



# CALIFORNIA STATE SCIENCE FAIR 2013 PROJECT SUMMARY

<b>Name(s)</b> <b>Jordan T. Kulischak</b>	<b>Project Number</b> <b>J1011</b>
<b>Project Title</b> <b>Can Algae Reduce Methane Production from Cow Manure?</b>	
<p style="text-align: center;"><b>Abstract</b></p> <p><b>Objectives/Goals</b> Globally, 28% of the world's methane emission came from livestock and methane is a contributing factor of global warming crisis. The purpose of this experiment is to determine whether algae has a role in decreasing methane production when it is grown on cow manure. The hypothesis is that algae would be able to reduce methane production by 20% when it is co-digested with cow manure.</p> <p><b>Methods/Materials</b> In the first trial, the cow manure and the cow manure/algae digesters were closed and left outdoor for 1 week. After 1 week, the digesters were placed under a heat lamp for a period of 7 days. Gas sample was analyzed using a mass spectrometer. In trial 2, the digesters were not capped, allowing algae to have air exchange and exposure to sunlight during the first 7 days. The digesters were then exposed to heat lamp as in trial 1. Gas sample were collected and analyzed.</p> <p><b>Results</b> The cow manure/algae digester had 69% methane on day 1 and increased to 72.4% on day 2. The cow manure started with 17.6% and dropped to 16.4% on day 2. The cow manure/algae digester produced more methane than the cow manure group. In the second trial, on day 4, the cow manure group showed 18% methane concentration. The cow manure/algae group displayed 12.4% methane concentration which is 22% less methane production than the cow manure group.</p> <p><b>Conclusions/Discussion</b> The combined results of the two trials support the hypothesis. The set up for trial 1 was not designed properly to test the hypothesis. The algae was not alive and served as additional organic substrate for the digestion process. A redesign of the experiment that allowed an open, healthy ecosystem for algae growth was done for trial 2. The result of trial 2 supports the hypothesis that algae when grown on cow manure can reduce methane emission from cow manure. Additional trials should be conducted to obtain more data to validate the hypothesis.</p>	
<b>Summary Statement</b> The objective of this study is to evaluate whether algae can reduce methane production from cow manure.	
<b>Help Received</b> Drs Lueker and Paplawsky offered the use of mass spectrometer for gas analysis.	