

# Institute of Natural Resource Sciences



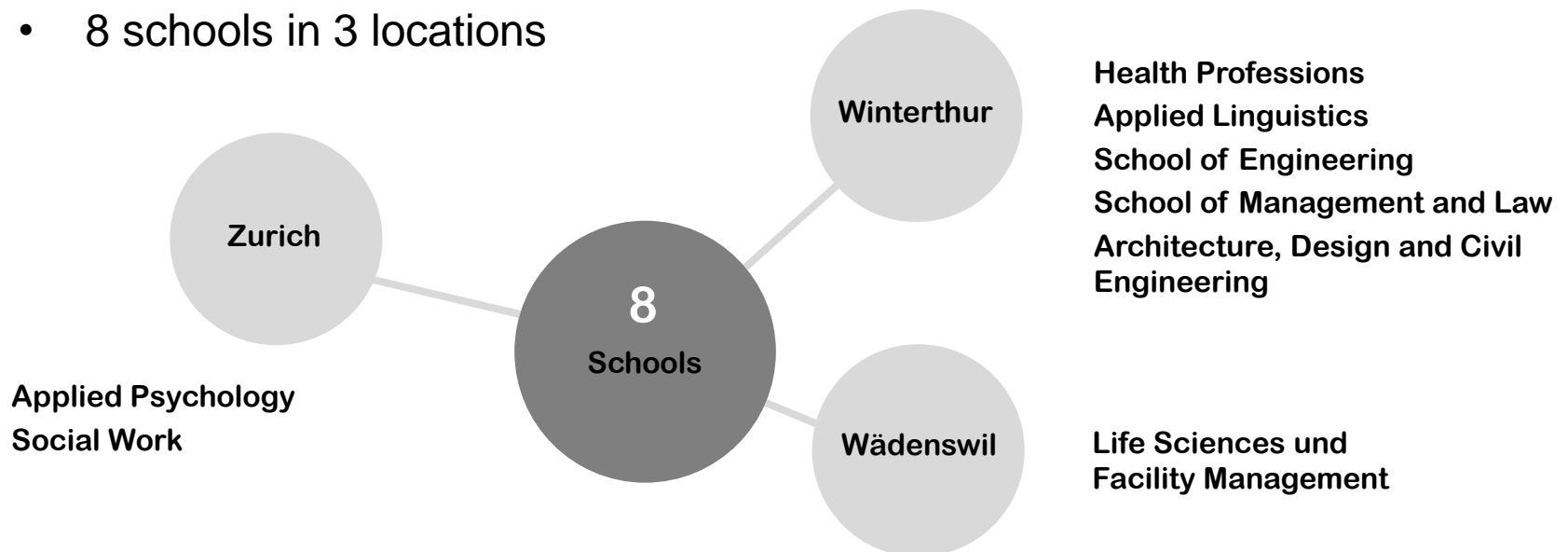
# Institute of Natural Resource Sciences



# The ZHAW in numbers

ZHAW Zurich University of Applied Sciences

- Part of the Zurich Universities of Applied Sciences and Arts
- 11 000 students (Bachelors and Masters)
- 2800 staff members
- 8 schools in 3 locations



## School

# Life Sciences und Facility Management (LSFM)

## Locations

- Wädenswil
- Zurich (Technopark)
- Wergenstein

## Degree programmes and continuing education

- 5 Bachelor's degree programmes / ~ 1390 students
- 2 Master's degree programmes / ~ 150 students
- A wide range of continuing education, courses and conferences

# Institutes in the LSFM School



Chemistry and Biotechnology



Food and Beverage Innovations



**Natural Resource Sciences**



Facility Management



Applied Simulation

# Institute of Natural Resource Sciences

- Bachelor's degree programme in Natural Resource Sciences
- Master's degree programme in Life Sciences Specialisation Natural Resource Sciences
- Continuing education for professionals (many MAS and CAS courses) and organisation of conferences
- Research and services

# Facts and figures (as of December 2015)



Illustrations: Fotolia.com

488 **BSc students**  
53 **MSc students**  
1100 **participants in continuing education**  
(CAS courses, training courses, conferences)



