

# Environment and Natural Resources Trust Fund 2020 Request for Proposals (RFP)

**Project Title:**

**ENRTF ID: 144-CH**

Environmental Education: Cricket Farming for Reducing Carbon Emissions

**Category:** H. Proposals seeking \$200,000 or less in funding

**Sub-Category:** C. Environmental Education

**Total Project Budget: \$** 198,879

**Proposed Project Time Period for the Funding Requested:** June 30, 2022 (2 yrs)

## Summary:

The project seeks to engage K-12 students in environmental education and cricket farming, an alternative to livestock for reduction of carbon emissions, for long-term preservation of Minnesota's natural resources.

**Name:** Sujaya Rao

**Sponsoring Organization:** U of MN

**Job Title:** Prof.

**Department:** Entomology

**Address:** 219 Hodson Hall, 1980 Folwell Avenue

St. Paul MN 55108

**Telephone Number:** (612) 624-1299

**Email** sujaya@umn.edu

**Web Address:**

**Location:**

**Region:** Metro

**County Name:** Hennepin

**City / Township:** Hopkins, Wayzata

## Alternate Text for Visual:

"K-12 Environmental Education" with a school bus with partners K-12, 3 Cricketeers and UMN inserted, comparison of crickets versus beef in environmental impacts, and a picture of cricket farming.

_____ Funding Priorities	_____ Multiple Benefits	_____ Outcomes	_____ Knowledge Base
_____ Extent of Impact	_____ Innovation	_____ Scientific/Tech Basis	_____ Urgency
_____ Capacity Readiness	_____ Leverage	_____ TOTAL	_____ %



**Environment and Natural Resources Trust Fund (ENRTF)**  
**2020 Main Proposal Template**

**PROJECT TITLE: Environmental Education: Cricket Farming for Reducing Carbon Emissions**

**I. PROJECT STATEMENT:** Carbon dioxide, methane and other greenhouse gases warm the Earth by absorbing energy and slowing the rate at which energy escapes to space, acting like a blanket insulating the earth and thereby warming planet Earth. With the alarming rate at which greenhouse gas emissions are increasing, the Earth's surface temperature is predicted to exceed historical values as early as 2047, with potentially harmful effects on ecosystems, biodiversity and human livelihoods.

Given the looming critical impacts, it is critical that education about the repercussions of carbon emissions, and alternatives for reducing their impacts, occur at an early age. Concepts related to greenhouse gases are, however, a challenge for youth to grasp. One effective approach is to link the issue to something familiar in their lives. Insects influence our lives in many ways and youth frequently encounter them in diverse environments. Thus, a novel and effective means for engaging youth in environment education is integration of hands-on activities involving insects.

In recent years, insects are being promoted as excellent sources of protein in lieu of livestock, as they are efficient in feed-to-protein conversion, require little land for production, and emit few greenhouse gases such as methane and ammonia, which have negative effects on our natural resources. Insects are easy to rear and convert to flour, and products with cricket powder are gaining popularity in the US. Cricket products for human consumption include chips, brownies, smoothies, etc. which children are familiar with – this will facilitate their learning about benefits of cricket farming for reducing carbon emissions.

This project seeks to integrate hands-on environment education activities into existing curricula in 4<sup>th</sup> grade classrooms in Minnesota schools for enhancing scientific knowledge about carbon emissions. Students will be engaged in novel activities that highlight to them, first-hand, benefits of insects over livestock in environment stewardship for preservation of Minnesota's natural resources for future generations. Cricket farming will be an innovative addition to environment education in K-12 for documenting to youth the need for alternatives for reducing our carbon footprint.

**II. PROJECT ACTIVITIES AND OUTCOMES**

**Activity 1 Title:** Development of inquiry-based lessons related to environmental education and protection of Minnesota's natural resources.

**Description:** University of Minnesota and 3 Cricketeers (local cricket farm) personnel, in collaboration with teachers from participating schools, will develop innovative lessons and simple experiments for enhancing knowledge about science, human lives, and impacts on the environment, enabling students to learn about the value of Minnesota's natural resources and the critical need to protect them. The lessons will be aligned with 4<sup>th</sup> grade standards on environmental protection and greenhouse gases to facilitate integration into existing curricula. In addition, mini cricket farm kits will be assembled for ease of use in classrooms. Environmental education lessons and cricket farm kits will be developed in the summer prior to the start of the academic year.

