

Theoretical Background of Study

The global population is growing rapidly, resulting in an increased demand for food[1] Presently, approximately **1.02 billion** people suffer from malnutrition worldwide [2] while **3.9 million** Cameroonians face acute food insecurity [3].

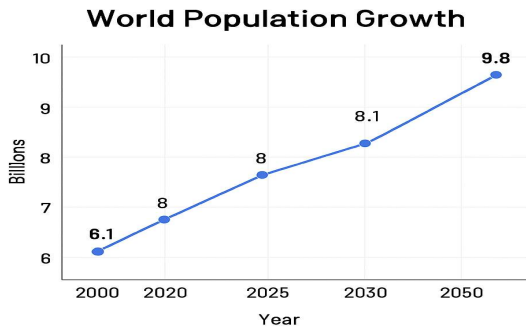


Figure 1 World Population Growth [1]



Figure 2 A picture of hunger in Africa [2]

Methodology 1: Pesticide Level Monitoring



Figure 3 Pesticide Level Monitoring Laboratory Experimental Setup

Methodology 2: Sensor Node For Soil Classification

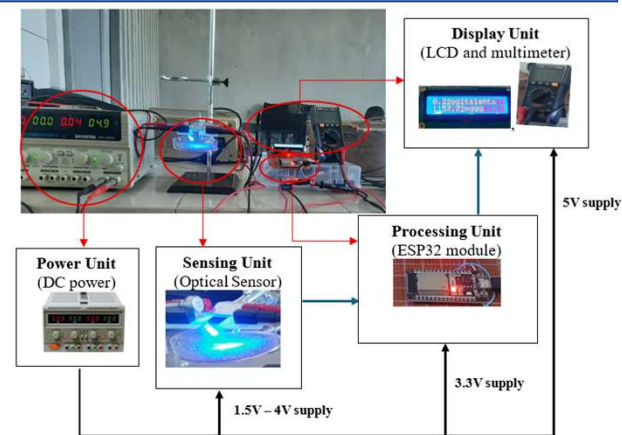


Figure 5 Sensor Node Laboratory Experimental Setup

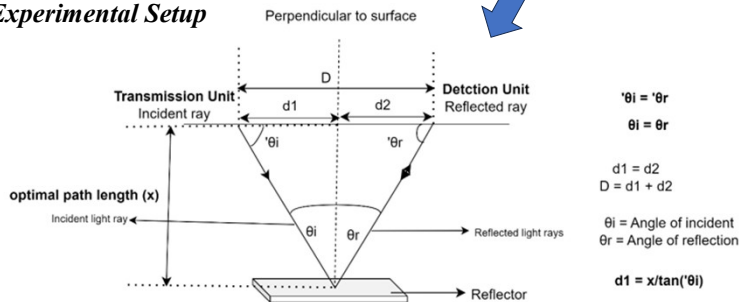


Figure 4 Sensor Dimensioning

Results

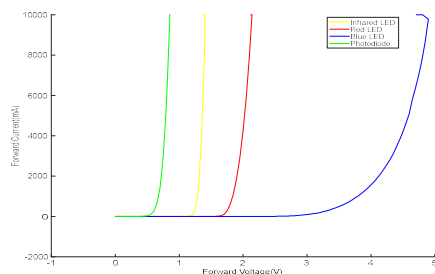


Figure 7 IV characteristic Curves of LEDs (infrared, red, and blue) and photodiode

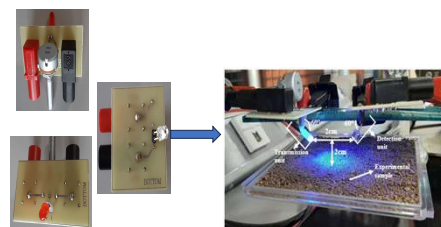


Figure 6 Final Sensor Design Prototype

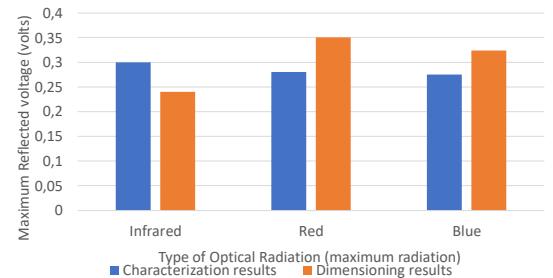


Figure 8 Maximum Reflected Voltage Generated by Photodiode during the Characterization and Dimensioning Procedures

CONCLUSION

Soil nutrients (Nitrogen, Phosphorus, Potassium) as well as pesticides were efficiently monitored using the proposed sensor nodes. Future studies will involve deploying these sensor nodes across large farmlands for final calibration and validation.

REFERENCES

- [1] "World Population 1950-2024." Accessed: Apr. 06, 2024. [Online]. Available: <https://www.macrotrends.net/global-metrics/countries/WLD/world/population>
- [2] S.-L. Nah and C.-F. Chau, "Issues and challenges in defeating world hunger," Trends Food Sci. Technol., vol. 21, no. 11, pp. 544-557, Nov. 2010, doi: 10.1016/j.tifs.2010.07.013.
- [3] C. S. Mbali, L. N. Fonjong, and A. J. Fletcher, "Climate Change and Small Farmers' Vulnerability to Food Insecurity in Cameroon," Sustainability, vol. 13, no. 3, Art. no. 3, Jan. 2021, doi: 10.3390/su13031523.