Agroecology as a tool to improve science capacity in agriculture through participatory research, education, and extension

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“Science capacity in the food, agriculture, natural resources and related sciences is at risk at a time of critical need”

(Association for Public and Land-grant Universities, 2009)
Agricultural education not keeping up with the changing nature of agriculture;

- often isolated from other disciplines
- Academic institutions often isolated from other sectors and employers;
- Employers are looking for skills, competences, and abilities not always found in agriculture graduates
Transforming Agricultural Education for a Changing World

- Changing student demographics
  - disconnect between student body and agriculture
  - Students are not aware of the opportunities in food and agriculture careers;
Follow up to previous National Academies reports on agricultural education

Agriculture and the Undergraduate 1992
Understanding Agriculture New Directions for Education 1988
Colleges of Agriculture at the Land Grant Universities Public Service and Public Policy 1996
Colleges of Agriculture at the Land Grant Universities A Profile 1995
Agriculture’s Role in K-12 Education Proceedings of a Forum on the National Science Education Standards 1998

and on undergraduate education

How People Learn Brain, Mind, Experience, and School 2000
BIO2010 Transforming Undergraduate Education in STEM 2003
Transforming Undergraduate Education in Science, Mathematics, Engineering, and Technology 1999
Evaluating and Improving Undergraduate Teaching in Science, Technology, Engineering, and Mathematics 2003
Educating the Engineer of 2020 2005
Build capacity through training programs in agroecology:

- the application of ecological concepts and principles to the design and management of agricultural systems

- Promotes a systems approach that supports the resilience and ecological, socio-economic and cultural sustainability of farming systems
- a scientific discipline that Acknowledges that agricultural systems are inescapably linked social-ecological systems
- a social movement seeking a new way of considering agriculture and its relationship with society (IIED, 2014)

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*High potential for immediate, multi-dimensional outcomes, through integrated research, education, extension*
• Regional history embedded in agriculture

• Statewide leader in the production of specialty crops

• Winter vegetables

• 350+ day growing season

• $732 million annually – economic impact of $1.6 B

• National leader in food related diseases

• Largest coverage of urban food deserts

• 4 of 10 top poorest counties in the US

• Lowest percent of people who eat vegetables regularly

Lower Rio Grande Valley
Participatory Action Research in Agroecology at UTRGV

CULTURALLY APPROPRIATE PEDAGOGY

OUTCOME ORIENTED

PARTICIPATORY ACTION

SERVICE LEARNING

and ENGAGED SCHOLARSHIP
Participatory Action Research (PAR)

- Collaborative inquiry and experimentation
- Community engagement
- Stakeholder empowerment
- Local knowledge/experiences
- Self-reflective process
- Endogenous science
Participatory assessment and planning

Partners

- Abundant Grace Farm
- Green Retros
- Freedom Harvest Farms
- Aurelia Consuelo Balthrop
What are the barriers to sustainable agriculture in south Texas?

- Severe barrier:
  - Weeds
  - Pest pressures
  - Lack of buyers
  - Few marketing networks

- Moderate barrier:
  - Input costs
  - Plant diseases
  - Weather related issues
  - Distance to organic markets
  - Difficulty obtaining price information
  - Soil fertility issues
  - Uncertainty in price information
  - Difficulties in organic transition process

- No barrier:
  - Lack of knowledge organic production
Pest pressures

Weeds

Plant diseases

Weeds

1. Assess economically viable organic weeding methods
2. Investigate strategies that reduce weed build up and improve soil fertility

Pest pressures

1. Identify major pest and beneficial insects in organic vegetable systems in South Texas
2. Test agroecological practices that can prevent/reduce pest buildup
Identify major pest and beneficial insects in organic vegetable systems in South Texas

In a 2 acre plot of kale, we monitored:
1. Foliar arthropod pests and beneficials
2. Ground-dwelling pests and beneficials
3. Aerial pests and beneficials
Identify major pest and beneficial insects in organic vegetable systems in South Texas

**Most abundant pests (foliar)**
1. Green Peach Aphid
2. Cabbage Looper
3. Spotted Cucumber Beetle

**Most abundant predators**
1. Convergent ladybeetle
2. *Pterostichus* ground beetle
3. *Pardosa* wolf spider

**Total of 12,105 insects collected**

- Neutrals 56%
- Beneficials 33%
- Pests 11%
Pests pressures in cruciferous crops in south Texas

Identify major pest and beneficial insects in organic vegetable systems in South Texas

BRASSICA PESTS & THEIR NATURAL ENEMIES

A FIELD GUIDE FOR TEXAS ORGANIC FARMERS
Pests pressures in cruciferous crops in south Texas

Test agroecological practices that can prevent/reduce pest buildup

Approach:

• Example potential of push-pull systems in brassica crops
• Compare Green peach aphid, beneficial arthropod abundance on neighboring kale

Lyford, Texas

Dill and Fennel

Indian mustard

Buckwheat

Green peach aphid
• Texas Organic Chronicles (1400+ members)

• SOAR Newsletter

• Advisory Board

• Electronic Listserv

• Website (www.utrgv.edu/agroecology)

• Annual Meeting
Basic Heuristics for Participatory Agroecology Research and Training

PRELUDE: building social capital; preliminary situation analysis; know your strengths

1. Backward Design (Wiggins and McTighe 1998): What are the desired outcomes?

*Do students as well as farmers/community benefit from collaboration and acquire skills, knowledge and abilities to handle new concerns, challenges, and opportunities?*
PRELUDE: building social capital; preliminary situation analysis; know your strengths

2. Look for things to try: identifying priorities; identifying ‘best-bet’ options from indigenous knowledge and scientific sources;
3. Design/implement experiments, monitoring and evaluation should all be participatory and collaborative
4. Share results through culturally and socially appropriate media—Student to farmer, farmer-to-farmer, farmer friendly social media
• Hidalgo County: Highest concentration of organic farms in Texas

• Statewide leader in the production of organic certified winter vegetables

• On-campus conversation about food systems sustainability

• Development of a degree program and research in sustainable food systems

• Systems approach to sustainable food systems with network of different actors
• Development of a degree program and research in sustainable food systems

• Masters in Agriculture, Sustainability and the Environment

• Nationally recognized program in Agroecology and Resilient Food Systems

• First certified organic research garden on University Campus in the state

• Provided fellowships or internships to 7 graduates and 38 undergraduates (89%) identified as Hispanic/Latino

• 60% of undergraduates reported ag-related jobs
• Implement Strategic Planning
• Build Stronger Connections and Strategic Partnerships with Farms, schools, administrators, etc;
• Broaden Treatment of Agriculture in the Overall Curriculum, use locally relevant examples
• Broaden the Student Experience through innovative curricula, engaged scholarship, service learning
• Start Early—K-12 Outreach
• USDA-NIFA-ORG
• USDA-NIFA-HSI
• Southern SARE
• UTRGV COS
• UTRGV FM

• Collaborators at USDA-ARS/APHIS
• Subtropical Organic Agriculture Research Partner farms
• NCAT-San Antonio