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

**I. PROJECT STATEMENT:** Carbon dioxide, methane and othergreenhouse 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 beingpromoted 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 4th 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**

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| **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 4th 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 4th grade classrooms | Year 1: September 2020  Year 2: September 2021 |
| *2.* Preparation of cricket farming kits | Year 1: September 2020  Year 2: September 2021 |

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| **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 4th 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.