SUSTAINABILITY INITIATIVES BY STUDENT ORGANIZATIONS FUNDING PROPOSAL

Part I - General Information

Name of Student Organization	Environmental Coalition
Contact/Responsible Person	Ferry Akbar Buchanan, Jake Murphey, Sam Gittelman, Hirsh V. Lal, Olivia Brown, Meredith Hickman
Contact Office Held/Title	Member
Contact Email Address	ferry092@vt.edu
Contact Telephone Number	925-998-2998

Part II - Project Cost Information

Estimate Cost of this Proposal	$1,715.12	See Part III.C
Estimated Savings –	$161.24	See Part III.D
Net Cost of this Proposal	**$1,553.88**	

Part III - Supporting Information

A. Please describe your sustainability initiative and attach supporting documentation.

The Dining Services Farm is a six-acre organic vegetable farm operated collaboratively by the Department of Horticulture, the College of Agriculture and Natural Resources, and VT Dining Services, that produces nearly 50,000 pounds of fresh produce annually to be served in campus dining halls. In addition to advancing the sustainability of campus food procurement, the Dining Services Farm is a flagship educational program at Virginia Tech, offering credit-bearing experiential courses, outreach and extension, and research opportunities in the area of sustainable agriculture and food systems. In 2014, the Dining Services Farm constructed a 30 by 96 foot unheated greenhouse, called a high tunnel, at the Urban Horticulture Center on Prices Fork Road in Blacksburg. The high tunnel extends the seasonal availability of produce sourced locally from the Dining Services Farm and serves as a proximate-to-campus resource for research and education for students and faculty.

Irrigation of vegetable crops produced in the high tunnel requires roughly 31,000 gallons of water annually. Rainfall intercepted by the high tunnel is unavailable to crops growing within the structure, and instead is lost to runoff. Considering an average annual rainfall of 41 inches in Blacksburg, VA, the water intercepted and lost from the high tunnel is 30,949 gallons per year (see section D). Installing a water catchment system to collect this runoff could substitute for nearly all of the water required for irrigating crops in the high tunnel. Additionally, diverting runoff away from the ground surrounding the high tunnel will mitigate current challenges with soil erosion and saturation, along with associated consequences for water quality and soil trafficability.

A rainwater catchment system installed on the high tunnel at the Urban Horticulture Center would consist of three components:

1) Rainwater catchment

Vinyl gutters will be attached (both sides) to capture rain on the 2918 square foot high tunnel at the Urban Horticulture Center (UHC). The gutters will be attached to boards affixed to the high tunnel below existing hip boards to allow a 6-inch drop per 100 linear feet to generate adequate flow into the

tanks. To collect rain from the rooftop, a narrow strip of plastic will be taped (roof repair tape) to the existing roof and the loose end of the plastic strip is laid in the gutter (allowing the water to run from the roof over the strip of plastic and into the gutter). To prevent wind from blowing the strip of plastic out of the gutter, a weight system (thin metal wire) will be webbed through the strip of plastic in the gutter.

1) Retention

The water will then be collected in two 600-gallon tanks located on each side of the tunnel, pumped from the tanks and used for irrigating crops in the high tunnel. A solar and battery powered pumping systems will be used for irrigation. A 12V diaphragm pump will be powered by a 12V deep cycle storage battery. This battery will be charged by a 50-watt solar panel placed on the rooftop of the high tunnel.

2) Irrigation system (already installed)

Irrigation in the high tunnel is achieved using drip emitters, and is automated with an irrigation timer to provide accurate, consistent, adaptable watering based on ambient temperature, sunlight, and crop requirements. Drip irrigation dispenses water at ground level at low flow rates (0.45 gallons per minute per 100 feet), resulting in nearly 90 percent water use efficiency.

B. How does this initiative help to achieve the goals of the Virginia Tech Climate Action Committee Resolution and Sustainability Plan?

