2013 DOE Bioenergy Technologies Office (BETO) Project Peer Review

Biodiesel Cellulosic Ethanol Research Project (Hendry County Sustainable Biofuels Center) EE0000303

Date: May 22, 2013
Technology Area Review: Biodiesel

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Presented by:
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Goal Statement & Project Overview

Goals

- Develop **strategies and tools** that assist in the creation of economically and environmentally sustainable bioenergy industries within **ecologically-sensitive regions** such as South Florida and, in particular, the greater Everglades.
- Use these bioenergy strategies and tools in evolving the **existing agricultural, urban, and ecological sectors** towards more sustainable structures and practices.
- Use bioenergy as a focal point in the **larger effort** to mitigate climate change and sea level rise, realities with particularly catastrophic consequences for South Florida.

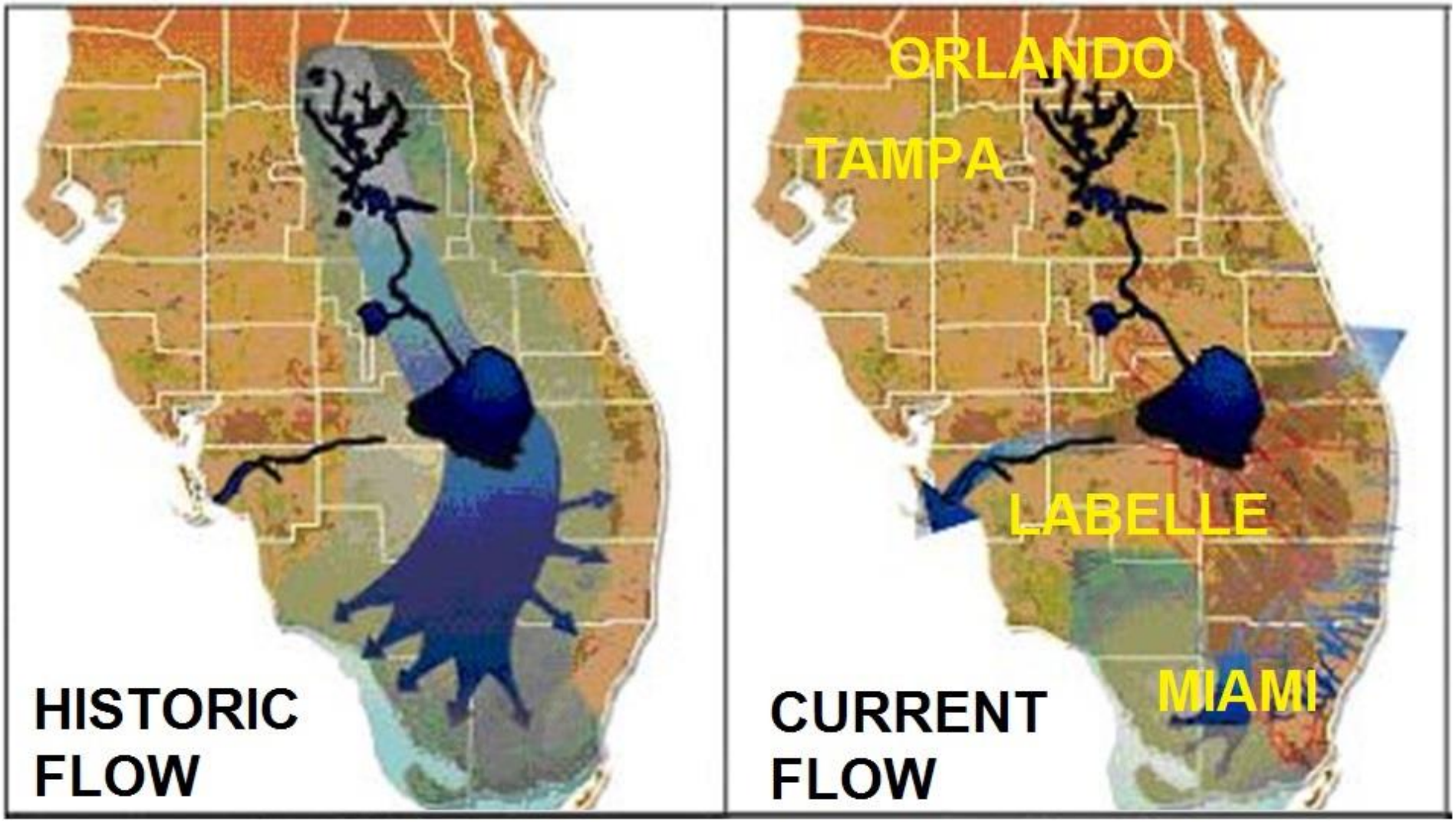
Goal Statement & Project Overview

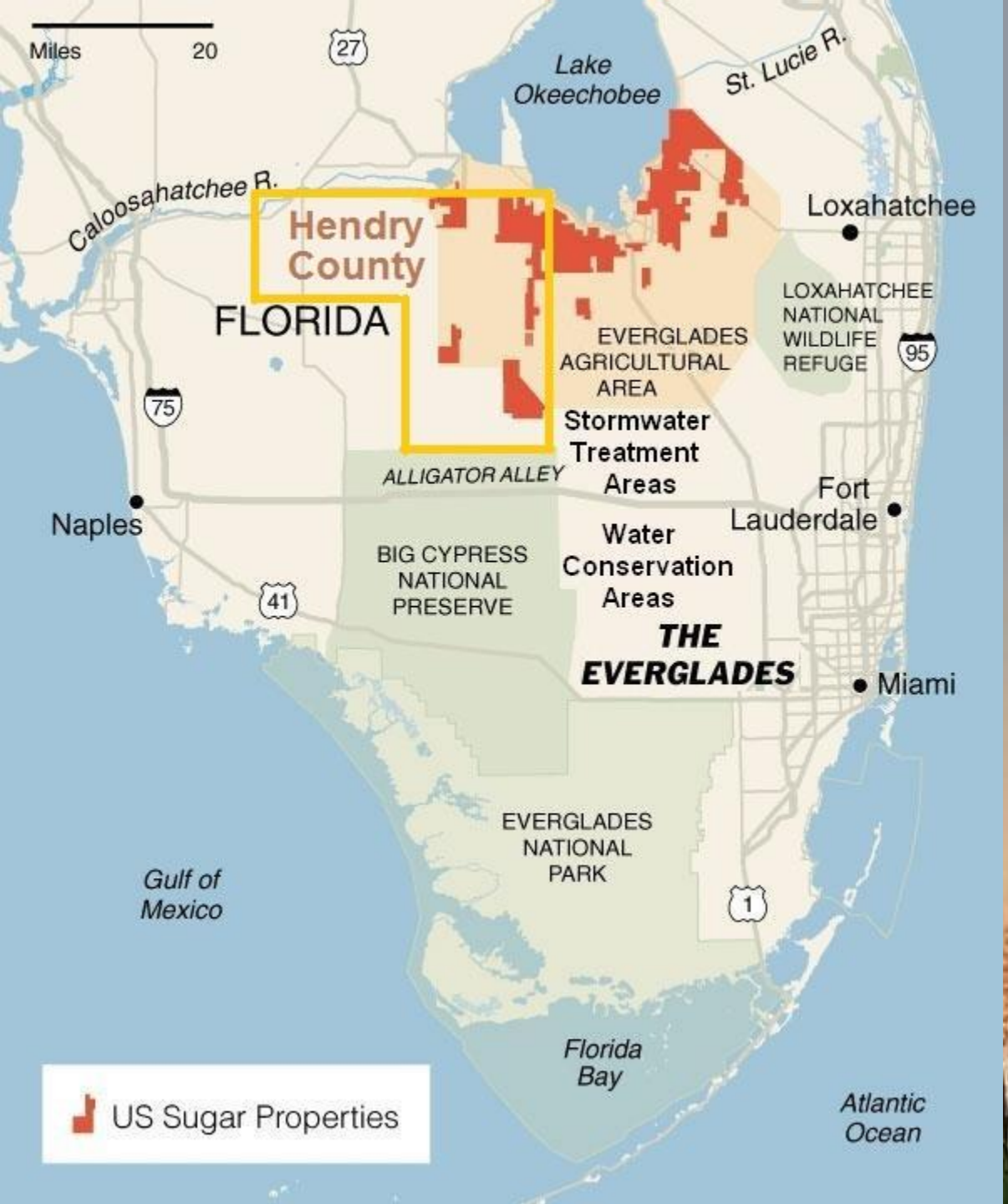
History & Context

- South Florida is a place where industrial agriculture, urban development, and the environment **fiercely compete** for natural resources & favorable economic/policy frameworks.
- Bioenergy entrepreneurs and existing agri-businesses have **sought assistance** from county, state, and federal agencies in growing this new industry, but these agencies have limited information regarding the economic and natural resource implications of their decision and policies.
- Bioenergy policy & technology development introduces an **energetics & systems analysis perspective** conducive to achieving sustainability goals in all sectors of the economy.

Goal Statement & Project Overview

History & Context





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Everglades

Goal Statement & Project Overview

History & Context

- A regional sustainability vision was articulated in 2009 to the then-Congressman of Florida District 16 by Hendry County Administration, Hendry County Economic Development Council, University of Florida, and Intelligentsia International.
- Hendry County submitted an appropriations request to its Congressman.
- Upon funding, Hendry County put the project to competitive bid with two teams responding:

(1) United States Sugar Corporation

(2) University of Florida, Edison State College, & Intelligentsia.

Quad Chart Overview

Timeline

- Start date: Oct 1, 2010
- End date: Feb 28, 2013
- 100% complete

Barriers

- Ft-B Sustainable Production
  (Existing data on the environmental effects of feedstock production and residue collection are not adequate….)

