows farmers to determine the best uses of scarce resources within their production environment and manage these in an environmentally and economically sustainable manner. Has a real potential to deliver a more productive and sustainable form of agricultural production, based on a more precise and resource-efficient approach.
NFR-5	**Availability**	Telecommunications technologies such as advanced networking and GPS. Hardware and software for specialized applications and for enabling IoT-based solutions, robotics and automation. This would enable farmers to monitor crops from anywhere.
NFR-6	**Scalability**	Scalability in smart farming refers to the adaptability of a system to increase the capacity, for example, the number of technology devices such as sensors and actuators, while enabling timely analysis. Cloud computing and edge computing improve the scalability. Cloud computing provides a high level of flexibility by providing remote services for monitoring and managing farm data. Challenges of scalability are identity management and access control, security, privacy, governance, and fault tolerance.