THE INTERNATIONAL TILAPIA AND AQUAPONICS COURSE AT THE UNIVERSITY OF THE VIRGIN ISLANDS

James E. Rakoczy, Donald S. Bailey, R. Charlie Shultz and Jason J. Danaher
University of the Virgin Islands
Agricultural Experiment Station
Overview

• Thirteen years of instruction: 1999-2011

• Course provides in-depth knowledge of the principles and practical application of the UVI aquaponic and biofloc tank culture systems developed over 30 years

• Fish production focuses on Nile and red tilapia

• Crop production focuses on vegetables and culinary herbs
System Design

Rearing tanks

Sump
Clarifier
Filter tanks

Base addition

Degassing

Effluent line
Hydroponic tanks

Return line

Total water volume - 110 m$^3$
Land area - 0.05 ha
Factors Contributing to Course Success

• New, innovative, productive technology
  - 5 mt of tilapia and 3-7 mt of vegetables annually in 0.05 ha UVI aquaponic system
  - 7 mt of tilapia annually in 0.02-ha biofloc system
• Good documentation on the Internet
• Research facilities complement lecture material
• Hands-on application of classroom lessons
• Social activities for exchange of ideas
UVI Facilities

• Conference Room
  – 96 student capacity
  – Internet connection
  – Multimedia projector/projection screen
  – Sensitive microphone/speaker system

• Dormitories
  – Double-occupancy rooms @ $35/night

• Cafeteria
Aquaculture Facilities

- Aquaponic systems
  - 1 commercial scale
  - 6 research scale

- Biofloc systems
  - 1 200 m³ commercial system
  - 7 70 m³ production systems
  - 1 70 m³ Quick tank system
  - 6 30 m³ research systems
  - 3 11 m³ nursery systems

- Breeding system
  - hapas
  - hatching jars
  - sex reversal tanks

- Nursery system
  - 1 recirculating system with 12 2 m³ tanks

- Brood fish maintenance
  - 21 11 m³ static tanks
Google Earth View
Total Number of Students - 566 from 56 Countries
# Other Countries and Territories

<table>
<thead>
<tr>
<th>West Indian Countries/Territories</th>
<th>Student No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Antigua</td>
<td>9</td>
</tr>
<tr>
<td>Bahamas</td>
<td>3</td>
</tr>
<tr>
<td>Barbados</td>
<td>6</td>
</tr>
<tr>
<td>British Virgin Islands</td>
<td>3</td>
</tr>
<tr>
<td>Cayman Islands</td>
<td>4</td>
</tr>
<tr>
<td>Curacao</td>
<td>3</td>
</tr>
<tr>
<td>Dominican Republic</td>
<td>3</td>
</tr>
<tr>
<td>Grenada</td>
<td>1</td>
</tr>
<tr>
<td>Haiti</td>
<td>3</td>
</tr>
<tr>
<td>Jamaica</td>
<td>7</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>West Indian Countries/Territories</th>
<th>Student No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Martinique</td>
<td>5</td>
</tr>
<tr>
<td>Montserrat</td>
<td>1</td>
</tr>
<tr>
<td>Nevis</td>
<td>2</td>
</tr>
<tr>
<td>Puerto Rico</td>
<td>28</td>
</tr>
<tr>
<td>St. Eustatius</td>
<td>2</td>
</tr>
<tr>
<td>St. Lucia</td>
<td>5</td>
</tr>
<tr>
<td>St. Maarten</td>
<td>9</td>
</tr>
<tr>
<td>Trinidad and Tobago</td>
<td>20</td>
</tr>
<tr>
<td>US Virgin Islands</td>
<td>57</td>
</tr>
</tbody>
</table>
## Other Countries and Territories