Budget

- FY11: (DOE = $342,472 / Cost share = $88,999)
- FY12: (DOE = $447,475 / Cost share = $118,713)
- FY13: (DOE = $161,553 / Cost share = $31,096)
- 3 years of project funding / $396,770 average annual funding ($317,167 DOE)

Partners

- Hendry County
- University of Florida Institute of Food and Agricultural Sciences
- Intelligentsia International, Inc.
- Edison State College
- University of South Florida

1 - Approach

- Implement the initial phases of a regional sustainability analysis research, education & extension program applicable to both biofuel feedstock production and other industrial & environmental systems.

1. Research

(a) Analytical Tools: LCA, Emergy Analysis, and CBA

(b) Eco-services Compensation

(c) Farming Systems Development

2. Education

(a) Curriculum Development

(b) Public Education

3. Business Development

(a) Stakeholders Collaboration

(b) Center Facilities Design

(c) Commercial Systems Analysis

Name	*Role*	*Affiliation*	*City*
Edward Hanlon	Project Manager	UF-IFAS	Immokalee
Shuchi Shukla	Project Management	UF-IFAS	Immokalee
Sanjay Shukla	Water Management	UF-IFAS	Immokalee
Monica Ozores-Hampton	Horticulture	UF-IFAS	Immokalee
Andrew Thoron	Education	UF-IFAS	Gainesville
Alan Hodges	Economics	UF-IFAS	Gainesville
Gene McAvoy	Extension	UF-IFAS	LaBelle
Leslie Baucum	Extension	UF-IFAS	LaBelle
Scott Cooper	Education	UF-IFAS	LaBelle
Robert Gilbert	Agronomy	UF-IFAS	Belle Glade
Stephen Jennewein	Farming Systems	UF-IFAS	Belle Glade
Jeffrey Van Treese	Farming Systems	UF-IFAS	Ft. Lauderdale
John Capece	Farming Systems	Intelligentsia Int'l	LaBelle
Michal Fidler	Farming Systems	Intelligentsia Int'l	LaBelle
Nana Amponsah	Emergy Analysis	Intelligentsia Int'l	LaBelle
Jose Izursa	Life Cycle Assessment	Intelligentsia Int'l	LaBelle
Kayla Ouellette	Eco-services Compens	Univ of South Florida	Tampa

1 – Approach (uniqueness)

1. Research

(a) Analytical Tools: LCA, Emergy Analysis, and CBA

Using innovative systems approach (Emergy Analysis).

(b) Farming Systems Development

Focusing on crop varieties not currently prioritized by industry.

(c) Eco-services Compensation

Applying federal Everglades Restoration priorities to bioenergy.

2. Education

(a) Curriculum Development

Integrating systems analysis into ag & industrial tech programs.

(b) Public Education

Introducing systems metrics into contentious policy debates.

3. Business Development

(a) Stakeholders Collaboration

Promoting cooperation between ecological & agricultural leaders.

