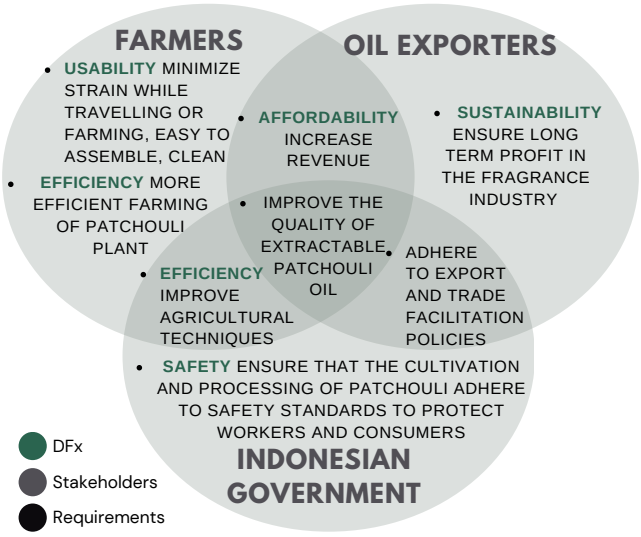
MULTIPROBE SOIL SENSOR

OPPORTUNITY SPACE

Improve the efficiency of farming Patchouli plants through identifying the nutrient levels in the soil.

- Allows farmers to identify optimal planting locations and determine if current areas may be used for another harvest.
- Allows farmers to identify areas that are lacking nutrients and require additional fertilization during growth.

VENN DIAGRAM OF STAKEHOLDER, DFX & REQUIREMENTS



KEY DESIGN DECISIONS

1. ***DESIGN FOR ASSEMBLY:*** Structural component is separated in to 3 distinct sections. This will make it easy for farmers to assemble, clean and maintain after each use.
2. ***DESIGN FOR FUNCTIONALITY:*** The design is based on multicolour pens, where multiple tubes can be dispensed through one integrated product. Due to there being an existing model, this may be easier to produce.
3. ***DESIGN FOR ERGONOMICS:*** The design is portable and hand-held with a firm grip, making it easy for farmers to carry around.
4. ***DESIGN FOR USABILITY:*** The interface on the lid informs the farmers of the properties of the soil tested, such as pH, moisture content and NPK levels with ease of interpretation.
5. ***DESIGN FOR EFFICIENCY:*** The multiprobe sensor conducts rapid tests to measure NPK, pH and moisture readings in real time.

NEXT STEPS

- Design the software and finalize the circuitry.
- Conduct research on the probes needed in the design to create a method for the probe data to inform the LED functionality.

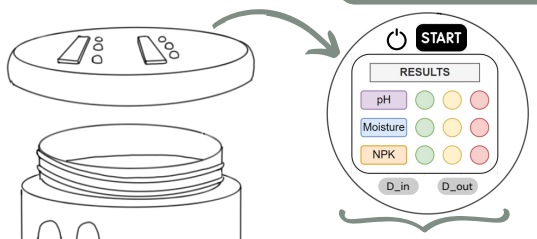
STRUCTURE & DESIGN FEATURES

The concept meets stakeholder requirements as it is able to detect the nutrient contents of the soil to inform farmers whether or not a patch of earth is suitable. This allows farmers to identify optimal planting locations based on nutrient concentration (NPK - nitrogen, potassium, phosphorus), moisture and pH readings.

(A) EXPLODED VIEW OF THE SEPARATED COMPONENTS

(B) DISPLAY PANEL WITH MEASURED READINGS FROM THE SENSORS

(C) CROSSECTIONAL VIEW OF THE MULTIPROBE



Main Body to enclose the electrical circuit

Interpretation of Results: To assist farmers in understanding the meaning of the readings - characterized by colored LEDs:
- **Green:** readings lie in normal range
- **Yellow:** readings require attention (i.e. outside the normal range but acceptable)
- **Red:** readings unacceptable - hazardous to crop health/survival

Opening to allow each sensor to probe into the soil one at a time

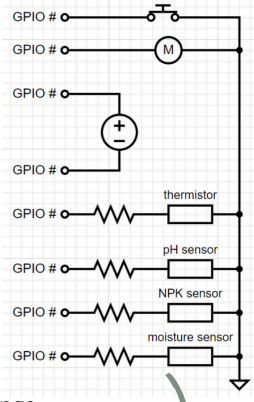
Indentations to allow for secure grip while drilling through the soil surface

Locking mechanism to secure the drill cap to the main body of the probe

Removable Drill Cover to allow cleaning of the exposed drill surface

Ridges at the drill surface to perform fast and efficient drilling

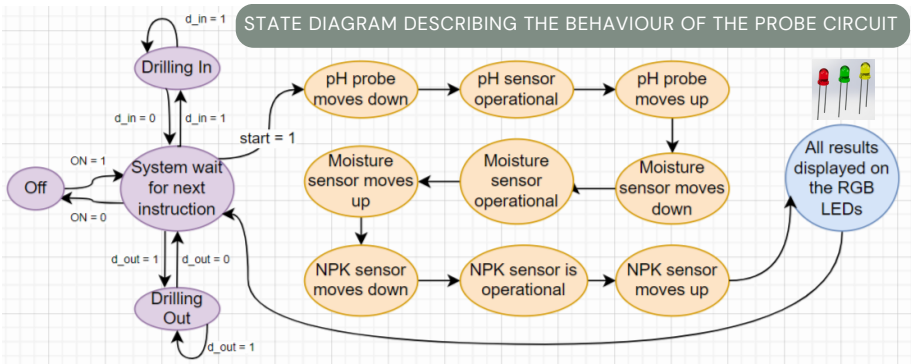
PRELIMINARY CIRCUIT SCHEMATIC DIAGRAM TO OPERATE THE SENSORS



HOW THE MULTITPROBE SENSOR OPERATES ?

1. Press ⏻ to switch on the multiprobe sensor.
2. Long press D_in to drill into the soil surface
3. Press START to calibrate the sensors and record readings
4. Long press D_out to drill out of the soil surface
5. Observe and interpret the readings on the display panel

STATE DIAGRAM DESCRIBING THE BEHAVIOUR OF THE PROBE CIRCUIT



The states ON, d_out, d_in, start = 1 represent the respective buttons pressed.