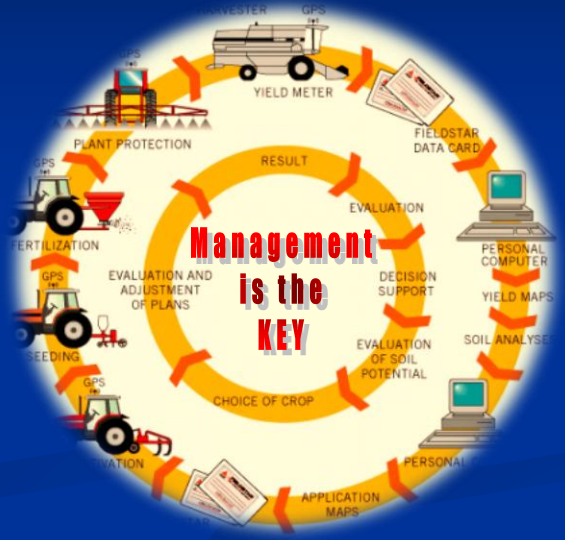
Outreach Delivery as Part of Bioenergy Education

- Bobby Grisso
  - Virginia Tech
- Seminar – May 10, 2012

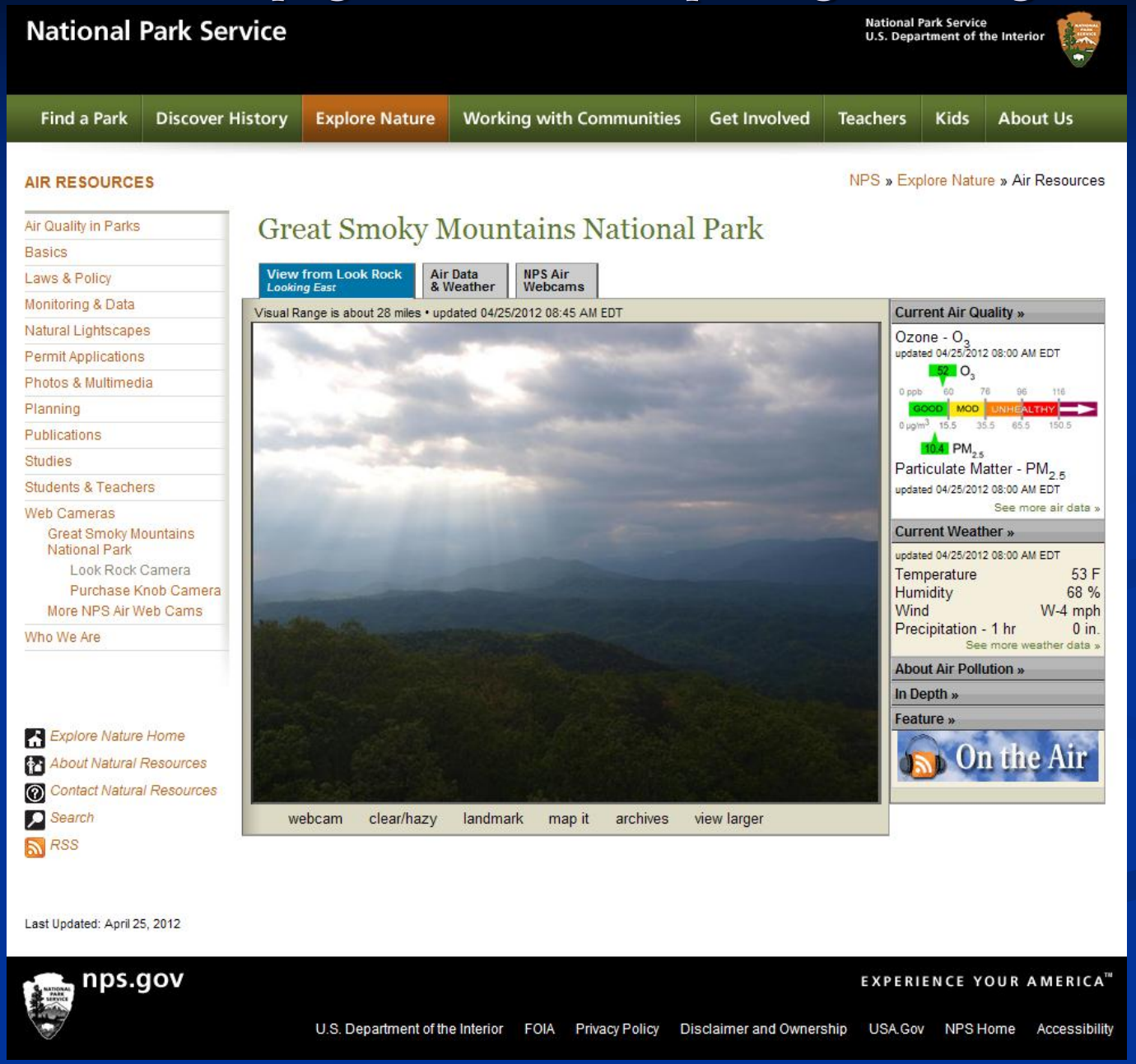
Outreach Delivery As Part Of Bioenergy Education

- Bobby Grisso
- Professor and Extension Engineer
  - BS & MS – VPI&SU
  - PhD – Auburn University
  - University of Nebraska
  - Virginia Tech



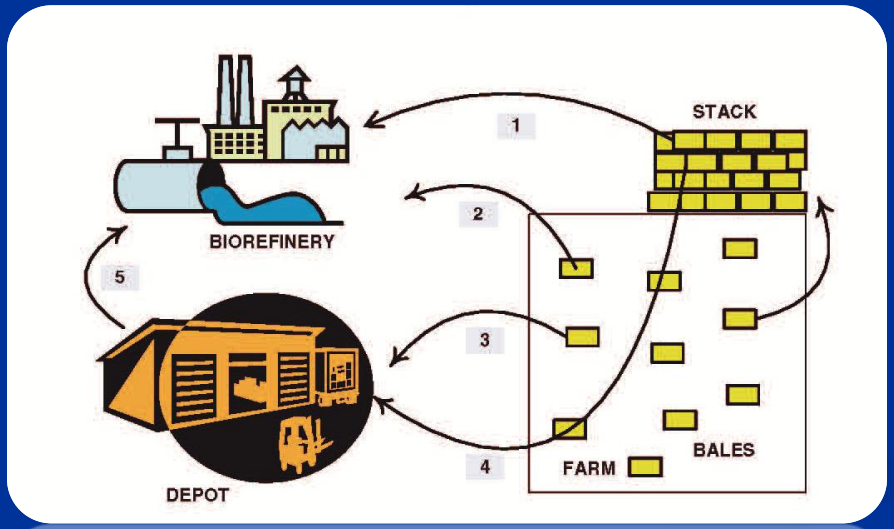
Biological Systems Engineering Virginia Tech

http://www.nature.nps.gov/air/webcams/parks/grsmcam/grsmcam.cfm



BSE - Grisso

- Sabbatical Spring 2012
  - Biomass Logistics
    - Machinery systems (equipment parameters)
    - Logistics patterns



