



CALIFORNIA STATE SCIENCE FAIR 2012 PROJECT SUMMARY

Name(s) Julie A. Fukunaga	Project Number J0915
Project Title Weedfinder: An Eco-Friendly Herbicide Sprayer, Year 2	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals Herbicide is wasted every year by farmers who spend 8 billion dollars to control weeds. Farmers lose money and harm the environment when using the full spray method in which everything is sprayed, including bare soil. To address this problem, I designed and built a device using electronic components and computer programming to detect and spray weeds selectively in vineyards. This eco-friendly system will lower farmers operating costs and reduce the volume of herbicide and water used. The engineering goals are to increase the efficiency of the device by 50% compared to last year's prototype while maintaining a low cost of production for widespread use.</p> <p>Methods/Materials I built a circuit and programmed a microcontroller to turn on a solenoid valve to spray herbicides whenever the sensors detect a plant's light reflectance (chlorophyll reflects infrared light). After testing several prototypes (year 2), I found out that frequency modulation helped detect weeds more efficiently. I also added a User Interface (UI) with a menu system and display to make testing easier, redesigned the lights and sensors for better brightness and alignment, and mounted the Weedfinder device on an ATV instead of using a handheld device.</p> <p>Results Trials in several vineyards showed that the average volume of herbicide and water saved was 67% compared to 38% in year 1.</p> <p>Conclusions/Discussion The design criteria and engineering goals are met in this project. The average volume of herbicide and water saved was 67% when using the Weedfinder. The new additions and changes in the device made it more efficient, and solved the problem of ambient light affecting the device's light source (year 1). Because of the use of pulse-width modulation, the sunlight no longer overpowers the infrared lights, making it difficult to detect the weeds' reflectance. The Weedfinder can benefit farmers and the environment by lowering the amount of chemicals and water used by 67%. A future application will be to test the device with a propane weed flame burner.</p>	
Summary Statement My project is about building an eco-friendly device that identifies and sprays weeds selectively to help farmers save on the herbicide, gas, and water they use.	
Help Received My father helped with soldering, spraying chemicals, and explaining C language; my mother helped with the board layout. I would like to thank Mrs. Anderson, Mrs. Burrell and Dr. Oliver for their support.	