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## MTSU Clean Energy Initiative Project Funding Request

There are five (5) sections of the request to complete before submitting. See <http://www.mtsu.edu/~sga/cleanenergy.shtml> for funding guidelines. Save completed form and email to [cee@mtsu.edu](mailto:cee@mtsu.edu) or mail to MTSU Box 57.

1. General Information	
Name of Person Submitting Request John Paul DiVincenzo	
Department/Office Chemistry/SCI 3077	Phone # (Office) 615-904-8251
MTSU Box # <b>X157</b>	Phone # (Cell) 615-243-7727
E-mail <a href="mailto:john.divincenzo@mtsu.edu">john.divincenzo@mtsu.edu</a>	Submittal Date 09/22/2017

2. Project Categories (Select One)	
Select the category that best describes the project.	
<input type="checkbox"/> Energy Conservation/Efficiency	<input checked="" type="checkbox"/> Sustainable Design
<input type="checkbox"/> Alternative Fuels	<input type="checkbox"/> Other
<input type="checkbox"/> Renewable Energy	

3. Project Information	
a. Please provide a brief descriptive title for the project.	
b. The project cost estimate is the expected cost of the project to be considered by the committee for approval, which may differ from the total project cost in the case of matching funding opportunities. <b>Any funding request is a 'not-to-exceed' amount. Any proposed expenditure above the requested amount will require a resubmission.</b>	
c. List the source of project cost estimates.	
d. Provide a brief explanation in response to question regarding previous funding.	
3a. Project Title Pesticide Impacts on Soil Microbe Health	
3b. Project Cost Estimate <b>\$8,500</b>	
3c. Source of Estimate Based on cost of supplies and equipment to complete the project. Detailed budget attached.	
3d. If previous funding from this source was awarded, explain how this request differs? <b>NA</b>	

#### 4. Project Description

(Completed in as much detail as possible.)

- a. The scope of the work to be accomplished is a detailed description of project activities.
- b. The benefit statement describes the advantages of the project as relates to the selected project category.
- c. The location of the project includes the name of the building, department, and/or specific location of where the project will be conducted on campus.
- d. List any departments you anticipate to be involved. Were any departments consulted in preparation of this request? Who? A listing may be attached to this form when submitted.
- e. Provide specific information on anticipated student involvement or benefit.
- f. Provide information for anticipated future operating and/or maintenance requirements occurring as a result of the proposed project.
- g. Provide any additional comments or information that may be pertinent to approval of the project funding request.

##### 4a. Scope: Work to be accomplished

The scope of this project focuses on research into the effects that agricultural pesticide application has on the health of beneficial soil bacteria. Soil microbes play a critical role in maintaining the health of the soil ecosystem. Among their many roles, they are largely responsible for the cycling of nutrients. Pesticides have been shown to negatively impact the viability and health of soil microbes. The DiVincenzo Research Group (6 undergraduates) proposes to investigate the effects of important pesticides such as Glyphosate (Roundup) on the beneficial soil microbes involved in nitrogen cycling. Through controlled laboratory studies we will develop methods for respiration chambers, fluorescent spectroscopy, soil columns, microbial assays, and nitrogen detection. The combined use of these methods will allow for an in depth look out how pesticide applications effect the production of important nitrogen compounds by the soil microflora.

##### 4b. Scope: Benefit Statement

We apply pesticides for the purpose of increasing our agricultural yields. If pesticides are negatively impacting critical soil microbes and decreasing crop yields, this information is essential for the agricultural and world community at large. While some research has shown pesticides can have a negative impact on soil microbes, we propose to look specifically at nitrogen fixing and nitrifying bacteria which are known to be sensitive to environmental conditions and good indicators of overall soil health. Pesticides are known to have negative impacts on soil and water quality and can remain in the environment for long periods of time. Continued heavy use of pesticides is not a sustainable design. The environment needs time to process, detoxify, and breakdown pesticide residues. Results from this study can potentially provide invaluable information that could lead to reduced amounts of pesticides applied.