**ENRTF BUDGET: \$ 51,232**

Outcome	Completion Date
1. Environment education lesson plans for implementation in 4 <sup>th</sup> grade classrooms	Year 1: September 2020



**Environment and Natural Resources Trust Fund (ENRTF)**  
**2020 Main Proposal Template**

	Year 2: September 2021
2. Preparation of cricket farming kits	Year 1: September 2020 Year 2: September 2021

**Activity 2 Title:** Implementation of environmental education lessons and cricket farming in K-12 classrooms.

**Description:** Classroom Lessons. University of Minnesota and 3 Cricketeers personnel will collaborate with 4<sup>th</sup> grade teachers for effective implementation of environmental education lessons developed under Activity 1 in classrooms. The project will be implemented in 20 classrooms in 5 schools in the Twin Cities area during the school years 2020-2021 and 2021-2022. In all, we anticipate engagement of ~ 500 students in novel environment-related activities.

Establishment of mini Cricket Farms. In each classroom, groups of 4 students will initiate a cricket farm. They will be provided a kit that includes all the materials required for raising crickets, including eggs from 3 Cricketeers, for initiation of their own cricket farms. Students will be trained in making observations while they raise crickets in the mini farms, and will thereby learn about diverse aspects about insects, their life cycle and behaviors, and benefits of crickets as sources of protein for humans compared with livestock. This will provide them experience with scientific observations, data collection, and discussion of global issues including greenhouse gases, and their impacts on humans and Minnesota's natural resources.

Field Trips. Field trips will be organized for students in all participating classrooms to 3 Cricketeers for first-hand experience with how crickets are raised on a large scale. This will also provide them with exposure on how MN industries are involved in addressing greenhouse gas and global warming issues for the benefit of all.

Poster Presentations. At the end of the school year, participating students will prepare posters on activities that they engaged in during the year for display in school hallways. These will showcase to their parents new knowledge gained about greenhouse gases and cricket farming through the new innovative environment education lessons implemented in their classrooms.

**ENRTF BUDGET:** \$ 147,647

Outcome	Completion Date
1. Year-round implementation of environmental education lessons and cricket farming in 20 classrooms in the Twin Cities area, and year-end poster presentations	Year 1: May 2021 Year 2: May 2022

**III. PROJECT PARTNERS AND COLLABORATORS:**

- 3 Cricketeers, an urban cricket farm in St. Louis Park, which is raising crickets for human and animal feed.
- Teachers in 5 schools in the Hopkins and Wayzata areas.

**IV. LONG-TERM IMPLEMENTATION AND FUNDING:**

Lesson plans will be developed as videos and posted on a UMN webpage, for easy access and implementation by K-12 teachers in their classrooms in future years. Cricket farm kits along with eggs from 3 Cricketeers will be prepared and provided to teachers upon request. Sujaya Rao and Chad Simmons will serve as a resource for all MN schools interested in implementing environmental education lessons and activities related to protection of Minnesota's natural resources, and establishment of mini cricket farms in their classrooms, for inspiring environment stewardship in the next generation.

Attachment A: Project Budget Spreadsheet  
 Environment and Natural Resources Trust Fund  
 M.L. 2020 Budget Spreadsheet

Legal Citation:

Project Manager: Sujaya Rao

Project Title: Environmental Education: Cricket Farming for Reducing Carbon Emissions