180 **staff members**

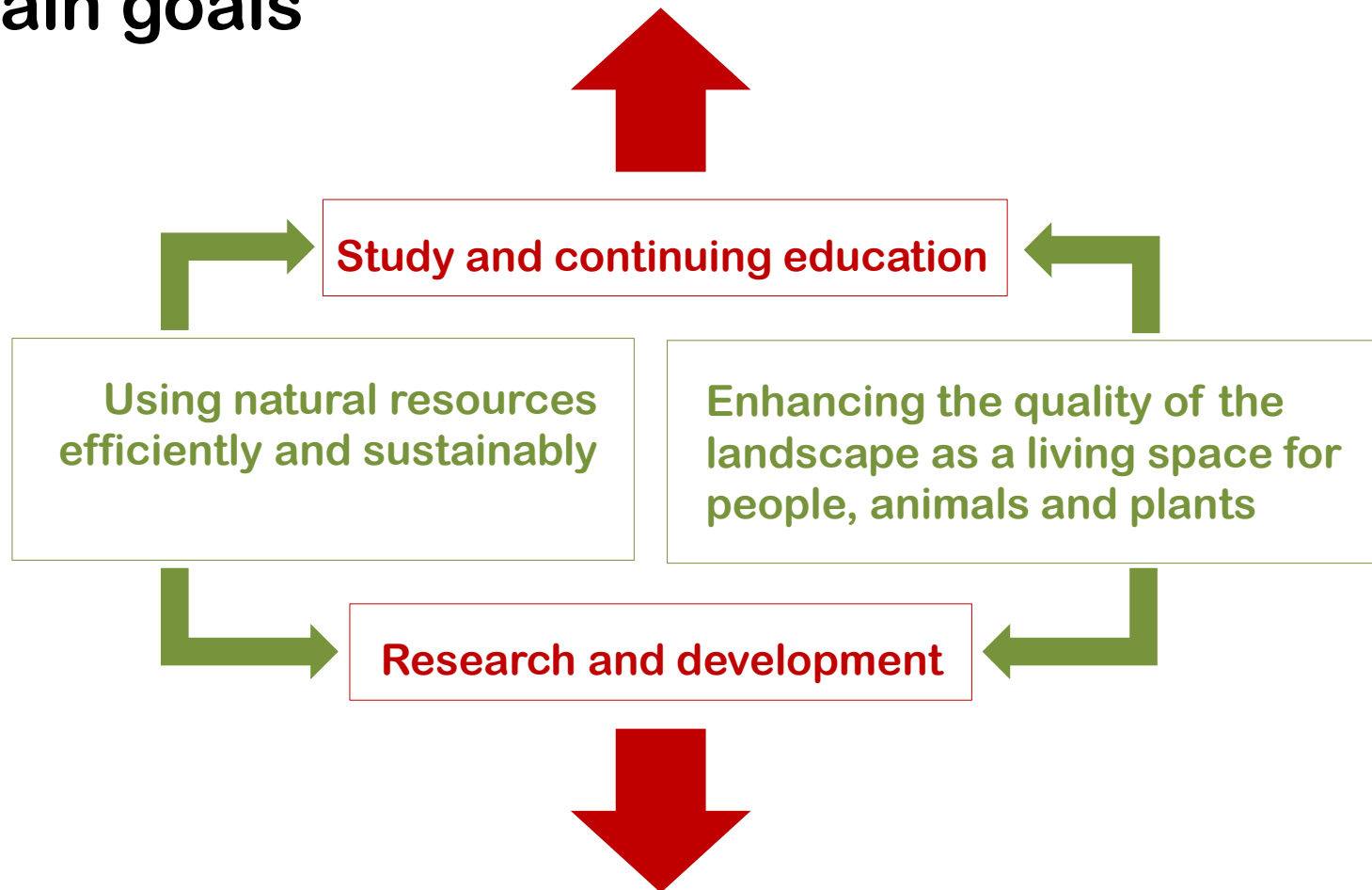


300 on going **projects** in  
R&D / Services



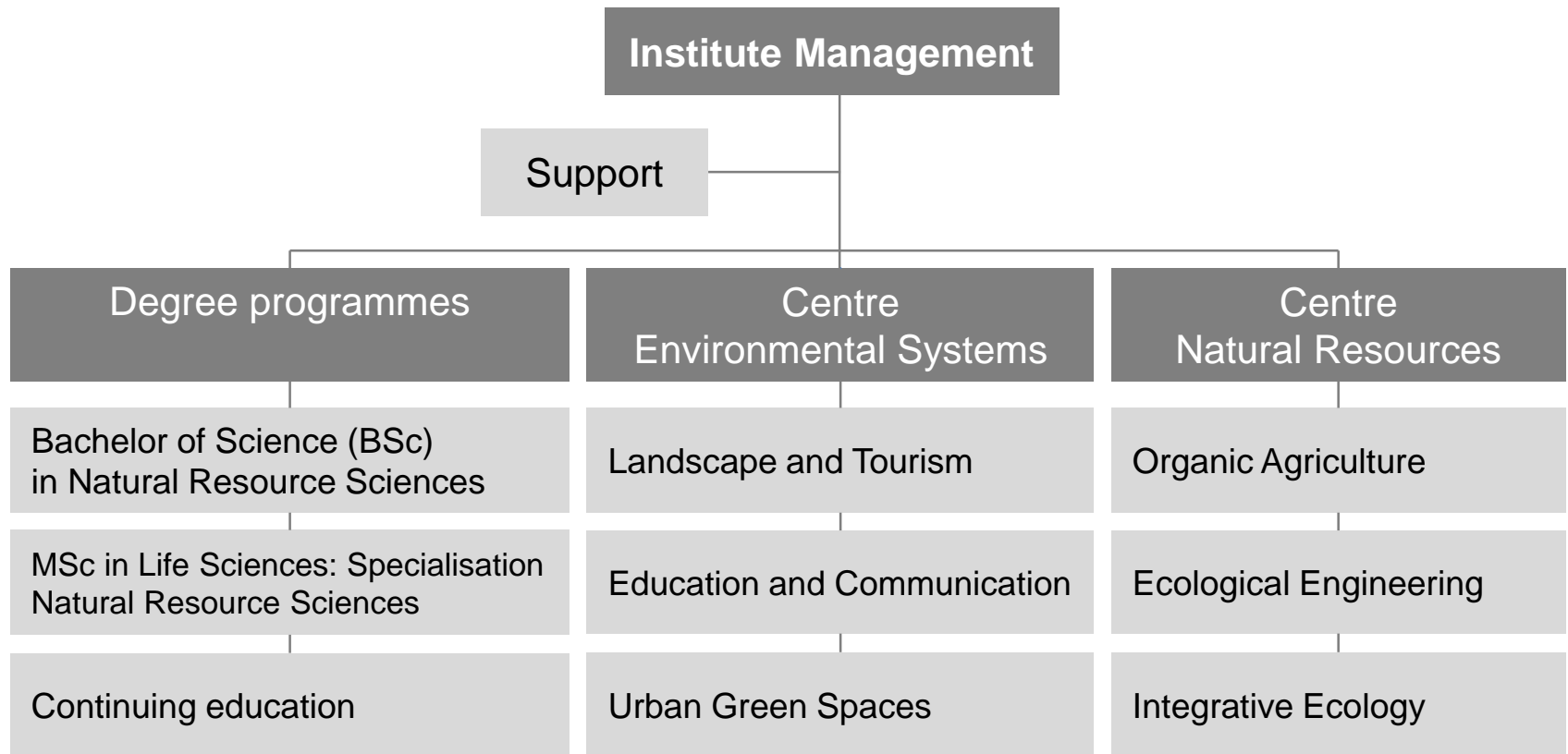
27.4 million  
**in proceeds**

# Main goals





# Organigram



Director of Institute: Prof. J.-B. Bächtiger

# Degree programmes



# BSc in Natural Resource Sciences

**Focus:** Professional qualification for the environmental sector

- **5 Specialisations (Majors):**
  - Organic Agriculture and Horticulture
  - Renewable Energies and Ecological Engineering
  - Nature Management
  - Environmental Systems and Sustainable Development
  - Urban Ecosystems
- **Supplementary qualifications (Minors):**
  - Species Knowledge and identification
  - Education and Consulting
  - Field Diagnostics and Analysis
  - Life Cycle Assessment and Labelmanagement
  - Profile International
- **Duration: 6 semesters**
- **Degree «Bachelor of Science ZFH in Natural Resource Sciences»**

