Aquaponics at Allegheny College

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Students in the Environmental Science Department at Allegheny College located in Meadville, Pennsylvania, USA are using aquaponic systems to address issues of environmental sustainability while fostering creativity and critical thinking through interdisciplinarity and community problem solving.

The initiative began in the fall of 2008, when an Environmental Education class visited the Tom Ridge Environmental Center in Erie, Pennsylvania. After viewing several recirculating aquaponic systems for the first time, many of the students became excited about the idea of exploring the technology further through research and coursework. In the fall of 2009, a Junior Seminar course was dedicated to designing an aquaponics program that would allow students to explore interdisciplinary interests in technical considerations of aquaponic systems and social applications of aquaponics for meeting the needs of local communities. With support from the Center for Economic and Environmental Development (CEED) at Allegheny College, and several external funding sources, the ideas that emerged from the class have led to student coursework, research, and community engagement in the areas of environmental education, green design, entrepreneurship, and international development.

One idea that Allegheny students have worked over the last two academic years to design and manage is “Aquaponics in the Community,” a project that promotes sustainable values while increasing public understanding of sustainable systems. The Meadville Market House, the hub of the Meadville community and the oldest market house in continuous use in Pennsylvania, is the site of a 250 gallon wooden flood and drain system that uses local blue gill to grow herbs and vegetable year round.

Student interns currently devote ten hours per week to engaging in conversations with visitors about aquaponics, focusing on the principles of environmental sustainability that the system embodies. Often times conversations that begin with questions as simple as “What kind of fish are those?” progress to topics ranging from classroom use to commercial agriculture and home recreation possibilities. Several customers have returned to the Market House days later to share with student interns interesting facts learned after conducting further research at home. For customers at the Market House, a simple grocery shopping trip can turn into an educational experience about aquaponics, the environment, and the future of sustainable agriculture.

Six low cost desktop replicas (15 gallon systems) of the Market House system were created by Allegheny students and distributed to local classrooms to link curriculum with local community efforts. In addition, students enrolled in the Environmental Education course are creating aquaponics lesson plans for Creek Connections, a partnership between Allegheny College’s natural science division and more than 48 elementary, middle, and high schools in the French Creek, Allegheny, and Ohio River watersheds. These modules will assist teachers in meeting Environment and Ecology standards for the state of Pennsylvania.
Inspired by such urban farming success stories as Milwaukee’s Growing Power and Sweet Water Organics, Allegheny students have also set their sights on a business idea that would utilize aquaponic systems to provide year-round local fish and produce to communities in Northwest Pennsylvania. Realizing that problems of local economic growth, health and nutrition, and environmental sustainability are become increasingly important to American consumers, students see Unsoiled Agriculture, the name of their proposed business, as a way to meet the demands of new markets for locally grown organic foods that support healthy diets, local business, and environmental friendliness.

In the past these markets have thrived in regions that benefit from warm climates, and have faced barriers to expansion into cold weather regions. By utilizing indoor organic processes and waste conservation methods, students hope to demonstrate that markets for local foods can thrive in any geographical location, and that business can be profitable while also being environmentally friendly.

The idea for bringing commercial aquaponics to Meadville, Pennsylvania was originally conceived in the late 1990s by Professor of Environmental Science Eric Pallant, whose students performed a study confirming the feasibility of the idea. The goal of Unsoiled Agriculture is to move those ideas from invention to innovation by incorporating more recent advancements in commercial aquaponics and energy efficient technologies.

Vaughn Raup, owner of Raup Fisheries located in Conneautville, Pennsylvania, has been instrumental in the development of the business concept. In the fall of 2010, Allegheny student researchers collected data on photoperiod effects on growth cycles using lab space and materials provided by Raup Fisheries. The data was used to determine the costs of artificial lighting for a 10,000 sq. ft. vacant industrial facility that would be the proposed site of the business venture. The students are now exploring funding opportunities for a pilot study, including the Northwest Pennsylvania College Business Plan Competition, where the plan for Unsoiled Agriculture is currently one of eight finalists.

As a final component of the aquaponics initiative, this year a team of students will focus their research efforts on designing an integrated aquaculture/agriculture (IAA) waste management system as part of an international development project. Bosanska Krupa, in Bosnia and Herzegovina, is a town that suffered severe environmental, economic, and social destruction during the Yugoslav wars of the early 1990s. As a result, fisheries were depleted of native stocks, and the economy collapsed leaving many people without employment opportunities. The town, which had once thrived from sport fishing tourism, was physically and economically devastated.

In response to the need for rejuvenation of local economic activity, a fish hatchery was constructed in 2008 to increase biodiversity in local waterways, create jobs for injured war veterans, and stimulate the local economy by promoting ecotourism and fishing. The hatchery produces over three tons of grayling, brown trout, and Danube salmon annually for restocking purposes, and as a recirculating aquaculture system (RAS) is the first of its kind in the country. It has been successful in its production of fish for the local watershed and now employs injured war veterans who have been trained to operate the facility. The production facility however, which employs a RAS, continues to release fish waste into the local Krusnica River.
An aquaponic system will be considered among several waste management alternatives for removing excess nutrients from the hatchery effluent. Several students will travel to Bosnia to examine the feasibility of using aquaponics as a waste management strategy, and to measure the associated environmental benefits. The potential for using the aquaponic system for community outreach through education and agritourism will also be examined. A long term goal is to create a partnership that would open the lines of communication between Bosanka Krupa, Bosnia and Herzegovina and Meadville, Pennsylvania, exchanging both technical and cultural ideas through interactions with aquaponic systems.

Few would have guessed that an idea sparked from a field trip would have grown into such a large project in so little time. The growth of the aquaponics initiative at Allegheny College demonstrates the limitless potential that students have for effecting change through education, research, and civic engagement.

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**Pictures:**

- *The flood and drain demonstration system located at the Meadville Market House.*
- *A 15 gallon replica of the Market House system designed by students at Allegheny College. Most materials for the system can be purchased inexpensively at local department stores. Six desktop systems have been distributed to local classrooms.*
Dillon Otten, a junior Environmental Science major, transfers a tilapia to the aquaponic system at Raup Fisheries at the beginning of a study on photoperiod effects.

Erin Cavagnero, a junior Environmental Science major at Allegheny college, displays a head of spring lettuce upon the completion of the photoperiod effects study.

The Krusnica River in Bosanska Krupa, Bosnia and Herzegovina.
Senior Environmental Science majors Chris Bonessi, Justin Gaudi, and Alex Haas used Google Sketchup software to propose green features for the lobby of the future Richard J. Cook Center for Environmental Science at Allegheny College. Their proposal would include an aquaponics system to “blur the lines between indoors and outdoors.” The soundscape created from running water would transform the lobby into a relaxing atmosphere for students, faculty, and visitors.