



**CALIFORNIA STATE SCIENCE FAIR
2011 PROJECT SUMMARY**

Name(s) Brennan Coulter; Cameron Coulter	Project Number 31872
Project Title The Potential for Plant Oils as a Substitute for Diesel Fuel	
Abstract Objectives/Goals Our research objectives were to: -Study the properties of the oil coming from both oil yielding trees and annual crops to confirm their potential as a fuel. -Determine the performance characteristics of the oils as a direct substitute for diesel or as blended with diesel. -Evaluate the overall environmental impact of the oils -Evaluate the economics of the plant oils as compared to diesel. -Research the potential supply of the various plant oils and potential to scale production. Methods/Materials The properties of twelve tree and vegetable oils, and blends of each with diesel were studied for properties as a fuel: viscosity, freeze/melt point, density, and blendability with diesel. Any fuels that failed these tests were not further tested; fuels not yet eliminated were evaluated for energy efficiency relative to diesel in a diesel generator. If an oil was within 10% efficiency of the diesel baseline it was then evaluated in terms of net energy production. If the oil had a net positive it's economics, potential to be scaled to production, and it's potential environmental effects were evaluated. Results From the property testing avocado(refined and unrefined), canola, corn, olive, peanut, soybean and diesel blends with avocado (refined and unrefined), corn, olive, peanut and soybean remained as viable candidates. Performance Testing showed a baseline performance of 204 grams diesel consumed, which was converted to a base 27.0 mpg. Fuel efficiency of diesel was followed closely by peanut, olive, soy, corn, unrefined avocado, refined avocado, and canola. Blended fuels (90% diesel) were also tested with surprising results indicating soy and unrefined avocado performed equal to or better than pure diesel. Several oils were found to require consumption of more energy in production than energy produced by the oils. As a result, all fuels other than avocado (refined and unrefined) and olive were eliminated. Conclusions/Discussion Based upon current economics of production, olive oil was eliminated as a candidate. However, avocado (both refined and unrefined) was found to be capable of production at a cost per mile competitive to diesel and capable of being produced on sufficient scale. Thus, avocado was found to meet all criteria to qualify as a substitute, and may provide US consumers a savings of \$0.12/ gallon, as well as provide substantial	
Summary Statement The Potential for Plant Oils as a Substitute for Diesel Fuel	
Help Received	