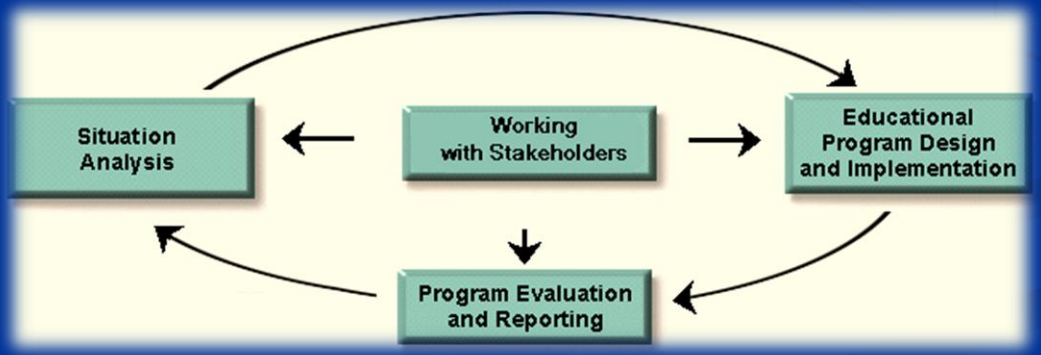

JOHN DEERE

Three Fold Mission

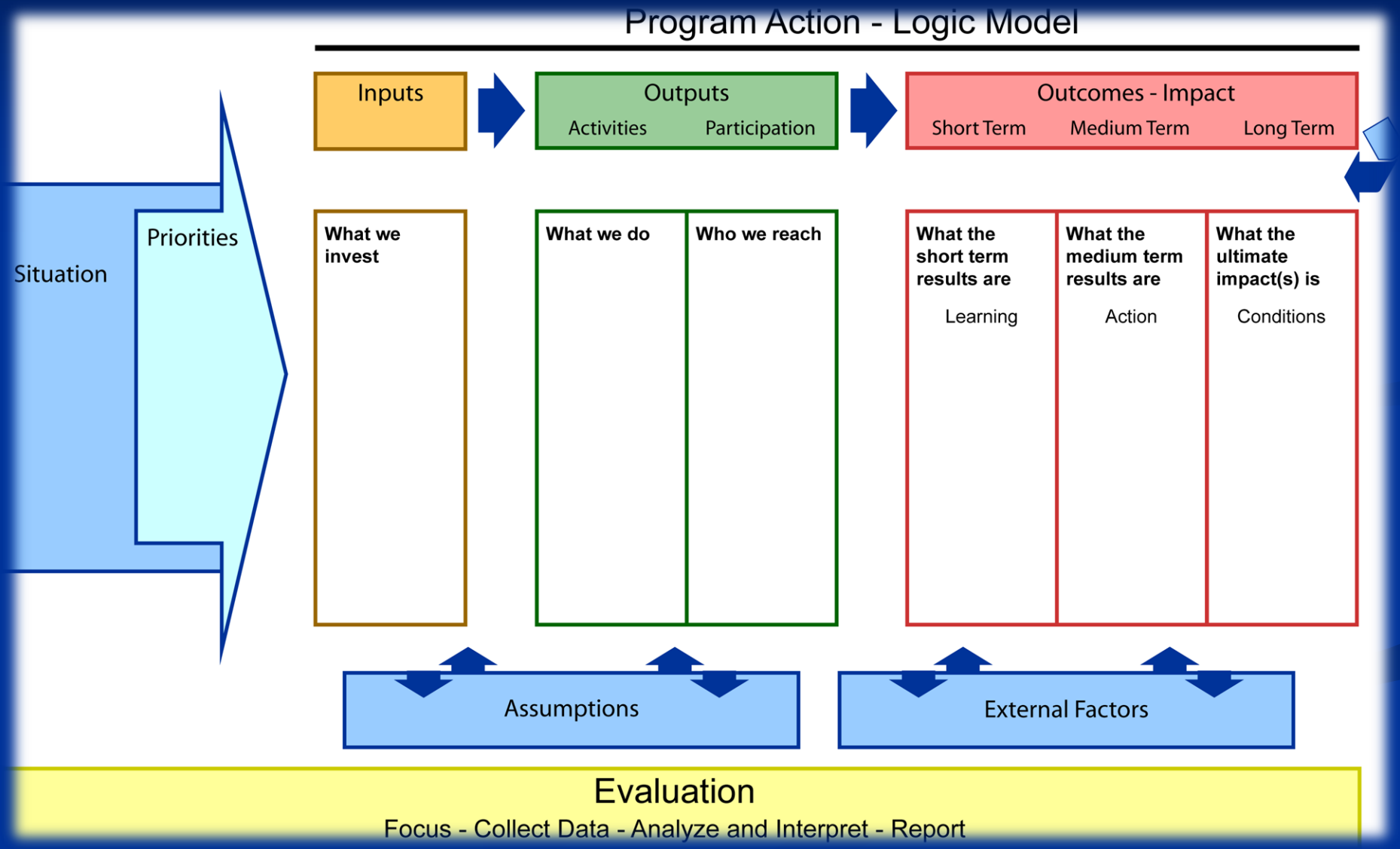
- Research – Teaching – Extension
  - Discovery – Engagement – Outreach
- Extension / Outreach
  - Unbiased research to help make decisions
  - Relevant insights of alternatives & solutions
  - Informal adult education
  - Impact of the educated (difference?)

Engaging Scholarship w/in Outreach Programs

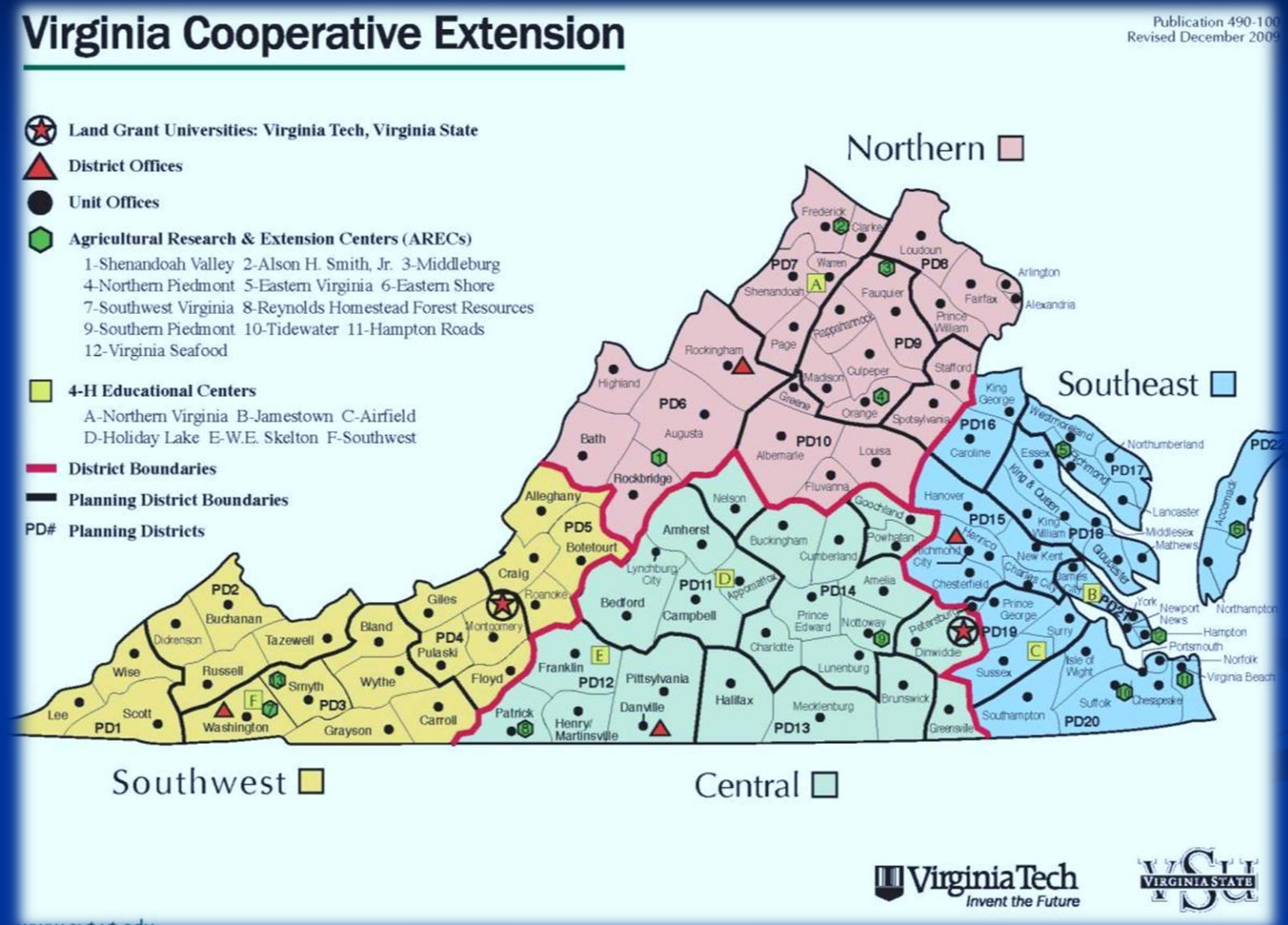
- Awareness – Land Grant University
- Program Logic Model
  - ftp://bsesrv214.bse.vt.edu/grisso/Program_Logic/
- Importance of Deliverables / Impacts
- Example programs