<b>4. Project Description (continued)</b>
<p>4c. Location of Project (Building, etc.)</p> <p>This project will be largely carried out in multiple laboratories within the new science building and sampling sites which may include MTSU agricultural lands.</p>
<p>4d. Participants and Roles</p> <p>Dr. John Paul DiVincenzo is an environmental scientist and will be responsible for the experimental design of the overall project and management of the budget in addition to the recruitment of undergraduate researchers. He will train all undergraduate research students in appropriate safety practices and laboratory techniques.</p>
<p>4e. Student participation and/or student benefit</p> <p>Each semester of the project 4-6 students will be involved directly in designing and implementing experiments and analyzing and presenting the data. Presentations at the annual Tennessee Academy of Science meeting and MTSU Scholars Week are expected. Students will benefit greatly by being directly involved in investigating sustainable issues not just reading about them. Word of mouth from these research students and discussion of this topic in several of Dr. DiVincenzo's courses will have a broader impact.</p>
<p>4f. Future Operating and/or Maintenance Requirements</p> <p>There are no maintenance requirements or long-term operating costs for this research project. The project will continue long past the termination of this funding and will be supported by the Chemistry Department budget and potentially external funding.</p>
<p>4g. Additional Comments or Information Pertinent to the Proposed Project</p> <p>The DiVincenzo Research Group has already begun developing this research effort but needs funding from this committee to sustain it.</p>

## 5. Project Performance Information

Provide information if applicable.

- a. Provide information on estimated annual energy savings stated in units such as kW, kWh, Btu, gallons, etc.
- b. Provide information on estimated annual energy cost savings in monetary terms.
- c. Provide information on any annual operating or other cost savings in monetary terms. Be specific.
- d. Provide information about any matching or supplementary funding opportunities that are available. Identify all sources and explain.

### 5a. Estimated Annual Energy Savings (Estimated in kW, kWh, Btu, etc.)

There will be no annual energy savings during this research. However, pesticide usage requires petroleum starting products in many cases, and requires substantial energy in the application process. Reduction in the frequency of application could result in substantial energy savings for farmers.

### 5b. Annual Energy COST Savings (\$)

If farmers can reduce the amount of pesticides applied and the number of applications needed, they could see substantial dollar savings. The Journal of Pesticide Reform estimates an annual savings of up to 50% with reduced pesticide usage when compared to conventional pesticide application programs.

### 5c. Annual Operating or Other Cost Savings. Specify. (\$)

There will be no annual operating or other cost savings associated with this research project.

### 5d. Matching or Supplementary Funding (Identify and Explain)

Dr. DiVincenzo is currently working with Jolene Gordon from Research and Sponsored Programs to identify some potential funding sources.

Pesticide Impacts on Soil Microbe Health  
Dr. John Paul DiVincenzo

Detailed Budget

<b>Soil Sampling and Columns</b>		<b>\$750</b>
<i>Sampling Equipment</i>	<i>Provided by Department</i>	
<i>Soil Columns</i>	<i>\$750</i>	
<b>Nitrogen Detection</b>		<b>\$250</b>
<i>Ion Chromatography Standards</i>	<i>\$250</i>	
<i>Eluting Solvents</i>	<i>Provided by Department</i>	
<b>Microbial Assays</b>		<b>\$1000</b>
<i>Plating equipment</i>	<i>\$750</i>	
<i>Media</i>	<i>\$250</i>	
<b>Fluorescent Spectroscopy</b>		<b>\$5500</b>
<i>Sample Preparation</i>		
<i>Dyes for Staining Bacteria</i>	<i>\$1000</i>	
<i>Gravity Separation</i>	<i>\$4500</i>	
<i>Incubation</i>	<i>Provided by Department</i>	
<i>Fluorescent Spectrometer</i>	<i>Provided by Department</i>	
<b>Respiration Chambers</b>		<b>\$1000</b>
<i>Chambers</i>	<i>\$1000</i>	
<i>Titration Supplies</i>	<i>Provided by Department</i>	
<b>TOTAL</b>		<b>\$8500</b>

Pesticide Impacts on Soil Microbe Health  
Dr. John Paul DiVincenzo

Timeline

Fall 2017

- Collect soil samples for nitrifying bacteria
- Develop soil column design

Spring 2018

- Purchase soil columns and set up
- Grow bacterial cultures
- Monitor nitrogen production
- Plate bacteria
- Purchase respiration chambers

Summer 2018

- Maintain active soil columns
- Develop Respiration Chambers
- Purchase fluorescent spectroscopy supplies

Fall 2018

- Begin pesticide application studies
  - Soil columns
  - Bacterial plates
- Develop and implement fluorescent protocols
  - Pesticide dosing
- Set up respiration chambers
  - Pesticide dosing

Spring 2019

- Collect agricultural samples
  - Study microbial populations
- Scholar's Week presentation
- Analyze Data

Summer 2019

- Repeat failed experiments

Fall 2019

- Tennessee Academy of Science Presentation