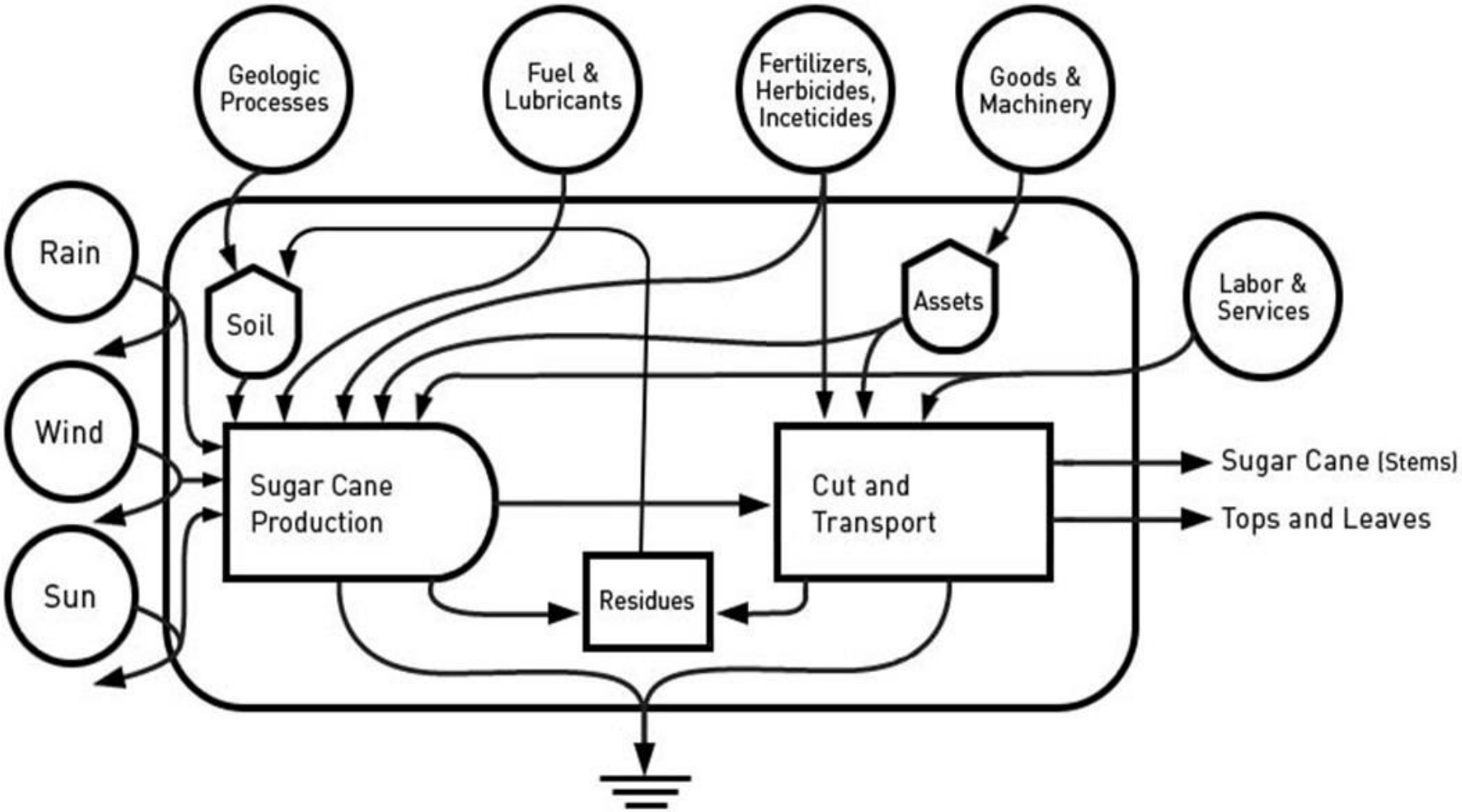
(b) Center Facilities Design

Envisioning a center not attached to UF, SFWMD, or Eco-groups.

(c) Commercial Systems Analysis

Partnering with feedstock producers & using Enterprise Budgets.

1 – Approach (systems analysis)



2 - Technical Accomplishments/ Progress/Results

1. Research

(a) Analytical Tools: LCA, Emergy Analysis, and CBA