# MSc in Life Sciences

- **Focus:** holistic, systematic understanding of complex environmental problems
- Specialisation: **Natural Resource Sciences**
- **Topic areas:** wide range of current topics (e.g. Wildlife Management, Vegetation Analysis, Ecotechnology, Geography of Food) and collaboration with corresponding research groups
- Duration: **3 semesters** (full-time)
- Degree «**Master of Science (MSc) ZFH in Life Sciences with specialisation in Natural Resource Sciences**»

## GENERATE

KTI

EUROSTARS

EUREKA

**With implementation partner:  
Science to market**

SNF

Bilaterals

EU/COST

Foundations

**Without implementation partner**

«Impulse»

BSc, MSc

**Own financing**

## TRANSFER

**Implementation partner:  
Commercialization**

CAS

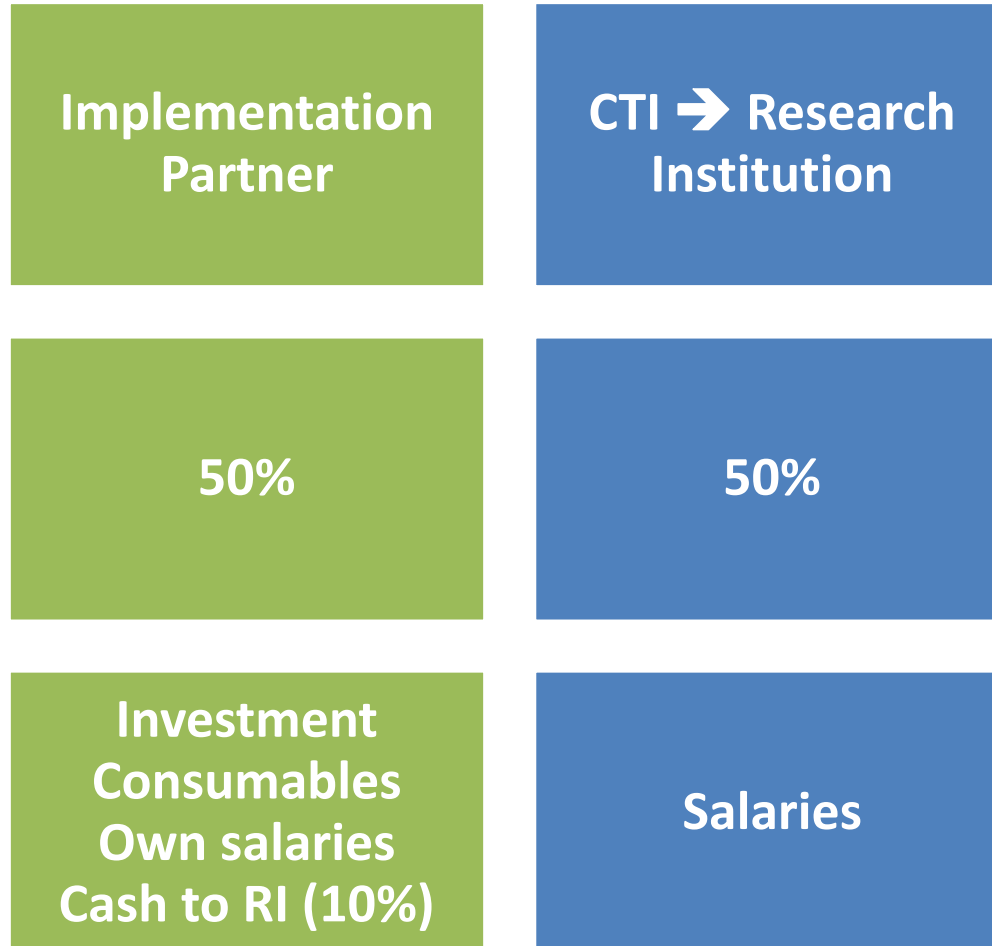
FBA

Courses

**Continuing  
Education**

**Specific  
targeted  
profiles /  
(potential)  
partners**

# KTI/CTI is the main funding Organisation for the applied R&D in Switzerland



CTI funding rules. See also <http://www.kti.admin.ch/?lang=en>

# Research focuses



Preservation of the landscape as a valuable resource.