<table>
<thead>
<tr>
<th>Region</th>
<th>Student No.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Europe, Middle East and Asia</strong></td>
<td></td>
</tr>
<tr>
<td>Bulgaria</td>
<td>1</td>
</tr>
<tr>
<td>Cyprus</td>
<td>2</td>
</tr>
<tr>
<td>Denmark</td>
<td>1</td>
</tr>
<tr>
<td>Finland</td>
<td>1</td>
</tr>
<tr>
<td>France</td>
<td>1</td>
</tr>
<tr>
<td>Hungary</td>
<td>1</td>
</tr>
<tr>
<td>Italy</td>
<td>1</td>
</tr>
<tr>
<td>Lebanon</td>
<td>1</td>
</tr>
<tr>
<td>Norway</td>
<td>1</td>
</tr>
<tr>
<td>Singapore</td>
<td>3</td>
</tr>
<tr>
<td>UAE (Abu Dhabi)</td>
<td>1</td>
</tr>
<tr>
<td>UK (England)</td>
<td>12</td>
</tr>
<tr>
<td>UK (Scotland)</td>
<td>1</td>
</tr>
<tr>
<td><strong>Central America</strong></td>
<td></td>
</tr>
<tr>
<td>Belize</td>
<td>1</td>
</tr>
<tr>
<td>Costa Rica</td>
<td>2</td>
</tr>
<tr>
<td>Guatemala</td>
<td>2</td>
</tr>
<tr>
<td>Honduras</td>
<td>1</td>
</tr>
<tr>
<td><strong>Oceania and Antarctica</strong></td>
<td></td>
</tr>
<tr>
<td>American Samoa</td>
<td>2</td>
</tr>
<tr>
<td>Guam</td>
<td>1</td>
</tr>
<tr>
<td>Saipan</td>
<td>2</td>
</tr>
<tr>
<td>Antarctica</td>
<td>1</td>
</tr>
</tbody>
</table>
Number of U.S. Students - 286 from 40 States
Course Content

- Lectures
- Classroom laboratory
- Field exercises
- Social activities
Lectures

• Tilapia production
  – Breeding
  – Diseases
  – Feed and feeding
  – Grow-out

• Vegetable production
  – Crop selection
  – Production
Lectures

• System design
  – Aquaponic system
  – Biofloc system
  – Pond/cage systems (review)
  – Component options

• Water quality

• Economics
  – Business planning
  – Budgeting
  – Marketing
Classroom Laboratory

- Water quality
- Tilapia dissection
Field Exercises

- Tilapia production
  - Breeding and fry production
    - Set up brood fish hapas
    - Collect eggs and incubate
    - Count fry
Field Exercises

• Tilapia production
  – Fingerling production
    • Grade and sample fingerlings
    • Count, weigh and stock production tank
Field Exercises

• Tilapia production
  – Harvest production tank
    • Weigh and count
    • Calculate survival, production, FCR
Field Exercises

- Tilapia production
  - Marketing
    - Clean and fillet for market
Field Exercises

- Vegetable production
  - Seedling production
    - Prepare potting mix in flats
    - Seed
    - Thin seedlings
Field Exercises

- Vegetable production
  - Crop production
    - Transplant
    - Harvest
Field Exercises

• System design
  – Initial field tour
  – Final field tour
Field Exercises

• System construction
  – Construction materials
    • Paint and drill hydroponic rafts
    • Drill and tap air distribution manifold
    • Modify fittings for liner attachment
Field Exercises

- System operation
  - Maintenance
    - Clean nets
    - Clean air stones
    - Clean rafts
    - Clean net pots
Social Activities

• Tilapia and aquaponic crop dinner
  – Filleted and whole tilapia prepared island style
  – Basil pesto
  – Salad
  – Rum mojitos
Social Activities

• St. Croix island tour
  – $\frac{1}{2}$ day to Pt. Udal,
    • Eastern most point of USA
  – Beachside cocktails
    • Off The Wall, Cane Bay
Social Activities – Group Photo
Social Activities

- Annual t-shirt - different design each year
- Contact list, certificate, evaluation
Social Activities

- Graduation banquet & culture show
  - Carambola Beach Resort
Social Activities

• Buck Island National Marine Park sail
Success Stories

• Monte Huwyler, '99
• Albion Correctional Pilot Aquaponics
  – Female correctional facility – New York
Success Stories

