**AGRICULTURAL RESEARCH FOUNDATION**

**INTERIM REPORT**

**FUNDING CYCLE 2015 – 2017**

**TITLE: Sequestering the Stink: Using water plants as component of an animal waste management system to reduce objectionable odors and recycle nutrients**

**RESEARCH LEADER: Gerd Bobe**

**COOPERATORS: None**

**SUMMARY:** Air quality and nutrient density are major public health problems of confined animal feeding operations (CAFO) in the U.S. and Oregon. Our objective is to reduce objectionable odors and recycle nutrients using animal waste treatment system using rapidly growing water plants, which can be used as feed. In year 1, we compared the growth, nutrient content, and winter survival of four water plant species: duckweed, mosquito fern, water lettuce, and water hyacinth on manure lagoons starting Spring 2015. Of the four plant species, mosquito fern had the highest growth rate (doubled every three days), the highest protein content (31.2% crude protein), and the best survival over winter. In the next year, we will focus on quantifying the effect of mosquito fern on nutrient transfer from animal waste and concentrations of volatile components of animal waste.

**OBJECTIVES:** The central hypothesis of this proposal was that water plant species decrease concentrations of volatile components and nutrients of anaerobically treated animal waste:

1) Determine the effect of water plants on concentrations of volatile components of animal waste.

2) Determine the nutrient uptake and content of water plants from animal waste.

PROCEDURES: In year 1, we compared the growth, nutrient content, and winter survival of four water plant species: duckweed, mosquito fern, water lettuce, and water hyacinth on manure lagoons. In year 2, we will determine the effect of water lettuce on concentrations of volatile components of animal waste and determine the nutrient uptake and content of mosquito fern from animal waste.

**SIGNIFICANT ACCOMPLISHMENTS TO DATE:** We were able to grow duckweed, mosquito fern, water lettuce, and water hyacinth on manure lagoons in Oregon from Spring to Fall. Mosquito fern and water lettuce grew best. During Summer and early Fall, mosquito fern doubled every 3 days and replaced duckweed as primary water plant on the manure lagoons. When temperatures reached single digits, water lettuce and water hyacinths froze and died, whereas duckweed and mosquito fern survived. Of the four evaluated water plants, mosquito fern had the highest protein content (31.2% crude protein), highest growth rate (doubled every 3 days in Summer), and best winter survival. After a learning phase, mosquito fern was eaten by cows. In year 2, we will focus on the effect of water lettuce on concentrations of volatile components of animal waste and determine the nutrient uptake and content of mosquito fern from animal waste.

**ADDITIONAL FUNDING RECEIVED DURING PROJECT TERM:**

**Oregon Dairy Farmers Association: “**Mosquito fern, a novel, locally-grown forage as partial replacement for traditional protein feed sources for dairy cows”

**FUTURE FUNDING POSSIBILITIES: USDA**

The next step will be to increase the scale of the animal waste treatment system and apply for federal funding.

The results of the proposed study will provide an innovative green animal waste management solution for farmers to reduce objectionable odors and recycle nutrients. The results of this study will be published in a format accessible to Oregon farmers for information and implementation, if appropriate for their waste management and animal feed strategy.