Organization: University of Minnesota

Project Budget: \$ 198,879

Project Length and Completion Date: Two years; June 30, 2022

Today's Date: April 9, 2019



ENVIRONMENT AND NATURAL RESOURCES TRUST FUND BUDGET		Budget	Amount Spent	Balance
<b>BUDGET ITEM</b>				
<b>Personnel (Wages and Benefits)</b>		\$ 115,771	\$ -	\$ 115,771
Project Coordinator - 1 position to be hired for coordinating activities between collaborators (University of Minnesota, 3 Cricketeers, 5 participating MN K-12 schools), and assisting with development of classroom activities and implementation in schools; 1 fte, 12 months, Year 1 salary = \$42,000/year; benefits=29.5% of salary; Year 2 = 3% increase)				
Undergraduate- 1 position for assisting with development of classroom activities and cricket farm kits; Year 1 salary = \$ 11/hour, 20 hours a week for 12 weeks in summer; Year 2 = 3% increase				
<b>Professional/Technical/Service Contracts</b>				
Chad Simmons (3 Cricketeers-contract) for collaborating on preparation of cricket farm kits and classroom activities including establishment and monitoring of cricket farms in classrooms; Contract = Year 1 \$ 100/hour, 240 hours; Year 2 = 3% increase		\$ 48,720	\$ -	\$ 48,720
<b>Equipment/Tools/Supplies</b>				
Supplies for cricket farming kits, Year 1= \$ 30/kit, 100 kits; Year 2 = 3% increase		\$ 24,360	\$ -	\$ 24,360
Supplies for environmental education activities, Year 1 = \$ 450/classroom, 20 classrooms; Year 2 = 3% increase				
<b>Capital Expenditures Over \$5,000</b>				
		\$ -	\$ -	\$ -
<b>Fee Title Acquisition</b>				
		\$ -	\$ -	\$ -
<b>Easement Acquisition</b>				
		\$ -	\$ -	\$ -
<b>Professional Services for Acquisition</b>				
		\$ -	\$ -	\$ -
<b>Printing</b>				
		\$ -	\$ -	\$ -
<b>Travel expenses in Minnesota</b>				
Travel from University of Minnesota campus to schools, Year 1 = 0.58 c/mile, 100 miles/day, 30 days; Year 2 = 3% increase		\$ 10,028	\$ -	\$ 10,028
School bus rental for visits to 3 Cricketeers Cricket Farm, Year 1 = \$ 80/hr, 4 hours per trip, 10 trips (2 buses/school, 5 schools); Year 2 = 3% increase				
<b>Other</b>				
		\$ -	\$ -	\$ -
<b>COLUMN TOTAL</b>		\$ 198,879	\$ -	\$ 198,879
<b>SOURCE AND USE OF OTHER FUNDS CONTRIBUTED TO THE PROJECT</b>				
	Status (secured or pending)	Budget	Spent	Balance
Non-State:		\$ -	\$ -	\$ -
State:		\$ -	\$ -	\$ -
In kind:		\$ -	\$ -	\$ -
<b>Other ENRTF APPROPRIATIONS AWARDED IN THE LAST SIX YEARS</b>				
	Amount legally obligated but not yet spent	Budget	Spent	Balance
		\$ -	\$ -	\$ -