- Comparisons of sugarcane/energycane systems, documenting the merits of sand land systems and Everglades Agricultural Area (organic soil) systems relative to sustainability.

(b) Farming Systems Development

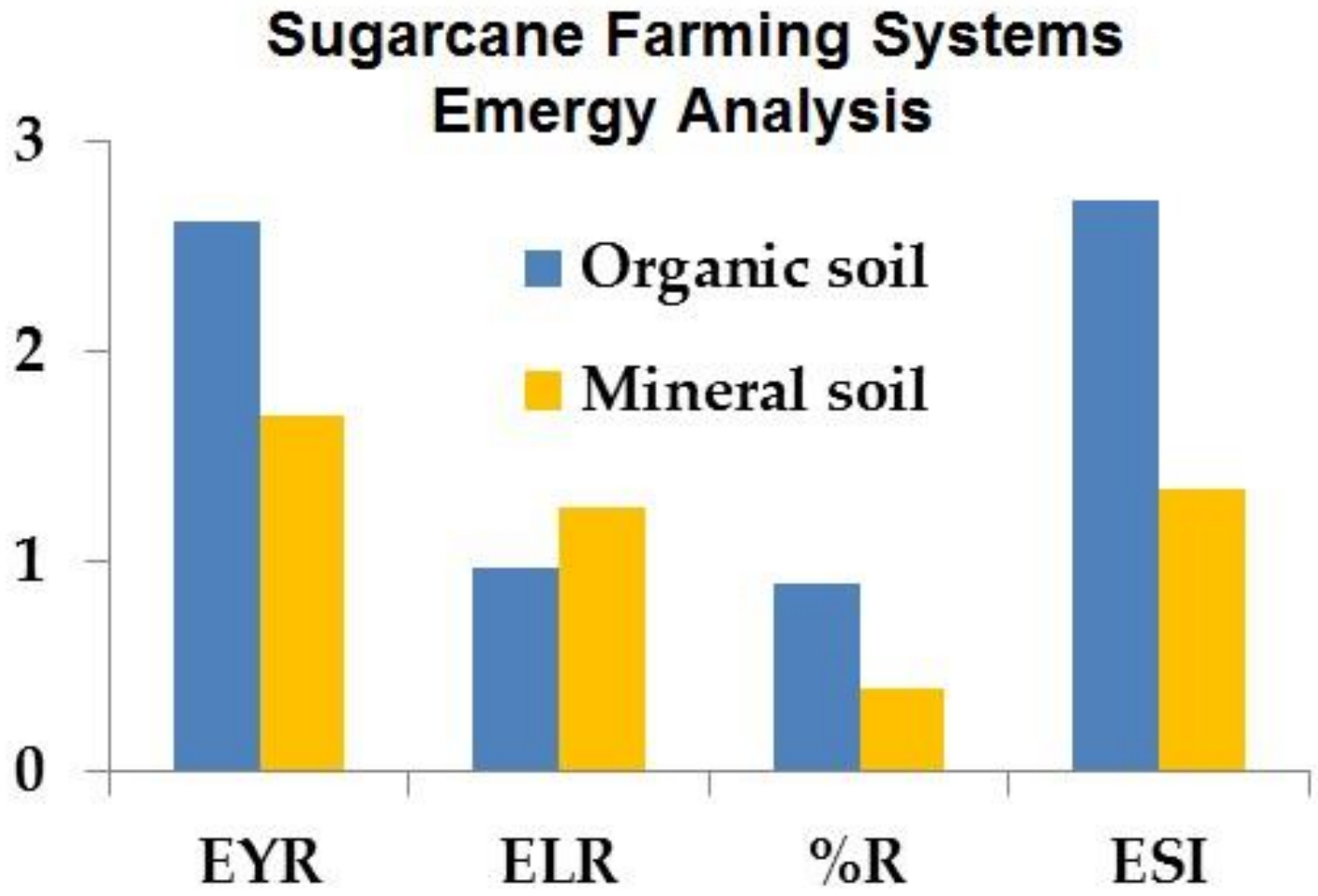
- Documented the water tolerance of sugarcane and other energy crops in the Everglades Agricultural Area

