Idaho Incubation Fund Program

Progress Report Form

Proposal No.	IF16-015
Name:	Daniel G. Strawn, Greg Möller, Bob Tripepi
Name of Institution:	University of Idaho
Project Title:	N-E-W Terra™: An Enhanced Efficiency Fertilizer (EEF) Manufactured from Biochar
Reporting Period:	July 1, 2015 through January 21, 2016

Information to be reported in your progress report is as follows (attach additional information as needed):

1. Summary of project accomplishments for the period just completed and plans for the coming reporting period:

In this period we have successfully recovered enough modified biochar from catalytic reactive filtration (N-E-W Tech™) using dairy water from the UI dairy lagoon as the process influent to start early plant growth trials. We call this biochar fertilizer product N-E-W Terra™. This established the system process required for upcycling nutrients into a product that can be recovered and potentially used as an enhanced efficiency fertilizer. We have submitted the samples for nutrient testing, have developed protocols that are in line with methods used by the fertilizer industry (following the Association of American Plant Food Control Offices (AAPFCO)) to measure enhanced efficiency fertilizer properties, and prepared the experimental design for plant growth trials. Initial lab test indicate the biochar has low salinity, which is a good first hurdle to clear.

Preliminary plant trials will begin in February to test the effects of N-E-W Terra™ on plant growth, and lab testing of N-E-W Terra™. We are planning another production trial of N-E-W Terra™ at the end of February at a waste water treatment plant, and another trial at a dairy in March. We will be testing the physicochemical properties of the N-E-W Terra™ generated from these trials to determine their potential use as enhanced efficiency fertilizers. Another more extensive growth trial will commence in March and carry through June

2. Summary of budget expenditures for the period just completed (**include project burn rate**):

As of Dec 31, 2015, we have spent $10,000 to purchase a Dow Tequatics advanced filtration unit, a critical piece if equipment needed to recover N-E-W Terra™ from N-E-W Tech™. We secured $20,000 from the University of Idaho Agriculture Experiment Station to purchase this unit as a fully assembled skid (plug-and-play), saving 6-8 weeks of time that would otherwise have been required for us to assemble the unit based on the filter alone. Burn rate is $1,667 per month, or 3% per month. Although the Burn rate is currently low, incurred expenses for analytical cost in January are pending, and planned high analytical costs as we move to the testing phase of N-E-W Terra™ (including hiring an undergraduate intern) will use remaining funds.

3. Numbers of faculty and student participation resulting from the funding, including internships:

The project involves five faculty, two graduate students, nine undergraduate students (including a senior thesis), and one senior staff engineer. We are in process of finding an undergraduate researcher to assist in the plant growth trials.

4. List patents, copyrights, plant variety protection certificates received or pending:

Möller, G., Strawn, D.G., Baker, M. and Staggs, G. Continuation in Part, Functionalized Biochar Water Treatment, Provisional Patent Application. 2016

Möller, G. and Strawn, D.G. Biochar Water Treatment, PCT Application No. PCT/US2014/066677. Patent Pending. 2014

5. List technology licenses signed and start-up businesses created:

A University of Idaho N-E-W Tech™/N-E-W Terra "Biochar Water Treatment" Option and Technology Evaluation Agreement License was signed with BlueXGreen, LLC (BXG). BXG is a new Idaho start-up company formed in 2015 by six seasoned senior partners in the fields of business, science and engineering as an emerging green tech/clean tech accelerator. BXG's mission is to help research products from the University of Idaho and Washington State University navigate the early "valley-of-death" pathway to commercialization for promising research innovations. Professor Strawn and Möller are partners in BXG and have initiated appropriate university research conflict of interest documentation. N-E-W Tech™/N-E-W Terra™ has received interest for commercial licensing in the U.K. and by a Southern California investment group, in addition to corporate interest in rights of first refusal licensing options.

6. Status of private/industry partnerships (include enough information to judge level of engagement):

Since September, 2015, we have had regular communications with Dr. Terry Tindall, the Director of Agronomy at J.R. Simplot Company on progress and product development. We provide him updates on our results, successes and challenges. Our planned meeting at our dairy recovery trial in December was thwarted by severe winter storms that halted our dairy operations for most of the month. Current plans are for Dr. Tindall to have a site visit in February or March. With their permission and encouragement, we are adding a Simplot logo to the list of research partners on our N-E-W Tech™ water treatment trailer that is producing the N-E-W Terra™ nutrient upcycled fertilizer. We are also working with secondary partners Blue Water Technologies, Inc. (Hayden, ID), DOW Clean Filtration Technologies, LLC (Redwood City, CA), Kemira, (Oulu, Finland), Regenis Dairy Waste Management (Ferndale, WA), and Evergreen Engineering (Peterborough, UK).

7. Any other pertinent information that will indicate to the council that the project is meeting satisfactory progress.

    - We submitted the $326,000 research proposal “INFEWS N/P/H2O: Molecular Mechanisms of Resource Recovery in a Functionalized Biochar - Catalytic Oxidation - Reactive Filtration Water Treatment Process” to the National Science Foundation Innovations in the Food, Energy Water System RFP in November 2015. We should receive feedback in 1Q2016.

    - An invited case study article N-E-W Tech™/N-E-W Terra™ appeared online and in the January 2016 paper issue of the engineering trade magazine **Control Design** with a total distribution of 193,000:
      http://www.controldesign.com/articles/2015/scalable-control-system-is-at-the-heart-of-water-treatment-process-skid-plc/?show=all
      IGEM is recognized in that publication.

    - The University of Idaho/State of Idaho N-E-W Tech™/N-E-W Terra™ project is submitted as a 12-month, almost $600,000 total commitment of Activities and Actions to Build a Sustainable Water Future-2016 White House Water Summit announcement. The White House Water Summit follows the announcement of what has been characterized in December 2015 by USA Today as a “moonshot for water” where innovations in science and technology are a central focus.

    - N-E-W Tech™/N-E-W Terra™ is central in a novel “whole system architecture” dairy waste management approach submitted to the Nutrient Recycling Challenge, a $20K prize competition searching the globe for new ideas to support animal agriculture operations. The concept paper was submitted by the new Idaho start-up company BlueXGreen, LLC, in cooperation with the University of Idaho.

The University of Idaho College of Agriculture and Life Sciences produced and released a 2-minute *YouTube* video “Creating a Sustainable Water Supply” about N-E-W Tech™/N-E-W Terra™. The video, which recognizes IGEM funding, is publically available at: https://www.youtube.com/watch?v=DnpvY4cWKEI

The video and accompanying UI-CALS *AgKnowledge* write-up were emailed to all members of the Idaho Legislature.