Possibilities of using the regional value added.



Systems approach, i.e. observation of the lifecycle of products and shutting down of metabolic cycles.



Development of city and countryside taking into account ecological, economic and social interests.

# Research units

- Education and Communication
- Landscape and Tourism
- Urban Green Spaces
- Organic Agriculture
- **Ecological Engineering**
- Integrative Ecology



# Education and Communication



Source: Esther Volken

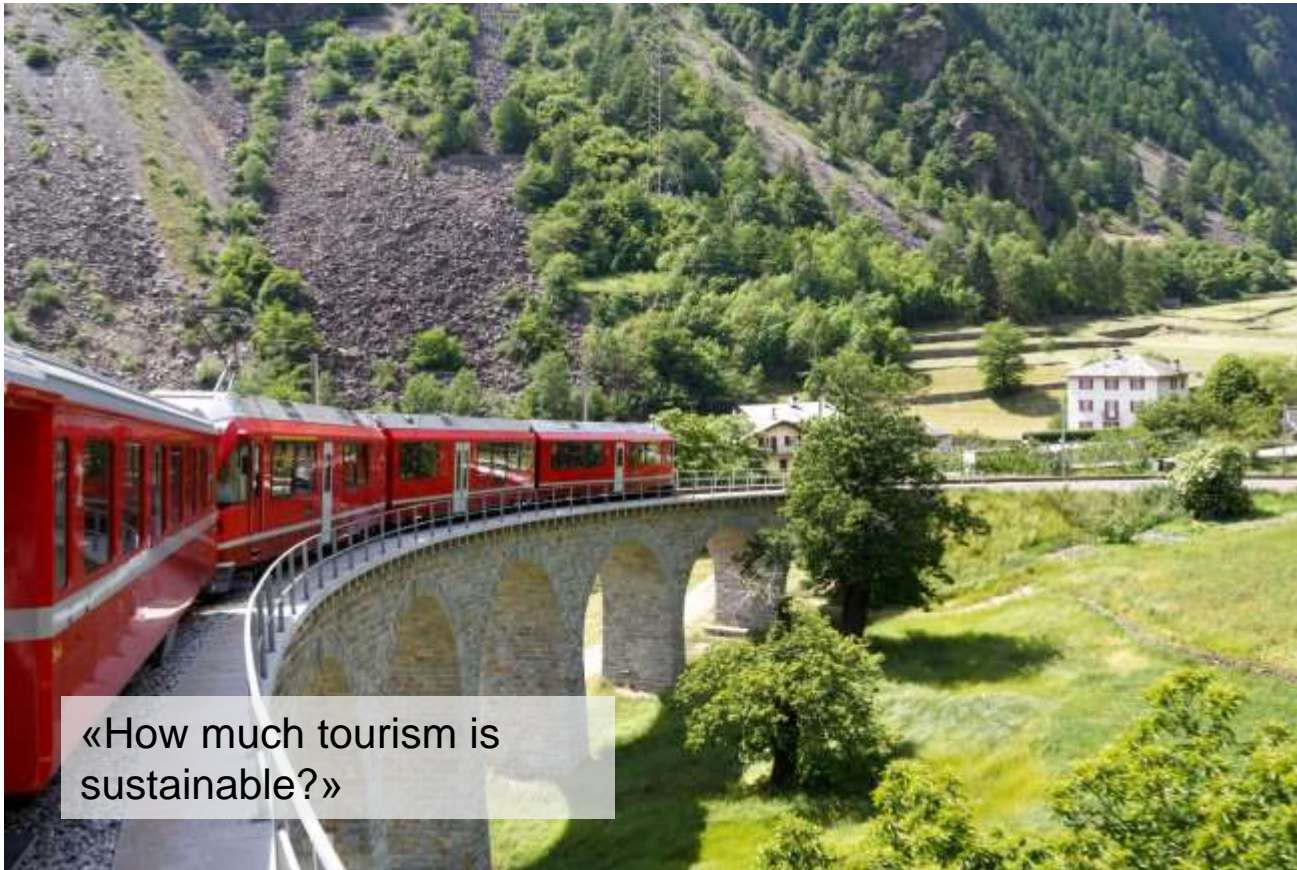
# Education and Communication

Research groups and main areas of focus:

- **Environmental Education:** methodology and general conditions for successful extra-curricular teaching and learning
- **Geography of Food:** valuation methods and analysis of labels in the area of nutrition
- **Grüental gardens:** infrastructure for “learning through research” in an active and ludic manner
- **Sustainability Communication:** fundamental principles in communication for sustainable development



# Landscape and Tourism



«How much tourism is sustainable?»