Program Logic Model

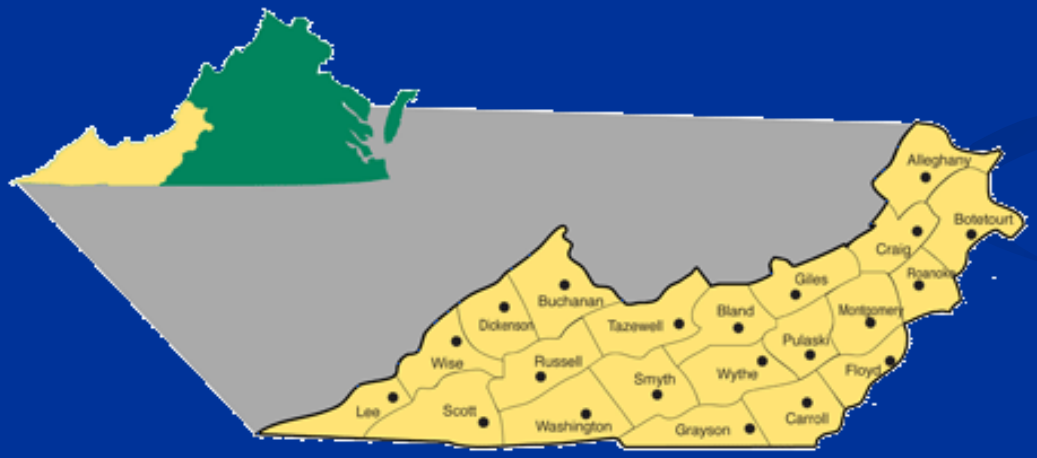


VCE - Extension



VCE - Extension

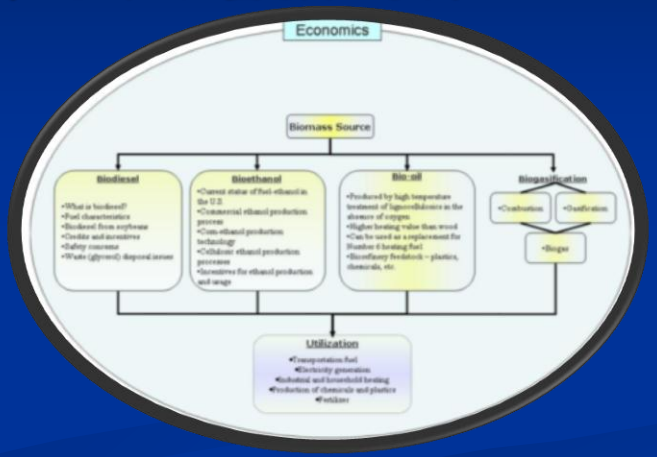
- Front door of the university…
- 4 districts / 12 AREC / 4-H Centers
- 93 Counties & 13 jurisdictions
- I live in the Southwest District



- In 2010, more than 1.8 million people reached with face-to-face programs

BSE Extension Programs

- Bioresidues Management & Utilization
  - Animal Waste Management
  - Agricultural Air Quality
  - By-Product Utilization
    - Biomass inventory
  - Bioenergy Engineering Education Program (BEEP)
  - Energy Conservation
    - Energy Series – Residential / Ag Production
    - Energy Audits
    - Plastic Recycling



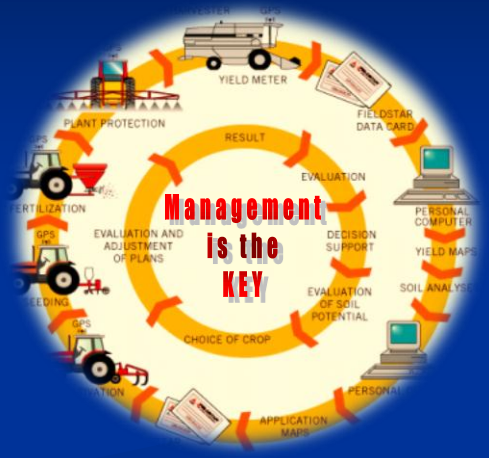
Biological Systems Engineering Virginia Tech

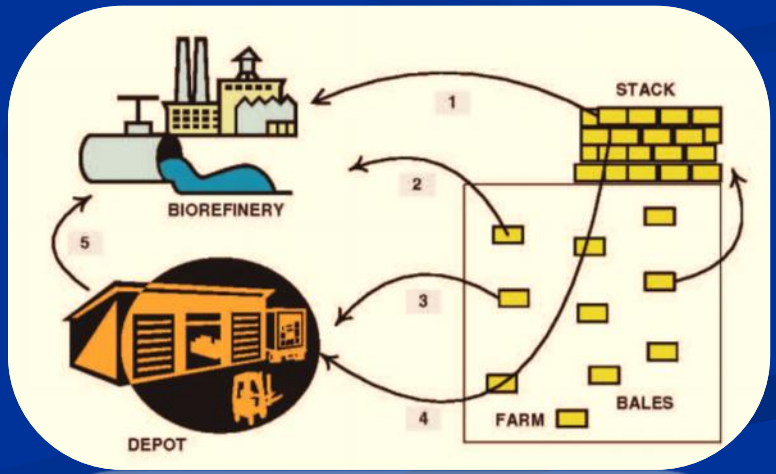
BSE Extension Programs

- Virginia Household Water Quality Program
- Watershed Studies
  - Watershed Management
  - Urban Stormwater Management
- Machine Safety & Management

Specific Programs: Grisso

- Machinery Management
  - Precision Farming
  - Machinery Performance
    - Pesticide Application Cert
    - Conservation Tillage
  - Biomass Logistics
    - Machinery systems
    - Logistics patterns