- Documented the land use implications of expanded bioenergy production relative to Florida food production & environmental protection.

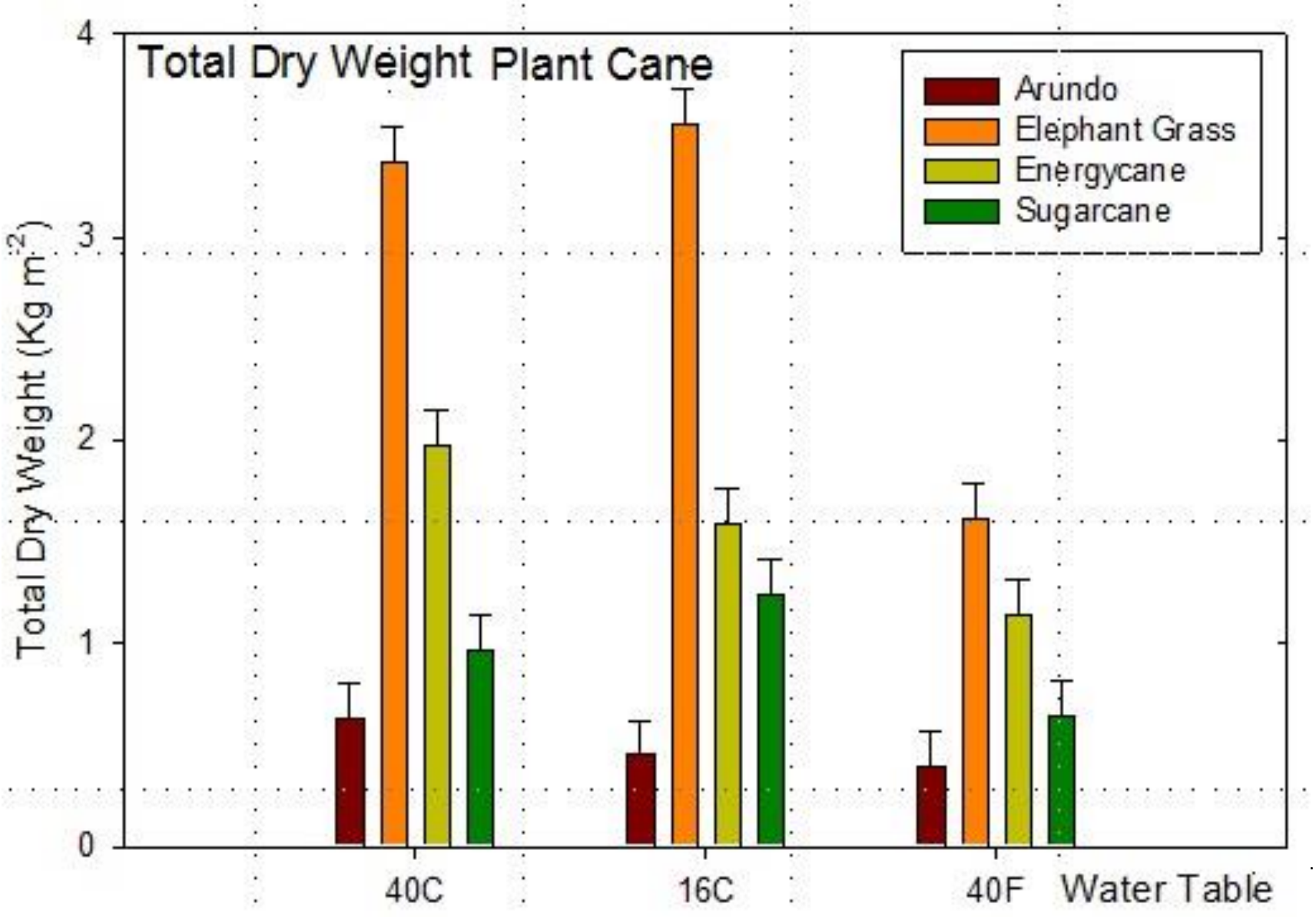
(c) Eco-services Compensation

- Valuation of the ecosystem services from enhanced water storage in agricultural production areas establishes a foundation for creating more sustainable farming systems within the federally-supported Comprehensive Everglades Restoration Program.

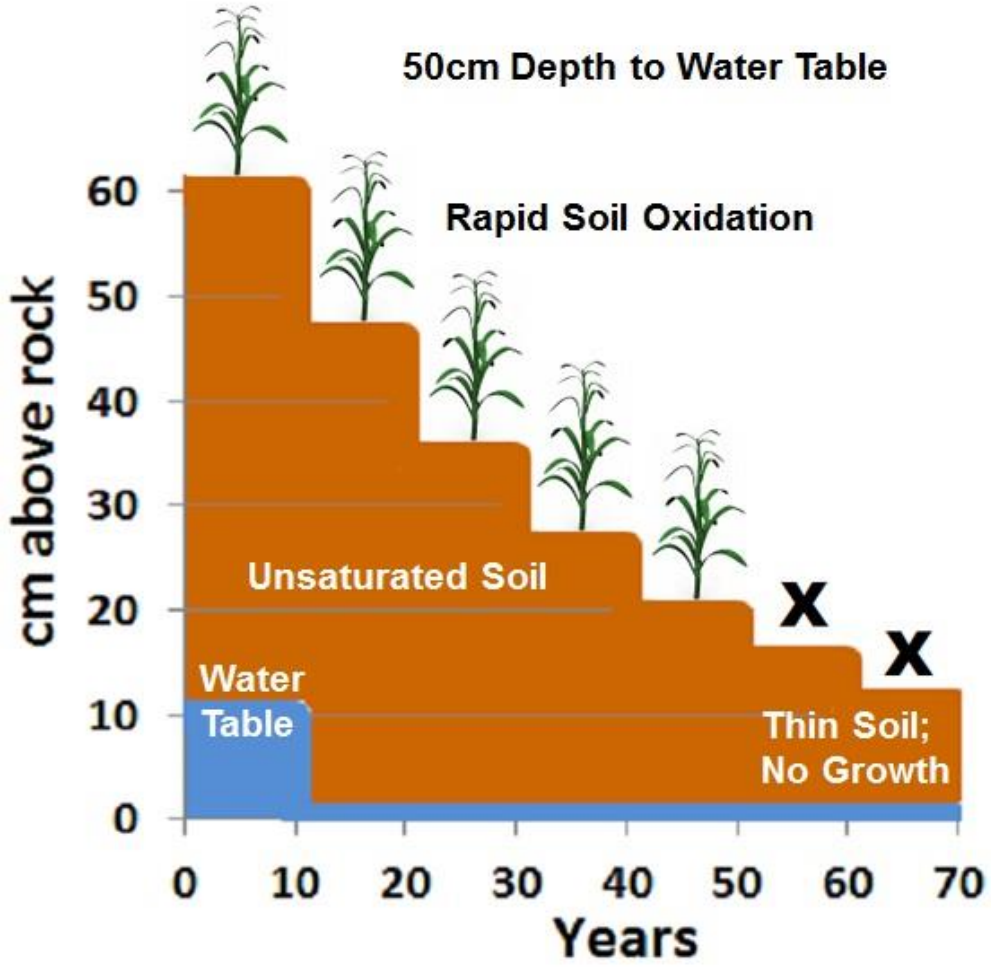
2 - Technical Accomplishments/ Progress/Results (Sugarcane Sustainability, Organic vs Mineral Soils)