Source: www.shutterstock.com

# Landscape and Tourism

Research groups and main areas of focus:

- **Landscape Development:** sustainable development of landscape and region
- **Regional Development:** strengths of the region as a natural space, a cultural space and as an economic area on the basis of natural and cultural potential
- **Tourism and Sustainable Development:** construction of nature and national parks as well as tourism possibilities with a link to the region



# Urban Green Spaces



Source: www.shutterstock.com

# Urban Green Spaces

Research groups and main areas of focus:

- **Green Care:** horticultural and therapeutic use of green spaces
- **Open Space Management:** designing of public and private open spaces working towards sustainability.
- **Planting Design:** aesthetic and sustainable planting of vegetation in urban spaces
- **Urban Ecology:** concept of green roofing in order to be at one with nature



# Integrative Ecology



«Are the protection and  
usage of water resources  
compatible?»

Source: www.shutterstock.com

# Integrative Ecology

Research groups and main areas of focus:

- **Ecohydrology:** protection and sustainable management of water ecology systems
- **Environmental Planning:** reduction of negative environmental influences in the areas of construction, recreational use and agriculture
- **Geoinformatics:** analysis of complex spatial and temporal patterns in the environment
- **Vegetation Analysis:** changes in the natural flora
- **Wildlife Management (WILMA):** conflicts pertaining to wild animals and formation of the landscape in a way which is suitable for wild animals





# Organic Agriculture



«How efficient is biological  
protection of plants?»

Source: www.shutterstock.com

# Organic Agriculture

Research groups and main areas of focus:

- **Environmental Genomics and Systems Biology:** decoding of the life cycle through genomics, metagenomics, transcriptome and proteomics
- **Horticulture:** production of vegetables, fruits and ornamental plants
- **Plant Protection:** environmentally friendly solutions for the protection of plants in fruit-growing, viticulture and horticulture, as well as for ornamental plants, greenery in the city and special crops
- **Viticulture:** education and continuing education at the various levels and cultivation of the Vineyard on the Halbinsel Au



# Ecological Engineering



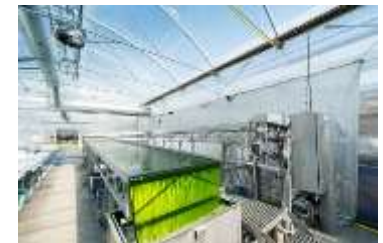
«How do we optimise energy  
production and use?»

Source: Frank Bröderli

# Ecological Engineering

Research groups and main areas of focus:

- **Ecotechnology:** utilisation, treatment and avoidance of wastewater, as well as a combination of fish and plant breeding in the circulatory system
- **Renewable Energy:** energy efficiency and sustainable energy supply
- **Soil Ecology:** chemical or physical strains on the soil and sustainable irrigation systems
- **Life Cycle Assessment:** LCA of energy systems and food systems



# Characterization of Nitrogen Dynamics in an Aquaponic System

Zala Schmutz<sup>1,2</sup>, Theo H. M. Smits<sup>2</sup>, Ranka Junge<sup>2</sup>,  
Emmanuel Frossard<sup>1</sup>

