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Development of an Aquaponics Research Program

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Proposal for Forward Thinking Poster Session At Marquette University (Dec. 3, 2013)

1. **Project Title**: Development of an Aquaponics Research Program

2. **Faculty**: Richard Marklin, Margaret Mathison, Brooke Mayer, Mark Nagurka, Vikram Cariapa, Michael Schlappi

3. **Students**: James Deane, COE UG, COE graduate student(s) TBN

4. **Introduction**: Aquaponics is a closed-loop, recirculating fresh water system in which plants and fish grow together. Fish and vegetative plants can be grown 24/7 every day of the year with an aquaponics system, which uses liquid fish waste (ammonia from fish gills converted to nitrates) as food for plants, which in turn clean the water for the fish. No soil is used in an aquaponics system. R. Marklin has recruited a team of 6 Marquette U. faculty in various disciplines to conduct aquaponics research. The research void is the economic feasibility of aquaponics in a cold climate (Great Lakes region). Specifically, we will quantify with high precision the *relationship between the amount of capital and operating costs (construction, labor, energy, fish food, and supplies) to the output (weight of fish and organic greens) of a small aquaponics system (6 x12').*

5. **Significance:** This proposed project addresses specifically the limited 4 to 5 month soil-based growing season in the Upper Midwest Lakes region for production of locally grown, fresh food (protein and vegetables) and the supply of fresh water for agriculture. An efficient, small-scale aquaponics model would allow homeowners and small businesses to produce their own fish and vegetables 24/7 every day of the year *with minimal amount of fresh water,* providing high quality organic greens and fish protein to diets. As the use of home and small business aquaponics units increases, there would be less need to import vegetables and fish protein from California, Florida, and offshore (such as South America, Vietnam, and Indonesia) to the Upper Midwest, which would decrease greenhouse gas emissions due to fossil fuel-dependent transportation systems.

6. **Forward Thinking**: The project addresses the critical issues of fresh water use and urban unemployment. If aquaponics systems were economically feasible, then urban residents would be able to grow high quality fish protein and vegetables above the ground (above polluted soil) and provide food and jobs for local urban communities.

7. **Student Involvement:** James Deane, COE UG student, worked as a research intern on the project in Summer 2013. Graduate students would be hired as extramural funding is procured. In Spring 2014 COE students will help build the greenhouse, which the MU Office of Architect has approved. Construction costs will be approximately $5000, and the estimated total cost of electricity will be less than $500 per year.

8. **Reference**s:

Rakocy, J.E. (2012). Aquaponics – Integrating Fish and Plant Culture. Chapter in *Aquaculture Production Systems*, First edition, edited by J. Tidwell. John Wiley & Sons.

Watten, B. J. and Busch, R.L. (Oct., 1984). Tropical production of tilapia (Sarotherodon aurea) and tomatoes (Lycopersicon esculentum) in a small-scale recirculating water system. *Aquaculture*, Vol. 41, Issue 3, 271-283. ***Note: this article was the first publication in a technical journal about an aquaponics system. At the time, it was called a "recirculating water system"***