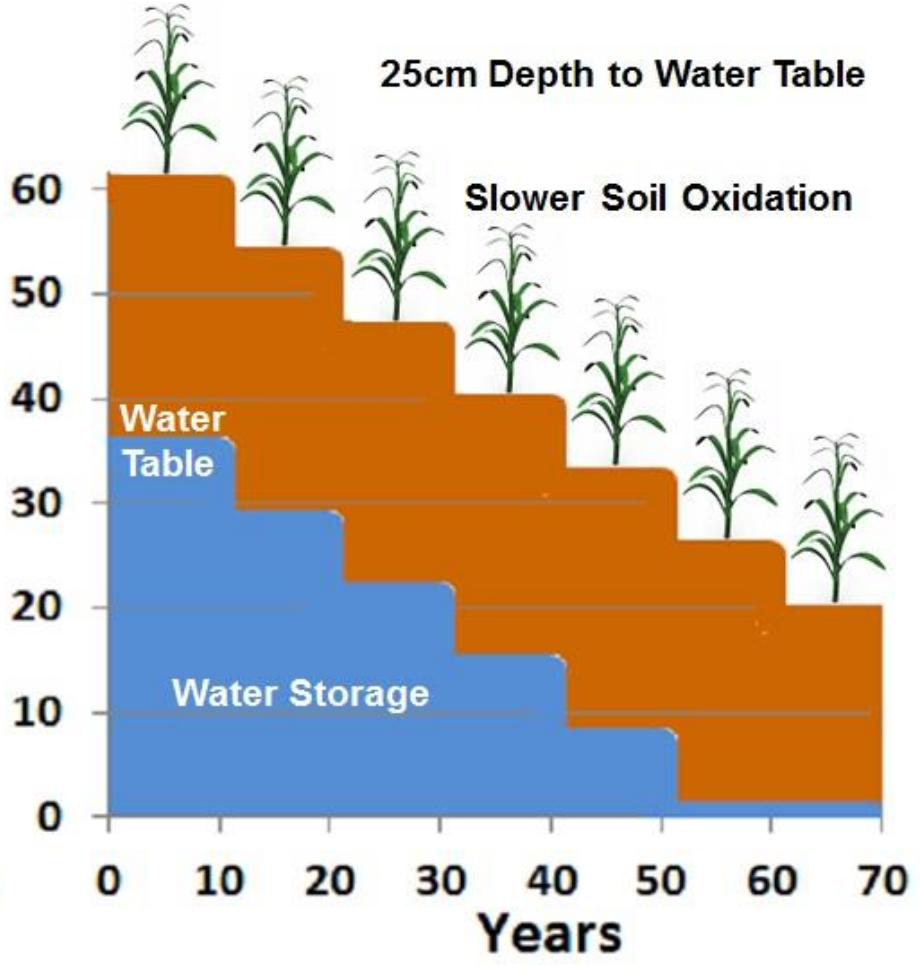


2 - Technical Accomplishments/ Progress/Results (Soil Water Tolerance)



2 - Technical Accomplishments/ Progress/Results (Eco-systems Services Valuation)





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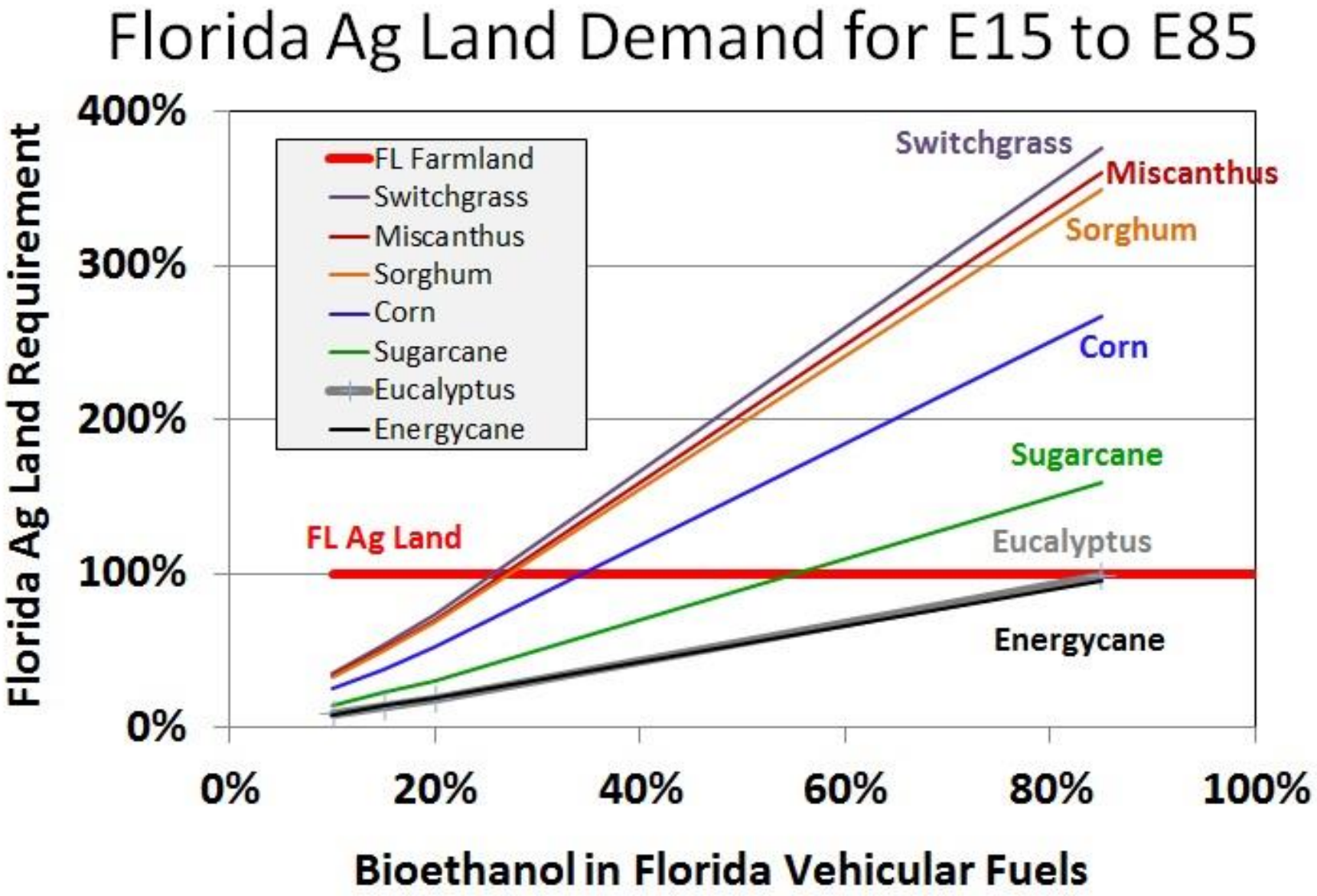