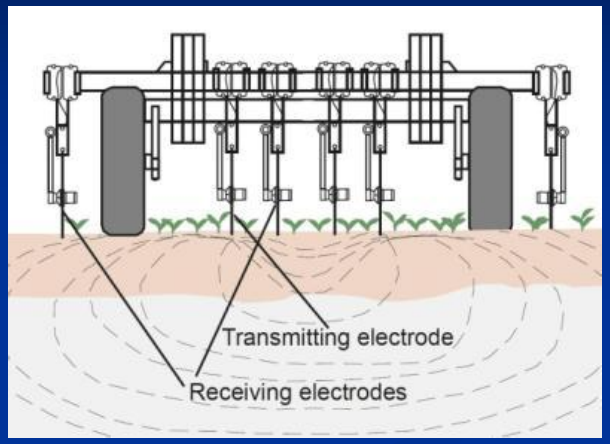




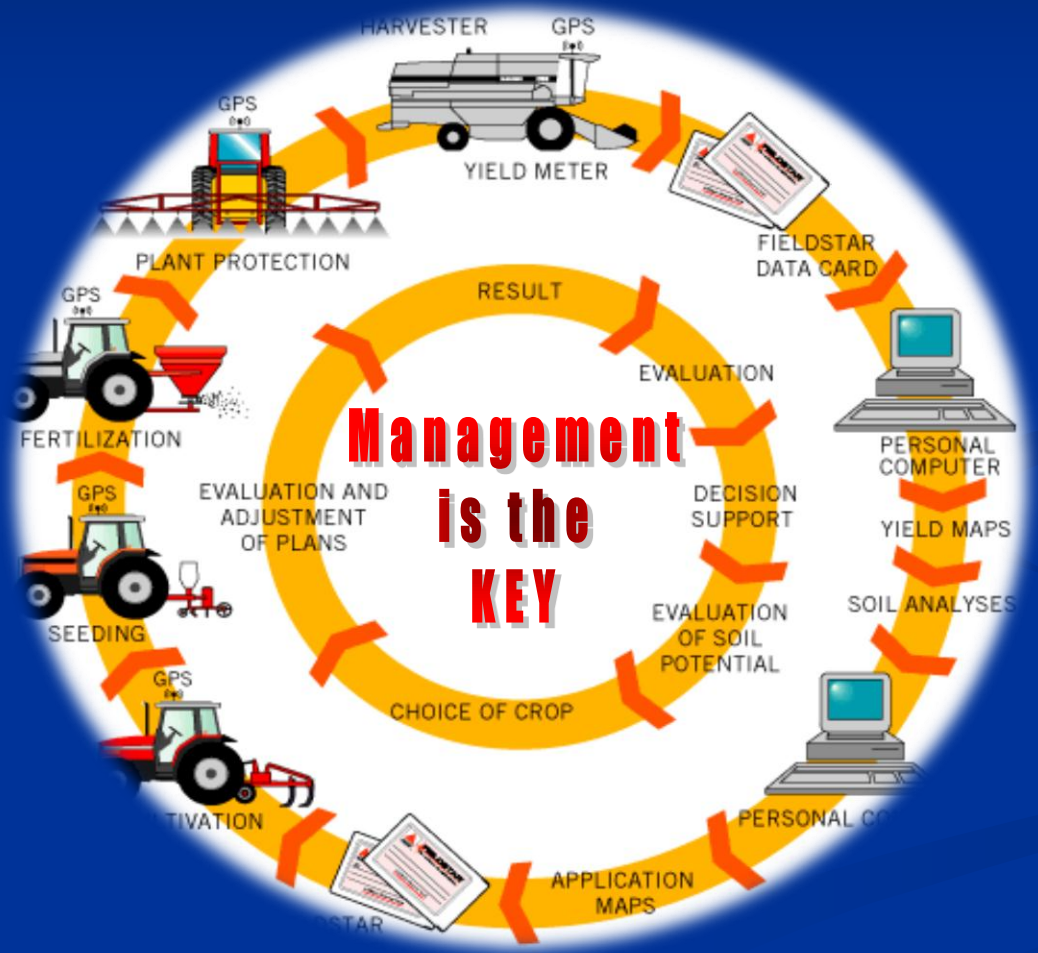
Biological Systems Engineering Virginia Tech

Precision Farming

- Awareness
  - Embedded technologies
  - Information driven
- Available technologies
- Potential return of investment
- Future developments & concerns

