

# MULTIPROBE SOIL SENSOR

## OPPORTUNITY SPACE

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

- Improve long-term sustainability through minimizing number of farmland relocations.
- Increase quality of extractable Patchouli oil leading to higher revenue through nutrient-rich soil identification.
- Identify areas requiring additional fertilization for improved plant quality.

## KEY DESIGN DECISIONS

- DESIGN FOR USABILITY:** Easy-to-operate interface, easy-to-interpret data.
- DESIGN FOR ERGONOMICS:** Hand-held portable device, easy to carry for long periods.
- DESIGN FOR EFFICIENCY:** Real time testing for pH, NPK, and moisture, continuous data collection.
- DESIGN FOR ASSEMBLY:** Structure is made out of 2 main components for easy cleaning.
- DESIGN FOR SUSTAINABILITY:** Reduce carbon footprint through reusable components and functional purpose.

## HOW THE MULTIPROBE SENSOR OPERATES ?

- Press **Start** to begin testing a new field.
- Press **Record** to store the moisture data for a location.
- At equal distance intervals test different locations of soil.
- Press **Finish** to complete soil testing.
- Press **Find Me** to locate your position in the field.

## ASSESSMENT

### Button Testing

#### Expected

#### Output

Start	"Program started"	✓
Record	Display moisture value.	✓
End	"Program ended"	✓
Find Me	GPS coordinates.	✓

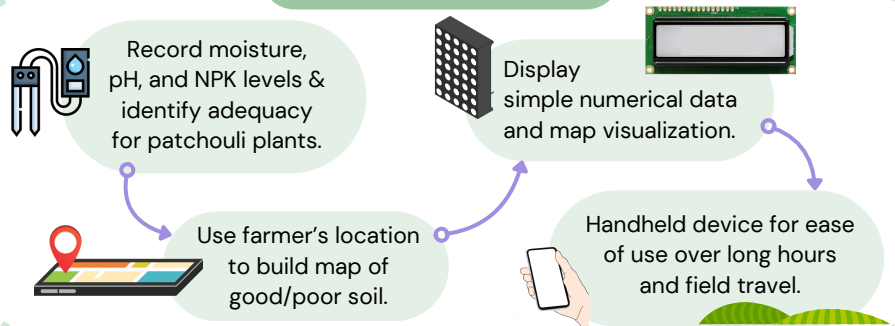
### Soil Sensor

#### Moisture

In air	Dry soil	~50%	~60%	Water
Expected (%)				
~0	>10	~50	~60	~100
Output (%)				
0.2-0.3	6	46-48	61-62	64-65

**Next steps:** Recalibrate sensors for better accuracy, continue work on 5x7 LED matrix and location map testing, add NPK and pH sensors.

## DESIGN CONCEPT



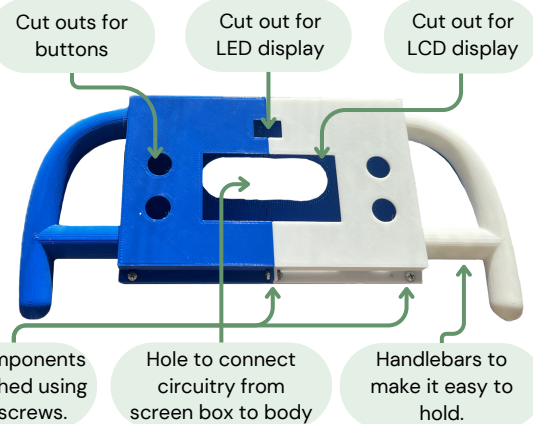
## STRUCTURAL SYSTEM

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.

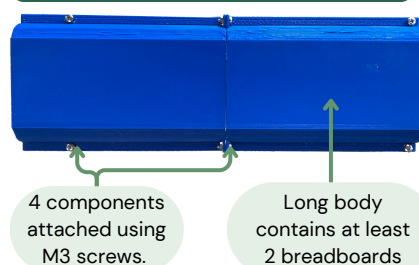
### CAD MODEL OF PROTOTYPE



### PRINTED PROTOTYPE: SCREEN BOX



### PRINTED PROTOTYPE: BODY (TOP VIEW)



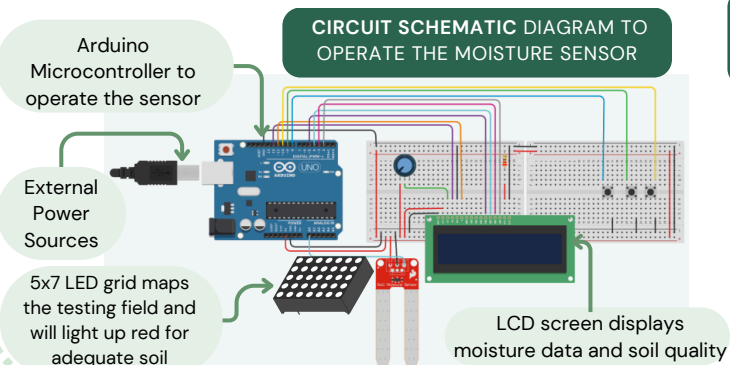
### SIDE VIEW 1



### SIDE VIEW 2



## CIRCUITRY AND SOFTWARE



### PHOTOGRAPH OF THE ELECTRICAL SUBSYSTEM