# K-12 Environmental Education

1X emission/kg

71g protein/100  
gallons water

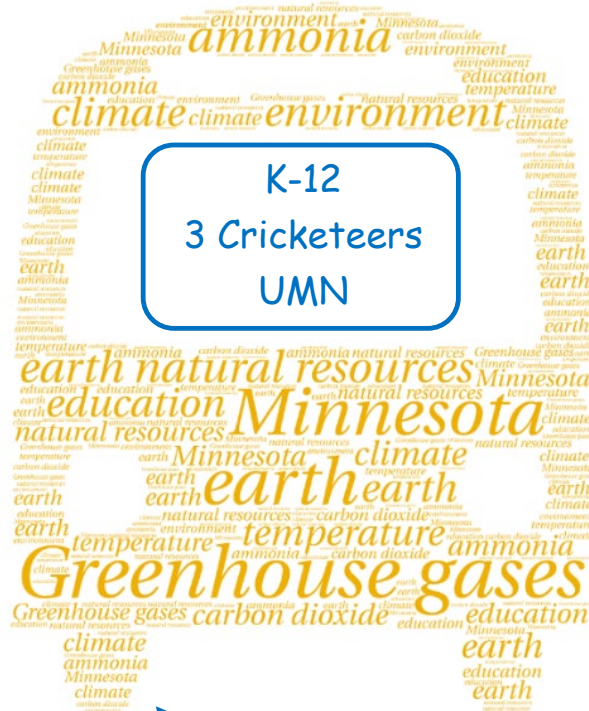
80% edible

K-12  
3 Cricketeers  
UMN

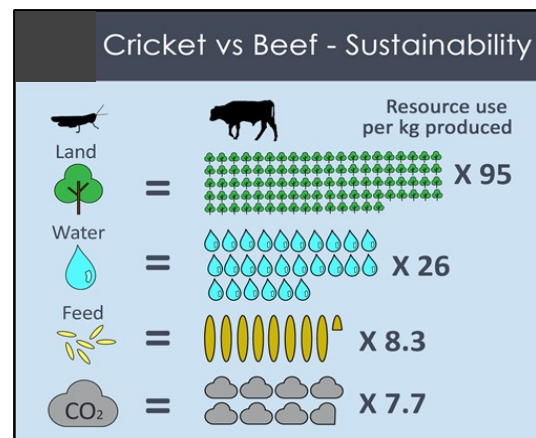
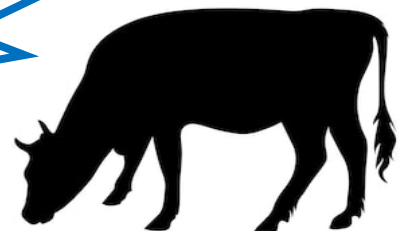
100X emission/kg

6 g protein/100  
gallons water

40% edible



Bugs vs Livestock



## **Project Manager Qualifications**

Project Manager: Sujaya Rao, Professor and Head, Department of Entomology, University of Minnesota; [sujaya@umn.edu](mailto:sujaya@umn.edu); 612-624-1299

Sujaya Rao will be responsible for ensuring that all aspects of the project are accomplished in a timely manner. At the University of Minnesota, Prof. Rao is actively engaged in educating the public and students on benefits of human consumption of insects given their efficiency in feed-to-protein conversion, low land requirement for production, and few greenhouse gases emitted. She is also mentoring a student's research project on social attitudes towards eating insects.

Prior to her move to Minnesota, Prof. Rao gained considerable experience with leading large research and educational projects at Oregon State University and the University of California. She extended her educational programs beyond universities to K-12 by establishing strong relationships with K-12 teachers and industry partners. With a 3-year, 1.3 million grant from NSF, she directed a program entitled "Integrating Biotechnology and Ecology into Science Education in Rural Schools in Oregon" in six schools around the university campus. Through this program, all year long, inquiry-based science activities were integrated into K-12 curricula. With additional funding, she implemented a pollination project entitled "Partners in Nature" for providing middle school students with a scientist's experience.

### **Grants received by Sujaya Rao related to K-12 Education:**

- NSF: Biotechnology and Ecology in Rural Schools in Oregon (\$1,318,079) (2002-2006)
- Toshiba America: K-12 webpage (\$10,000); Oregon Youth "Grow" their Own Fuel (\$23,500); Partners in Nature (\$13,700); Introductory Biotechnology (\$14,820) (2003-2007)

### **Publications related to K-12 Education:**

- **Rao, S.,** Shamah, D. and Collay, R. 2007. Meaningful involvement of science undergraduates in K-12 outreach. *Journal of College Science Teaching*. 36: 54-58.
- **Rao, S.,** Scherr, M., Royce, L., Stephen, W. P., Halse, R. and Soeldner, A. 2007. Bees and pollination: A 'scientist' experience for rural youth. *American Entomologist*. 53: 74-77.

## **Organization Description**

Project Manager: Sujaya Rao is based in the Entomology Department in the College of Foods, Agricultural and Natural Resources Sciences on the Saint Paul campus of the University of Minnesota. The Entomology Department has adequate space and resources such as computers and internet for preparation of lessons and activities to be implemented in K-12 classrooms.

Project Coordinator: (To be hired) will coordinate activities between collaborators (University of Minnesota, 3 Cricketeers, 5 participating schools), and assist with development of classroom activities, and implementation in schools.

Collaborator (Contract): Chad Simmons, 3 Cricketeers, St Louis Park, MN, will collaborate on preparation of cricket farm kits and classroom activities including establishment and monitoring of mini cricket farms in classrooms by K-12 students. Letter of Commitment submitted to S.Rao.