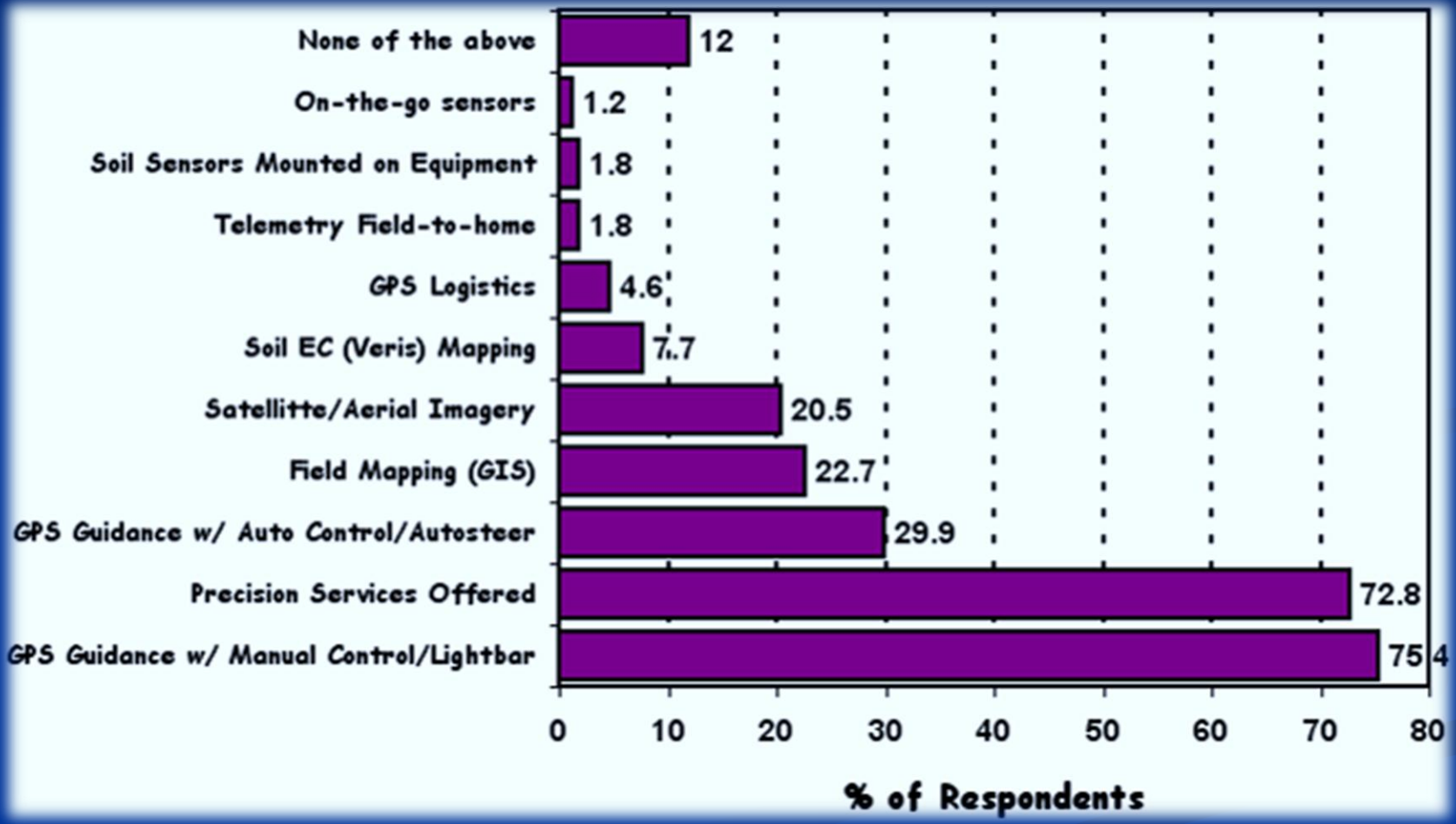


Precision Agriculture:
Systems Approach

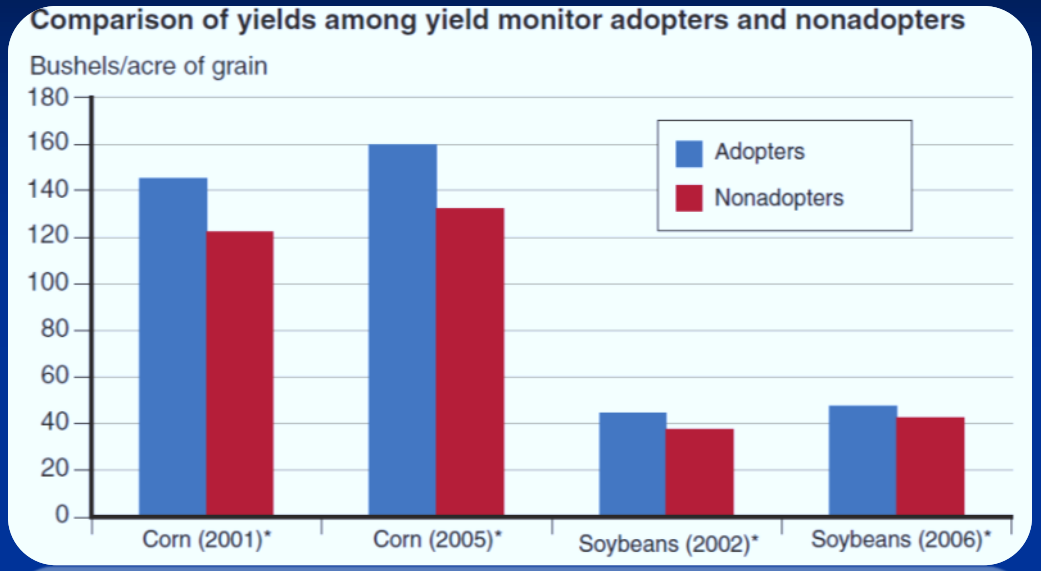


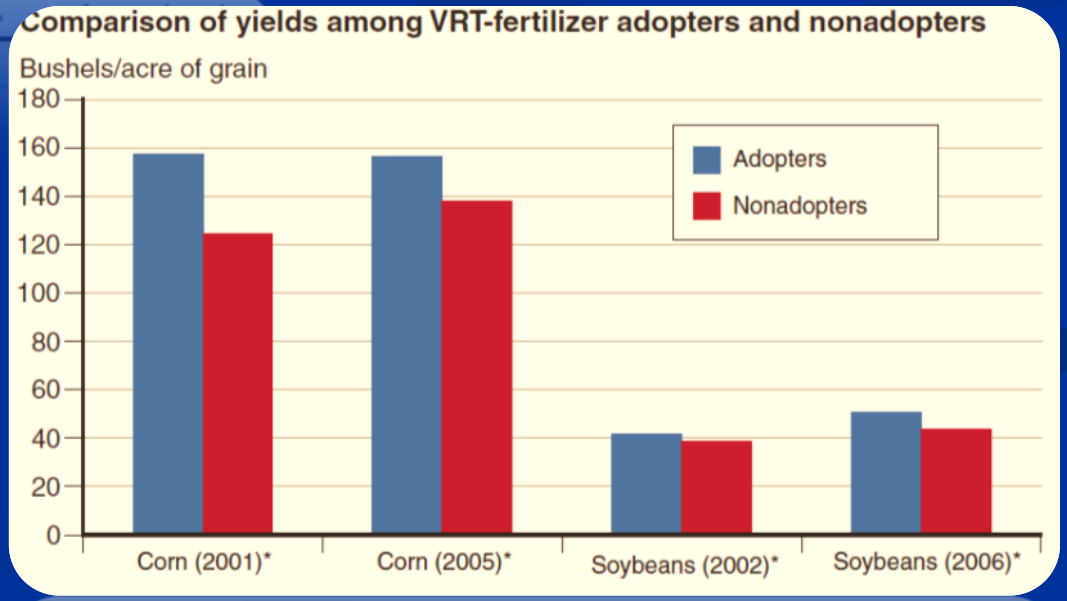
Right source
Right rate
Right time
Right place

Precision Technology Use



Precision Farming Impacts





Precision Farming Impacts

- Linked to emerging environmental and farm management questions.
- Has a positive impact on environmental quality through more efficient use of inputs.
- Farm management enhanced by more complete information on field conditions.

Scholarship

- Published & publicly disseminated
- Practical applied problems
- Publish findings both in
  - Research & Extension Forums
- Measure impacts and team activities
- Submit work for Blue Ribbon Awards

Scholarship

- Examples – Precision Farming
  - Adamchuk, V.I., R.D. Grisso, and M.F. Kocher. 2011. Spatial variability of field machinery use and efficiency. Chapter 8, 135-146. In: *GIS Applications in Agriculture*. Volume Two. Nutrient Management for Energy Efficiency, D.E. Clay and J.F. Shanahan, eds. Boca Raton, Florida: CRC Press.
  - Grisso, R.D., M.F. Kocher, V.I. Adamchuk, P.J. Jasa, and M. Schroeder. 2004. Field efficiency determination using traffic patterns indices. *Applied Engineering in Agriculture* 20(5):563-572
  - Grisso, R.D., P.J. Jasa, M.A. Schroeder, and J.C. Wilcox. 2002. Yield monitor accuracy: Successful Farming magazine case study. *Applied Engineering in Agriculture* 18(2):147-151

Farm Energy Community Page

Last Updated: February 10, 2011

Have a question?
Try asking one of our Experts

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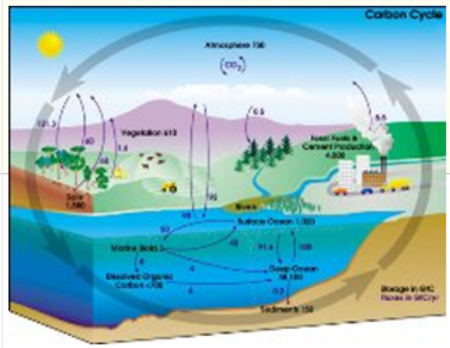
Welcome to the eXtension Farm Energy web resource brought to you by University Extension specialists throughout the United States.



The **eXtension Farm Energy website** is designed to provide timely and practical energy information for agricultural producers and service providers that enhances profitability, conserves natural resources, and promotes the well-being of local communities.

Who Are Our Specialists?

The Farm Energy Community of Practice is a virtual, or on-line, community which includes over 170 members from land-grant universities and other agencies, including USDA, SARE, NREL, Sun Grant, ATTRA, NCAT, and state and county governments.

Community members have combined their expertise to provide this eXtension Farm Energy website. It is an information source for farmers and agricultural educators interested in all aspects

This resource area was created by the: Farm Energy community

Resource Area Feeds

- Track all new content

In This Resource Area

Topics

- Introduction to Farm Energy
- Anaerobic Digestion and Biogas
- Biodiesel
- Biomass Combustion
- Efficiency and Conservation
- Feedstocks and Energy Crops
- Sustainability Dimensions of Farm Energy
- Solar Energy
- Wind Power

Ag Energy Webcast Series
Bioenergy Curriculum - NEW!

www.extension.org

Community members have combined their expertise to provide this eXtension Farm Energy website. It is an information source for farmers and agricultural educators interested in all aspects of farm energy--from conservation and efficiency to renewable energy production.

What Can Be Found?

The eXtension Farm Energy website provides fact sheets, research summaries, case studies, decision tools, worksheets, and many other resources to get started on a range of practices, including:

- Conserving energy through modified farming practices and equipment upgrades
- Growing and producing your own biofuels
- Evaluating feedstocks such as switchgrass, algae and sugar crops
- Calculating wind and solar power potential on your farm
- Objective and practical information on the Sustainable use and production of Farm Energy

photo courtesy of James Wade

Browse related Articles by tag: ag energy

Have a specific question? Try asking one of our Experts

Unlike most other resources on the web, we have experts from Universities around the country ready to answer your questions.

www.extension.org

BIOENERGYTRAINING

an on-line educational resource

The **Bioenergy Training Center** provides educational and training resources for Extension and other community-based educators. Resources include curriculum, links to instructor-led trainings (webinars, videos), information about face-to-face training programs, and assessment tools.

http:// fyi.uwex.edu/biotrainingcenter

SUSTAINABLE BIOENERGY

Our introductory series contains four modules that present core topics and key concepts around bioenergy generation and environmental sustainability. The curriculum covers a wide range of issues, including sustainability concerns, technical aspects of bioenergy generation, bio-energy feedstock production, water quality, and community engagement processes to assist communities in understanding the implications of bio-based alternative energy.

BIOEN1: Introduction to Bioenergy: Background; Bioenergy products, feedstocks, co-products & by-products; Economic, social & ecological impacts of bioenergy at local, national, and global levels; Current and emerging challenges to bioenergy development

BIOEN2: Bioenergy Crop Production & Harvesting: Marketing and economics; Bioenergy crop production: A crop-by-crop analysis; Best management practices for protecting soil, water & wildlife

BIOEN3: Water Resources: Issues & Opportunities in Bioenergy Generation: Introduction; Watershed-level impacts: water use in bioenergy production; Policy options & implications

BIOEN4: Community Economic Development & Bioenergy Generation: Introduction to community issues in bioenergy development; Community participation in renewable energy development; Roles for Extension educators

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Farm Energy Home

Bioenergy Curriculum

Last Updated: April 12, 2012

Have a question? Try asking one of our Experts

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This curriculum from the **Bioenergy Training Center** was created by **over 40 University Specialists** in the U.S. North Central region to provide unbiased, researched and peer-reviewed information for this emerging field.

Targeted for Extension and other community educators, these resources also provide valuable information for farmers, landowners, community leaders, industry and the inquisitive public.

Online courses are offered as modules, where learners can choose to study sequentially or with focus on specific topics. Each comprehensive module includes learning objectives, lessons, background and guiding questions, supporting resources, and self-quiz sections. The Sustainable Bioenergy Course features three community assessment tools to encourage participation in decision making about energy alternatives. (All materials are available in PDF download format.)

This resource area was created by the: Farm Energy community

Resource Area Feeds

- Track all new content

In This Resource Area

Topics

- Introduction to Farm Energy
- Anaerobic Digestion and Biogas
- Biodiesel
- Biomass Combustion
- Efficiency and Conservation
- Feedstocks and Energy Crops
- Sustainability Dimensions of Farm Energy
- Solar Energy
- Wind Power

Ag Energy Webcast Series

Bioenergy Curriculum - NEW!