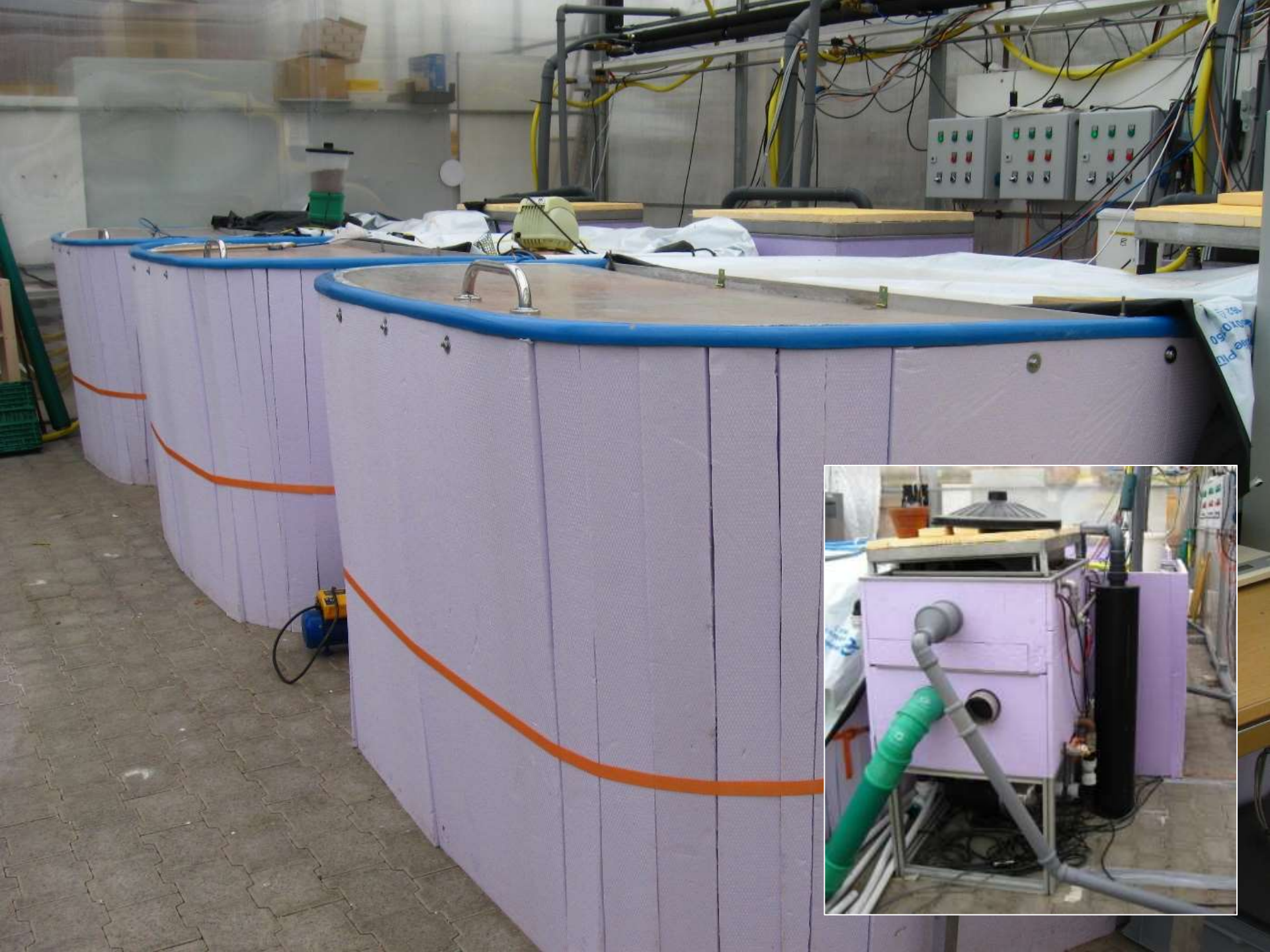
<sup>1</sup> ETH Zurich, Institute of Agricultural Sciences, Plant Nutrition ([sczala@student.ethz.ch](mailto:sczala@student.ethz.ch))

<sup>2</sup> Zurich University of Applied Sciences, Institute of Natural Resource Sciences

# AQUAPONIC

An **aquaponic** (AP) system combines a recirculating aquaculture system with a hydroponic system and recycles water and nutrients between these two main components.







# OBJECTIVES

1. Quantification of nitrogen fluxes between different compartments of the AP system. (**Quantification of different nitrogen forms** in AP system compartments over time.
2. Quantification of nitrogen losses from the system. **Tracing nitrogen fluxes using a  $^{15}\text{N}$  isotope** in order to parametrize the nitrogen dynamics.
3. Characterization of microbial communities that are involved in the nitrogen cycle. **Study of bacterial community composition and function** using metagenomics approach and by quantitative PCR for specific bacteria populations involved in N-cycling.