• Eric Hutchings, ’00
• Lethbridge Community College
  – Education and extension, Lethbridge, Canada
Success Stories

• Carlos Leon Ramos, '03
• Bofish-Acuaponia
  – Commercial enterprise - Guadalajara, Mexico
Success Stories

- Myles Harston, '04
- AquaRanch
  – Commercial enterprise - Illinois
Success Stories

- Michael Musoke, '06
- AquaOrganics, LLC
  - Commercial enterprise - Florida
Success Stories

- Hawaiian Aquaponics
- 18 aquaponic farms
- Modified UVI design
UNIVERSITY OF THE VIRGIN ISLANDS
INTERNATIONAL AQUAPONICS AND TILAPIA AQUACULTURE COURSE

June 13-19, 2010

Program - 7-day course that will provide in-depth knowledge of the principles and practical application of the aquaponic and biofloc tank culture systems that have been developed at the University of the Virgin Islands. Participants will be introduced to a variety of system designs that maintain water quality by various solids removal techniques and by hydroponic plant culture (aquaponics), a suspended growth process (biofloc tank culture) or fixed-film nitrification. Fish production instruction will be conducted using both the Nile tilapia (Oreochromis niloticus) and red tilapia. Hydroponic plant production will focus on vegetables, culinary herbs and ornamental flowers.

Instruction - Each day will include a half-day of classroom lecture and a half-day of hands-on field work. Participants will learn the technology through presentation of the theory and practical skill development. Each student will be given a CD-ROM of reference materials. Water quality labs will cover the methods of analysis and the use of water quality test kits. Field work will include fish handling, vegetable production and system operation.

Facilities - UVI is located in the heart of beautiful St. Croix. The Aquaculture Program operates fifteen research-scale systems (six aquaponic and 16 biofloc) as well as commercial-scale aquaponic and biofloc systems, a biofloc demonstration system with a large vegetable garden, a fry sex-reversal system, a recirculating system for fingerling rearing and a purge system. Brood Nile and red tilapia are maintained on site. The program annually produces about 50,000 lbs. of tilapia and a variety of vegetables.

Topics
Aquaponic system
- System design and management
  - Components
  - Construction techniques
  - Operation
  - Water quality
  - Fish production
    - Stocking rates
    - Feeding, growth and survival
    - Harvesting and processing
  - Plant production
    - Seedling production
    - Disease and insect control
    - Harvesting and packaging
Biofloc tank system
- Fish production
  - Stocking and growth
  - Water quality management
  - Feed and feeding methods
  - Sludge use for field crops
-Economics
  - Capital budgeting
  - Operations plan
  - Marketing
  - Fingerling production
  - Brood stock management
  - Breeding
  - Sex reversal

Cost - This course will cost $950 for participants registering by June 1 and $1100 for registrations received later. Course fee includes instruction, course materials, graduation banquet and a sailing trip to Buck Island National Park for a day of snorkeling amid spectacular coral reefs and a beach barbecue. Local hotels and inns provide comfortable accommodations at reasonable summer rates. Several are listed on the registration form. Airfare to St. Croix (STX) is not included in the registration fee. Meals are available at the university cafeteria ($10-15 each) or at many other local restaurants ($10-50 each).

Registration - Register by completing the form at the Course website and mailing with your deposit. A $300 deposit, payable to the University of the Virgin Islands, is necessary by June 1, 2010. The balance will be due the first day of class.

Instructional Staff
Dr. James Rakocy - System design/production/water treatment technology
Dr. Wilson Leonard - Australian guest lecturer/small-scale aquaponics
Donald Bailey - Business planning/marketing/operations/construction methods
Jason Damaher - Biofloc systems/tilapia biology/feeding and nutrition
R. Charlie Shultz - Water quality/pest management/plant production

For more information and to register contact Dr. James Rakocy, RR 1, Box 10,000, Kingshill, VI 00850-9781, Phone: 340-692-4020, E-mail: jrakocy@uvi.edu

Visit the Course website for more information. http://www.uvi.edu/sites/uvi/Pages/AES-Aquaculture-International_Aquaponics.aspx?s=RE