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- COURSE 1: Bioenergy & Sustainability

- BIOEN1 – Intro to Bioenergy
  - Unit 1.1: Introduction to Bioenergy
  - Unit 1.2: Bioenergy Products, Feedstocks, Co-Products & By-Products
  - Unit 1.3: Economic, Social and Ecological Impacts of Bioenergy at Local, National and Global Levels
  - Unit 1.4: Current and Emerging Challenges to Bioenergy Development

- BIOEN2 – Bioenergy Crop Production & Harvesting
  - Unit 2.1: Bioenergy Crop Production: Marketing and Economics
  - Unit 2.2: Bioenergy Crop Production: A Crop-by-Crop Analysis
  - Unit 2.3: Bioenergy Crop Production: Best Management Practices for Protecting Soil, Water & Wildlife

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- COURSE 1: Bioenergy & Sustainability

- BIOEN3 – Water Resources: Issues & Opportunities
  - Unit 3.1: Introduction
  - Unit 3.2: Watershed Level Impacts
  - Unit 3.3: Water Use in Bioenergy Production
  - Unit 3.4: Policy Options & Implications

- BIOEN4 – Community Economic Development
  - Unit 4.1: Introduction to Community Issues in Bioenergy Development
  - Unit 4.2: Community Participation in Renewable Energy Development
  - Unit 4.3: Roles for Extension Educators

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Developing…

- COURSE 2: On-farm Energy Conservation & Efficiency
  - ENCON1 – Introduction to Farm Energy Use
  - ENCON2 – Farm Practices to Improve Energy Efficiency
  - ENCON3 – Resources
- COURSE 3: Anaerobic Digestion
  - ANDIG1 – Introduction to Anaerobic Digestion
  - ANDIG2 – Factors that Affect Manure Digestion
  - ANDIG3 – Types of Anaerobic Digesters
  - ANDIG4 – Anaerobic Digester Start-up, Operation & Control
  - ANDIG5 – Economics of On-farm Anaerobic Digesters
  - ANDIG6 – Cooperative Development of Digesters
  - ANDIG7 – State and Federal Regulations

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Welcome! What's your local institution?
Tennessee State University
University of Tennessee

extension
more mind reach

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Farm Energy Home

Feedstocks for Biofuel Production

Last Updated: April 02, 2012

Have a question? Try asking one of our Experts

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- Solar Energy
- Wind Power

Ag Energy Webcast Series
Bioenergy Curriculum - NEW!

Introduction

Switchgrass briquettes. Photo: Daniel Ciolkosz, Extension Associate, Penn State.

Biomass feedstocks for energy production can result from plants grown directly for energy or from plant parts, residues, processing wastes, and materials from animal and human activities. The U.S. Department of Energy conducted an assessment of these feedstocks in 2005, ("Biomass as Feedstocks for a Bioenergy and Bioproducts Industry: The Technical Feasibility of a Billion Ton Annual Supply") and concluded that over 1 billion tons of agricultural and forestry-related biomass could sustainably be collected and delivered to biorefineries. Feedstocks can be classified by categories of plants or residues, by the energy products they produce, or in other ways. For discussion purposes, the following categorization of feedstocks will be used: sugars/starches, fibers/grasses, oil, crop residues, manures and organic wastes, and wood and woody biomass.

Sugar and Starch Crops

Many of the sugar and starch crops that are candidates to produce biofuels are those currently being used for grains for feed and food or for sugars for sweeteners. Root and tuber starches are typically used as food staples throughout the world. These crops and their specific products can easily be converted, via traditional fermentation methods, to ethanol and similar alcohols for use in transportation and other fuels.

The specific challenges with most of these crops will be the competition for food and the need for genetic, production, and processing modifications to enhance energy production in a sustainable way.

- Corn Grain
- Sweet Sorghum

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Cellulosic Biofuels Web Seminar Series 2010

Webinar Series Purpose

Cellulosic ethanol production is an emerging industry. Production practices, materials and business methods are expected to be different from those currently used in agriculture. This webinar series is intended to provide interested individuals with an overview of the ethanol industry and the anticipated needs, from production, agronomic, and contractual perspectives for supplying cellulosic materials to a biofuel plant. This webinar series was facilitated by John Hay, U.Nebraska Extension and presented by National eXtension and the High Plains Extension Energy Team.

State of the Industry: Corn and Cellulosic Ethanol

March 26, 2010

- Presenter: Todd Sneller, Nebraska Ethanol Board
- Program Announcement
- Video Recording of the Webcast

Economics of Cellulosic Biofuels

April 30, 2010

- Presenter: Dr. Robert Wisner – Iowa State University (retired)
- Video Recording of Webinar

Cellulosic Biofuel Logistics

May 28, 2010

- Presenter: Dr. John Cundiff, Virginia Tech University; discussion of issues associated with biomass production and delivery
- Program Announcement
- Video Recording of Webinar

Agronomic Impacts of Cellulosic Material Harvest

Corn Stover Feedstock Logistics

June 25, 2010

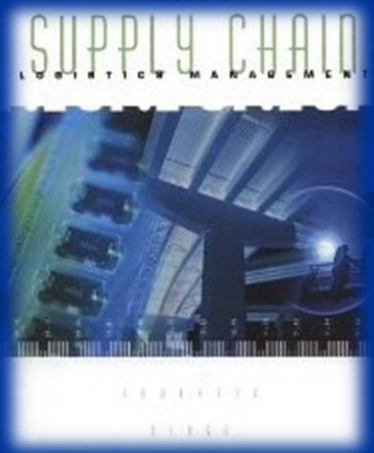
- Presenter: Dr. Greg Roth, Penn State University
- Video Recording of Webinar

