Functional Requirements:

- IoT soil moisture sensor
    - Data collection
    - Medium-long range wireless transmitter
        - Zigbee, LoRa
- IoT base station
    - Data logging
    - Medium-long range receiver to sensors
        - Zigbee, LoRa
    - Wifi data transfer to AWS cloud
    - Secure and consistent data logging and distribution
- AWS cloud
    - Data logging for verified data integrity
    - Data graphing to display to farmers
    - Data transfer using MQTT for IoT and sqs for application
    - Use of Amazon RDS, IAM, and Elasticsearch to support data flow and security
- Flutter application
    - Security authentication
    - Push notification alerts
    - Data visualization and representation
    - Data logging and graphing
    - Send data back to the base station

Non-Functional Requirements:

- IoT soil moisture sensor
    - Secure and consistent data collection and distribution
    - The IoT sensor will be able to withstand different climate conditions like rain, snow, and wind
- IoT base station
    - Secure and consistent data logging and distribution
    - The IoT base station will be able to withstand different climate conditions like rain, snow, and wind
- AWS cloud
    - Data can be stored and accessible from any location and time
    - Stored data will be secure
    - Deploy infrastructure via Terraform and potentially Drone

Physical Requirements:

- Minimal Footprint (Constraint)
    - Can not take up space needed for crops
    - Can not impede tractor movement.
- Weather resistant (Constraint)
    - Water-proof
    - Hot and cold temperature tolerance

- High Visibility
    - Distinct colors to make it easy to locate in a field
    - Reflector strips at night and inclement weather

Resource Requirements:

- Batteries should last from planting to harvest
    - Minimal maintenance needed

Environmental Requirements:

- Batteries don't leak into soil
- Materials don't change soil nutrient levels

UI Requirements:

- Flutter application
    - Data is only accessible to platform user
    - System performs identically regardless of location
    - Application operates on multiple operating systems
    - Application can handle multiple users at the same time
    - Users can not view other users data

Engineering Standards:

Flutter Application:

- ISO/IEC 5055:2021: Software quality standards for source code to be measured upon. The standard takes into account reliability, security, performance efficiency, and maintainability of source code.
- ISO/CD 18893: Applies to mobile elevating work platforms to protect users from personal injury, property damage, and accidents. As well as, establishes criteria for inspection, maintenance, and operation.

Cloud Computing:

- ISO/IEC 19944-1 (2020): Provides guidance on ensuring data flow and use as well as making cloud service agreements. Helps guide transparent use of data across the cloud services. Doing so will maintain trust between use parties and protects personally identifiable information (PII)
- AWS Well-Architected framework: Defines six pillars to help create the best design possible in the cloud. Assists with efficiency, cost-optimization and sustainability.

IoT Infrastructure:

- IEEE 802.15.4 is a standard that defines operation of a low-rate wireless personal area network (LR-WPAN). It specifies the physical layer and media access control for LR-WPANs. Zigbee is regulated under 802.15.4 and is the communication method between nodes and the base station.
- IEEE 802.11ac is the most recent update to ac wi-fi standards. Our devices may use wi-fi, so following the IEEE standards will be important for compatibility purposes.