Water availability and quality are inextricably linked to the sustainability of agriculture and food systems. The increasing unpredictability of rainfall caused by climate change, along with growing competition for water from industrial and domestic uses, are tightening the constraints on the supply of water for food production. This issue is a key concern facing leaders and policy makers in the twenty-first century. Institutions of higher education have a responsibility to explore and promote proactive strategies to address these complex problems.

A cornerstone of the Virginia Tech Climate Action Committee Resolution and Sustainability Plan is the "commitment to engage students, faculty, and staff through education and involvement to reduce consumption of energy, water, and materials in academic and research buildings, dining and residence halls, and other facilities." The Dining Services Farm high tunnel at the Urban Horticulture Center is uniquely poised to accomplish these integrated goals of sustainability, education, and research. A rainwater catchment system will capitalize on the synergism of existing facilities (high tunnel) with expanding needs (local, campus-grown food) to harness available water resources that are otherwise wasted, thus reducing the demand on the municipal water supply. The existing widespread, cross-disciplinary engagement of students, staff, and faculty with the Dining Services Farm will serve as platform for education and outreach on the integration of water conservation with building design and sustainable food production.

C. What is the cost of your proposal? Please describe in adequate detail the basis for your cost estimate.

COSTS:

<u>Pump</u>	
12V Industrial diaphragm pump	$50
12V photovoltaic solar panel with mount (50-watt)	$99.50
12V Deep cycle storage battery	$159.66
Solar charge controller	$29.78
<u>Cisterns</u>	
2x 600 gallon tank #N-43800 (64" Diameter x 50" Height)	$759.98
2x tank outlet valves	$15.96
<u>Gutters</u>	
18x 10' long vinyl gutter section	$71.64
54x PVC Gutter Brackets	$177.12
18x Gutter slip joints	$78.30
72x Gutter mounting screws	$3.98
1x Gutter seal lubricant (1 bottle)	$5.98
44x 1"5 pipe straps (conduit clamps) and 1.25" construction screws	$23.38
4x vinyl high flow drop outlets	$24.10
2x vinyl downspouts 10'	$4.68
2x vinyl gutter end caps	6.56
16x 12' long 2x4's lumber	$89.12
2x hose adapters for valves	$<15
<u>Misc.</u>	
Wiring for panels, battery, controller	$<30
2x large inflatable children's vinyl balls (8" Diameter)	$10.44
25 feet of coated #9 wire	$9.98
2x Long garden hoses	$49.96
Total	$1,715.12

This project will be implemented in partnership with students in the Department of Biological Systems Engineering, along with the support and guidance of faculty and staff in the Department of Horticulture who coordinate the Dining Services Farm project.

D. Will your proposal produce cost savings for the University? If so, how much? Please describe in adequate detail the basis for your savings estimate.

The annual water requirement for irrigation of crops grown inside the high tunnel is approximately 31,000 gallons. Blacksburg, Virginia receives an average of 41 inches of rainfall annually. With a surface area of 2,880 square feet, the total annual rainwater catchment capacity of the high tunnel is 30,949 gallons (one acre-inch of water is 27,154 gallons). This suggests that a rainwater catchment system could supply nearly all of the water needed for irrigation of crops grown in the high tunnel. Irrigation at the high tunnel is currently supplied by the municipal water supply. The cost per 1,000 gallons of municipal water supplied by the Town of Blacksburg is $5.21. The total replacement cost for irrigation water would therefore be $161.24 annually.

E. Is this funding request an Ongoing or One-Time change **(please check one)?**

X **One-time** ☐ **Ongoing**

F. Is funding available for this request from another source? If yes, describe the funding (source, amount, etc.)

No other funding available.

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Part IV- Requestors/Reviewers	
Prepared By (Name of Contact for Student Organization) Ferry Akbar Buchanan	Date 11/11/15
Reviewed By (Name of Appropriate University Official) Alex Hessler, Horticulture Department	Date 11/11/15
Reviewed By (Name of Office of Energy and Sustainability Representative) Denny Cochrane	Date 11/11/15