2 - Technical Accomplishments/ Progress/Results *(continued)*

2. Education

(a) Curriculum Development

- Curricula developed for K-12 and post-secondary schools.

- Educational programs implemented for teachers & students.

(b) Public Education

- County officials responsible for land use & tax incentive decisions are being educated on the natural resources implications of bioenergy options.

- Project topics and results served as the focus of the 22nd Annual SW FL Water Resources Conference: "Water & Energy"

3. Business Development

(a) Stakeholders Collaboration

Ongoing bioenergy & sustainability collaborations developed.

(b) Center Facilities Design

Design concepts and site options/merits developed.

(c) Commercial Systems Analysis

Partnering with feedstock producers & using Enterprise Budgets

3 - Relevance

- Project accomplishments help provide a **technical and human resources foundation** for the creation of a bioenergy industry in Florida compatible with the state's **sensitive ecosystem**.
- Local government **decision makers** will be provided with evaluations of bioenergy business proposals **impacts upon natural resources**.
- Results will be used to assist bioenergy **entrepreneurs** in maximizing the **sustainability characteristics** of their projects.
- The analytical methods and farming systems developed in this project can help **guide general agriculture** and other industrial sectors.

4 - Critical Success Factors

- For a systems analysis approach to be **accepted** by stakeholders in the South Florida energy, land, water, biodiversity and economic decision processes, the methodology developed by this project must be published in peer-review journals and accepted as reliable by the professional community, the governance/industry class, the environmental advocates, and the general public.
- The current **respite** in the rush to South Florida bioenergy projects provides an opportunity to more fully develop sustainability indices for evaluating proposed business models and offer improvements.
- Challenges:
  - ***Establishing an effective multidisciplinary technical team***
  - ***Assembling the required production systems input data***
  - ***Establishing a truly independent research environment***

5. Future Work

- The DOE-supported project ended in Feb 2013. The UF technical PI (Dr. Hanlon) has **retired from UF**, but remains interested in the subject matter and is working with investigators on publications.
- Related work continues through the programs of the various other **University of Florida investigators**, to the extent that their other funding resources permit.
- **Intelligentsia International** is continuing the systems analysis work with its volunteer student interns.

5. Future Work *(continued)*

- Near-term interest in **large-scale** bioenergy projects has waned during the past year, as witnessed by the **cancellation of plans** and projects by some of the major agribusiness & energy firms of the region (U.S. Sugar, Lykes, BP, etc.).
- Interest in more **modest-scale** bioenergy projects remains strong by medium-size farmers and entrepreneurs pursuing specialized **biodiesel** production.
- These **smaller operators** are more cooperative and represent a better opportunity to document the production inputs and outputs necessary for accurate systems analysis.

Summary

1) Approach
   - Multidisciplinary & broad-based strategy towards sustainability
2) Technical Accomplishments
   - Systems analysis, farming systems, land use, & educational programs
3) Relevance
   - Applicable to sustainability of bioenergy, food production, & restoration
4) Critical Success Factors and Challenges
   - Independence, technical team
5) Future Work
   - Analytical methods, farming systems, PI retirement
6) Technology Transfer
   - Professional publications, decision makers, entrepreneurs, and farmers

Publications, Presentations, and Commercialization

- Project-related presentations are cataloged at: *http://www.imok.ufl.edu/soil_water/biofuels/hcsbc/meetings.aspx*
- Journal articles in progress include:

Topic	Lead Author
Ag Systems Analysis	Van Treese
Emergy Analysis	Amponsah
Life Cycle Assessment	Izursa
Land Use Implications	Fidler
Biomass Crops & Flooding	Jennewein
Biofuel Cost-Benefit Analysis	Hodges
Curriculum Development	Burleson

- Other journal articles are planned but await work completion.