Regional Feedstock Supply Opportunity

June 25, 2010

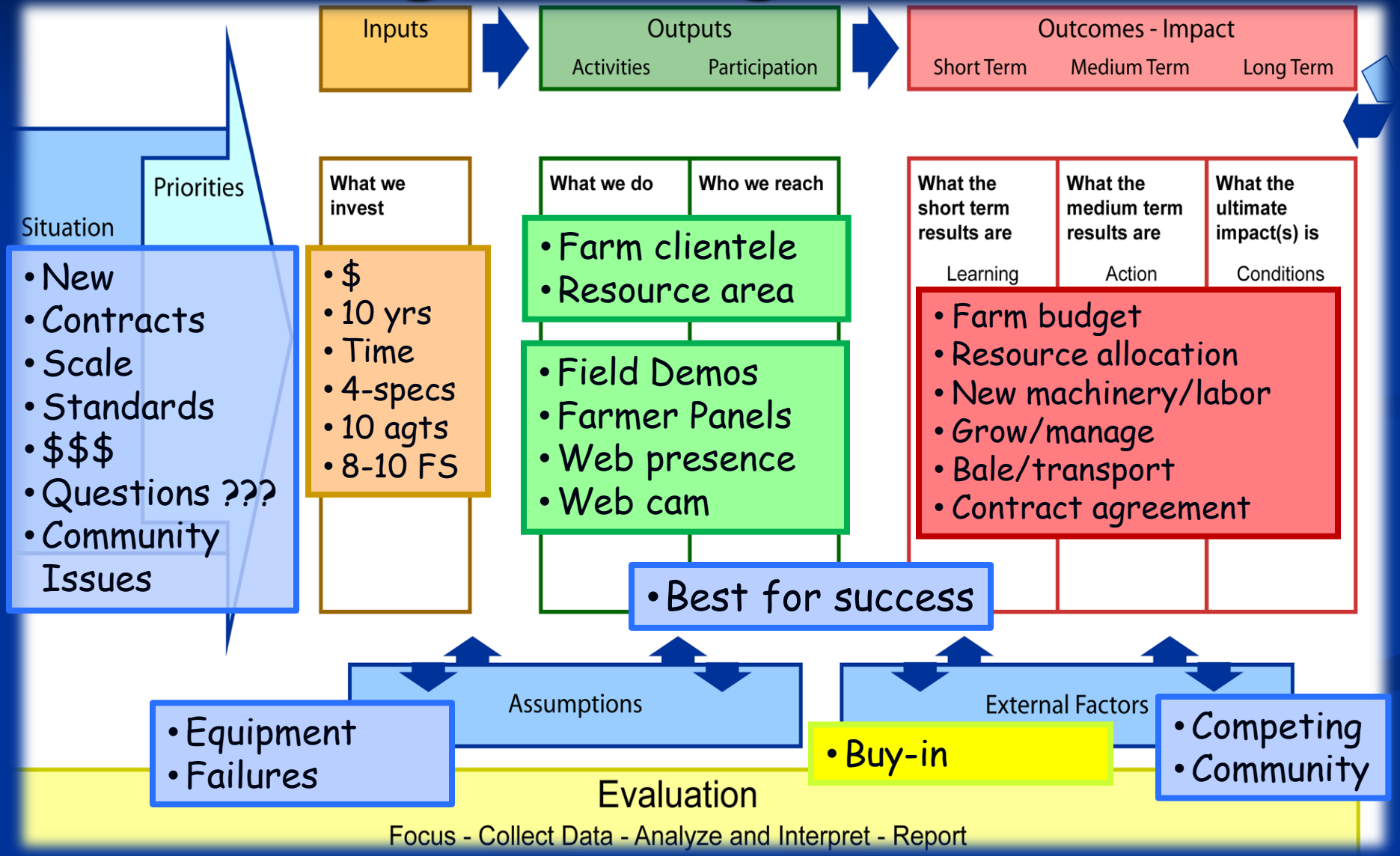
Supply Chain Logistics Management

- Supply chain management – consists of firms collaborating to leverage strategic positioning and to improve operational efficiency
- Logistics – is the work required to move & position inventory through a supply chain… the process that creates value by timing & positioning inventory



Collaborating to leverage strategic positioning

Program Logic Model




ADVANCED
BIOFUELS
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Tennessee Experience

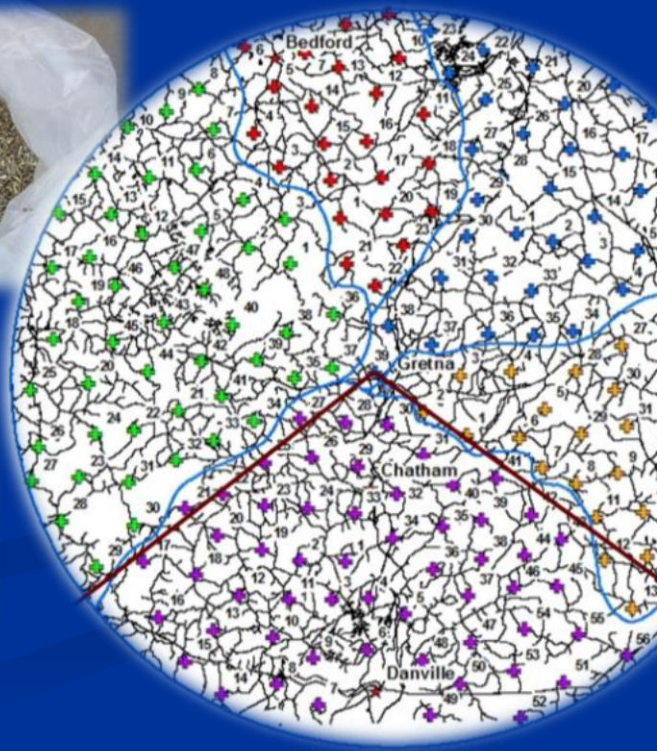
- Contracting with local farmers to produce 5,100 ac of switchgrass
  - 2,700 ac harvested in 2009
  - Added >2,400 acres in 2010
  - 1,000 ac improved varieties
  - Currently work with 61 farmers in a 9 county area in East Tennessee
  - 2010 Harvested 17,000 bales
- UT/Genera contract
  - ~$450/ac/yr for 3 years
  - We provide seed, technical expertise
  - Separate storage contracts
  - Yield-based component in 2010
- Averaging about 8 tons/ac by 3rd year
  - Harvesting ~2 tons in year 1
  - ~5 tons in year 2
  - ~8 tons year 3 and beyond


Vermeer
TG5000
Volunteer
Federal


w Holland
XtraSweep

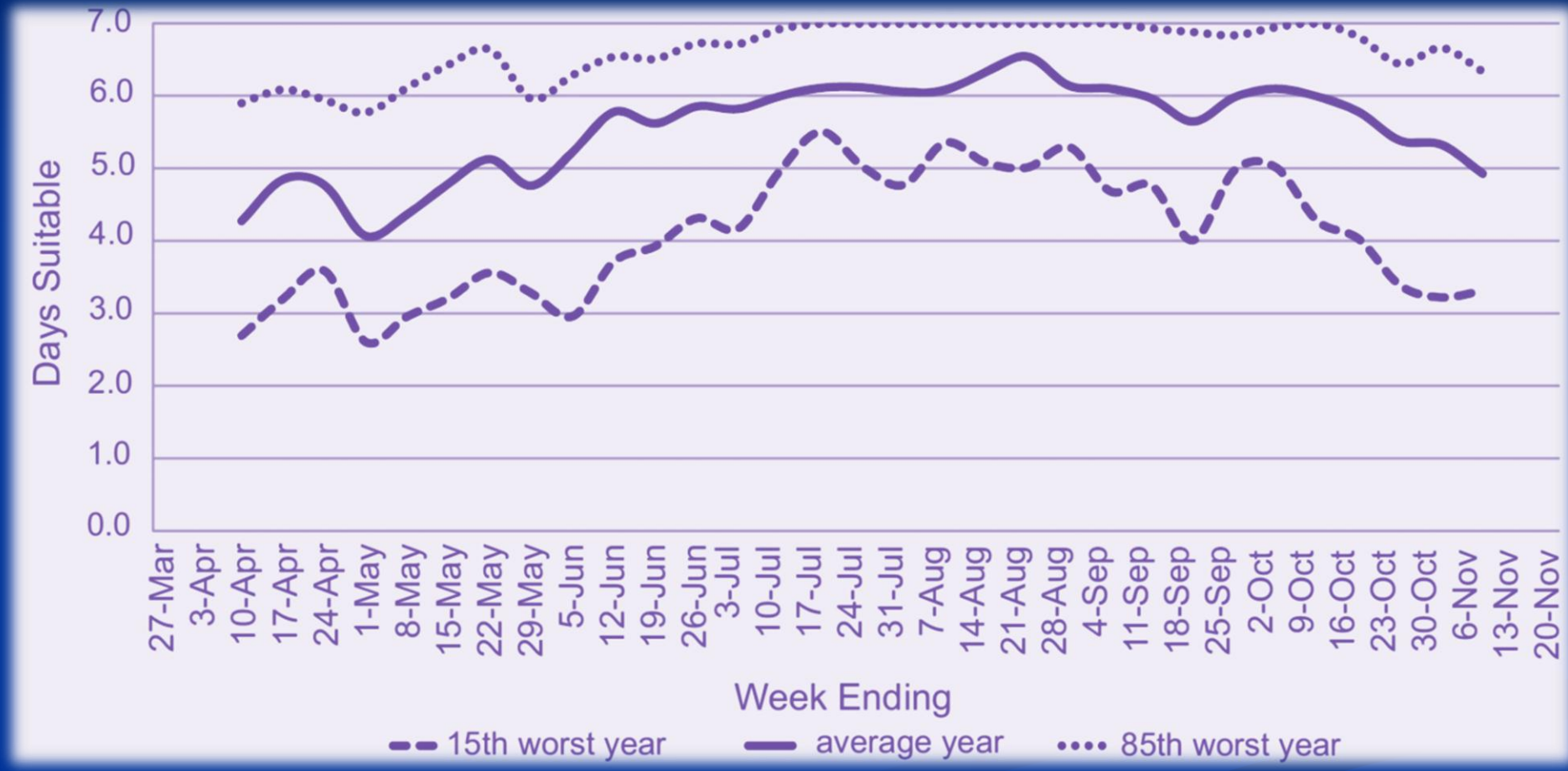
Weak Links


nput
Crop in field
Harvest
In-field hauling
Storage rack loading
Loading truck
Hauling
Unloading truck
At-plant storage
Rack unloading
Size reduction
Conveying into plant
Outpu


