**Introductions**

Gustavo – Rapid prototyping, sensing, agriculture

Wesley (Wess) – background as mechancial and technology sensors

Atif – Mainroads, bridge health monitoring

**Highlight Risks**

Don’t have anyone with an electrical, mechatronics, mechanical and agriculture background

**Project Overview**  
After minining oil and gas, agriculture largest industry in WA

40% of grain exports comes from WA

Access to bunch of farmers.

Farmer needs to do bunch of operations during growing season

Problem: cannot operate heavy machinery during rain due to compaction + bogged

Average farm size is 6000 hectres

When it rains heavy machinery has issues – no real time monitoring in Satellite currently

Current solution – person on ground checks ground to see whether they can do their farming process with their machinery

**Sensor requirements:**

Soil monitoring at different depths, when a level of moisture is reached it sends a message

Constraints: Ruggedised sensor, calibrated for different types of soil, measuring conductivity (different soils influence calibration). LORA equipment run for scientific purposes are quite expensive. Any equipment is minimum $700, as we need to have multiple sensors especially in water logged areas. Current smart agriculture solutions are being offered by one platform for decision support service (John Deere) - can access their API etc.

What we need is a real time soil monitoring system + Dashboard and integrate with John Deere API – within the same platform. Still to decide on the sensor, it is quite complex. Each real time monitoring system will have multiple sensors at different depths. We need to focus on communication network, low power sensor and the integration as the sensor itself and ruggedising it is something that will have to be looked at with a team with proper capabilities.

**Constraint is Time and our Capabilities - Major Milestones:**

1. **Project Specification – Lock in Meeting in Week 4 for feedback**
2. **Final Project Demonstration and Report – Lock in Meeting in Week 10 for demo and report**

**Action Steps**

**Find Challenges ushc as**

* Integration with John deere API
* Capture soil moisture at different depths
* Managing power - low power
* Communication inside the ground
* Thesis
* Edge Computing (Farmer’s house, cellular connectivity), what type of data has to be
* What John Deere API payload looks like
* Dashboard User interface – is it a RAG indicator for point in space (GPS location) soil moisture, is it a reading of soil moisture, is there interpolation between sensors

Deliverable:

Overview of Design and Requirements

Document in a way it built upon

Power, appropriate microcontroller, What the data looks like, Commuication of it, and basic Protoype focus is Wireless Network, Power, and integrating to John Deere API

Focus on Design with small prototype and Simple soil moisture sensors

Define the requirements, then timeline and requirements

How to best communicate the dashboard output (user interface) on John Deere Platform – talk to a real farmer

Problem of finding the sensors and then also running over it etc.

**John Deere Platform Farm to see how it works – Gustavo**

Basically device sends telemetry data

Geospatial information and interpolation (need to consider this). Point based information for sensor, surface (inverse distance way so if 50 + 35, divide between it)

Overview of the problem, all the things we want and then perhaps a demonstration of a part of it with a basic prototype. Focus on project requirements. Defined documentation is also important

**Before Next Meeting**

* Goals
* Timeline of research
* Stakholders, and look at John Deere sensor (find out what it looks like on the dashboard)
* Research on communication tehcnology
* **Required, every week: Send weekly update of what we have done**

## Meeting Preparation:

**Introductions**

Go around table and understand everyone’s background and what their expertise is, so we know who might be the best person to contact for a particular issue or area of knowledge.

**Client Role and Expectations**

1. Roles – what are your roles for this project
   1. How involved do you want to be in the project development process? Can we do some research, get some feedback and iterate?
   2. Are there any other stakeholders we need to engage?
2. Expectations for meetings – Availability, Time
3. Communciation preference - Email and/or F2F/Teams Workshop
4. Expectation for final deliverable – What does it look like? One Soil Moisture monitoring system with some sensors, microcontroller, battery that sends data using a communication protocol to eventually connect to the internet and update a live dashboard to show insights into soil moisture and maybe make a recommendation based on a threshold or value?

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**Project has a bit of breadth and depth. Goal is to provide you something valuable. Is this a prototype or an MVP? Because if we did it right and considered all the elements MVP will require significantly more time than time allows for. We could identify all the elements that we cannot complete and add into future works**

**Understanding Client's Needs and Expectations**

1. **Project Scope and Objectives**:
   * What are the main goals of the soil moisture monitoring system?
   * Are there specific features or functionalities that are essential?
2. **Current Practices and Challenges**:
   * How do farmers currently monitor soil moisture?
   * What challenges do they face with the current methods?
   * Besides what is in the brief are there any specific problems related to soil compaction that need to be addressed?

**Technical Requirements**

1. **Data Requirements**:
   * What specific data points are crucial for effective soil moisture monitoring (e.g., soil moisture levels at various depths, temperature, humidity)?
   * Is there any analysis or transformation of data like an equation or something for soil moisture?
   * How frequently should the data be collected and reported?
2. **Sensor Selection**:
   * Are there any preferences or restrictions regarding the types of sensors to be used (e.g., cost, durability, accuracy)?
   * Are there specific depths at which soil moisture needs to be measured?
3. **Environmental Considerations**:
   * What environmental factors should be considered (e.g., waterproofing, resistance to rust, temperature range)?

**Communication and Data Management**

1. **Read Omar’s paper before on Communication Technology, wanted to clarify**:
   * Communication technology really depends on payload (data size). What communication technologies are feasible for transmitting data from the sensors to the local hub/server and then to the internet? NB-IoT or LoRAWAN might be easiest
2. **Data Integration and Dashboard**:
   * What attributes and metrics should be included in the dashboard?
   * Do you have any prefererence on how the data should be visualized to provide actionable insights for farmers?
   * Did you want us to integrate anything else into the dashboard – see link in my research

**Cost and Implementation**

1. **Budget Constraints**:
   * Are there any budget constraints or funding considerations for the project?

**Analysis and Testing**

1. **Testing System accuracy and robustness:**
   * I found capactative soil moisture sensor requires calibration etc. that will take time.
   * Hard to do this as we need commercial sensors – see research (we can simulate)

**Miscellaneous**

1. **Regulatory and Compliance Issues**:
   * Are there any regulatory requirements or compliance issues that need to be considered? E.g. we have to go off site to test or something

**Clarifying Soil Compaction**

* Ask about the relationship between soil moisture and soil compaction:
  + How do they currently measure or assess soil compaction?
  + Are there existing technologies or methods they use to monitor soil compaction?

**Example Sensors and Technologies**

* Discuss potential sensors and technologies that could be used from researc:
  + Capacitive or resistive soil moisture sensors for measuring moisture at different depths.
  + GPS modules for location information.
  + Wireless communication modules (e.g., LoRa, NBIoT) for data transmission

**Summary of Meeting**

**Action Steps**