Bedford
Gretna
Chatham
Danville

Expected days suitable for fieldwork

Data source: National Agricultural Statistics Service, Arkansas Field Office: 1975-2009.
Source: Griffin, T. and Kelly, J. 2010. Days Suitable for Fieldwork in Arkansas, FSA33

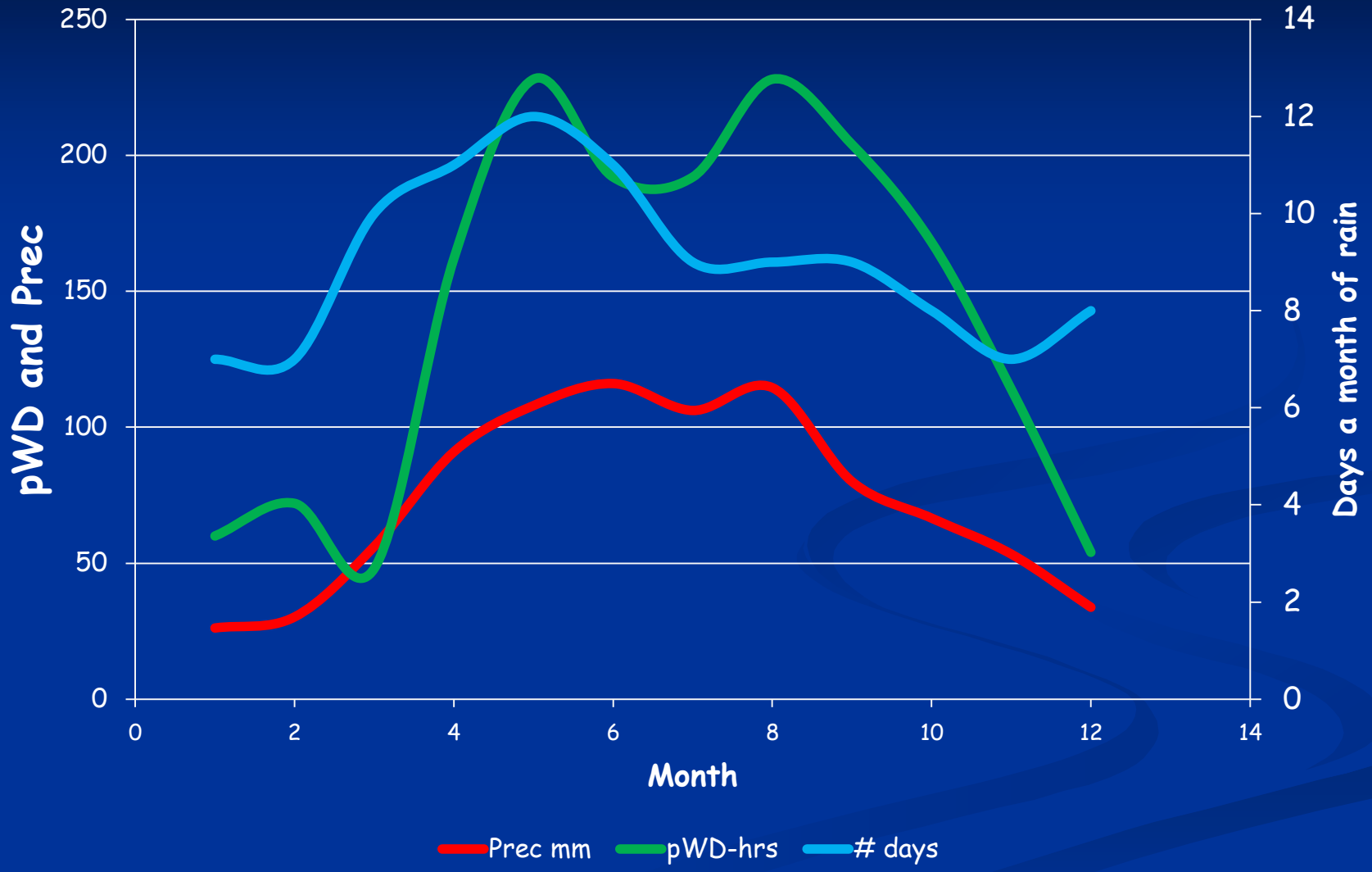


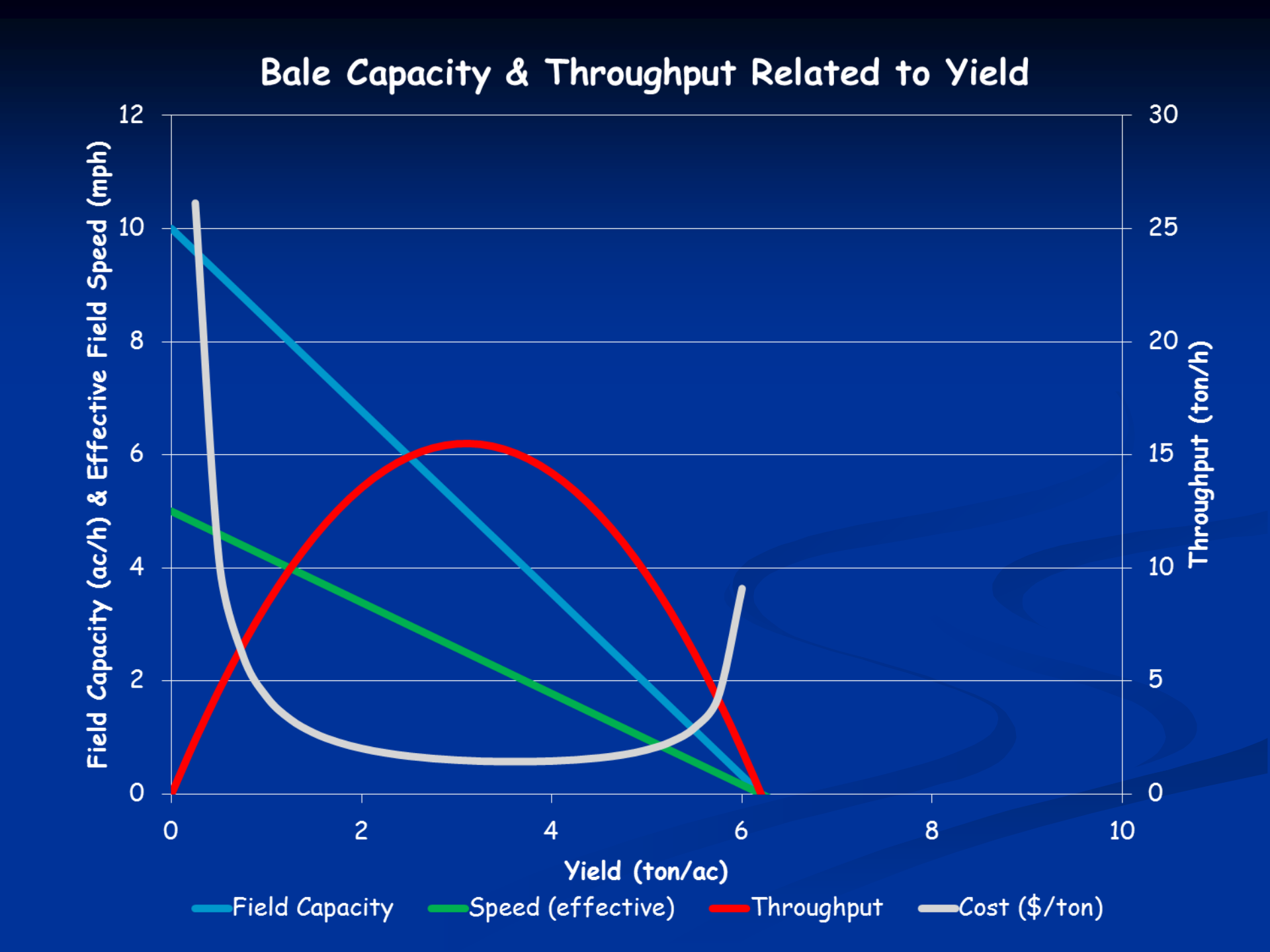
Available Working Days

$$\begin{cases} WP \times (a_1 \times \%TotalSolar + a_2 Temp + a_3 PrecTemp + a_4 ET) \\ WN \times (b_1 Prec + b_2 Prec_{lag} + b_3 PrecAmt + b_4 Rain?) \end{cases}$$

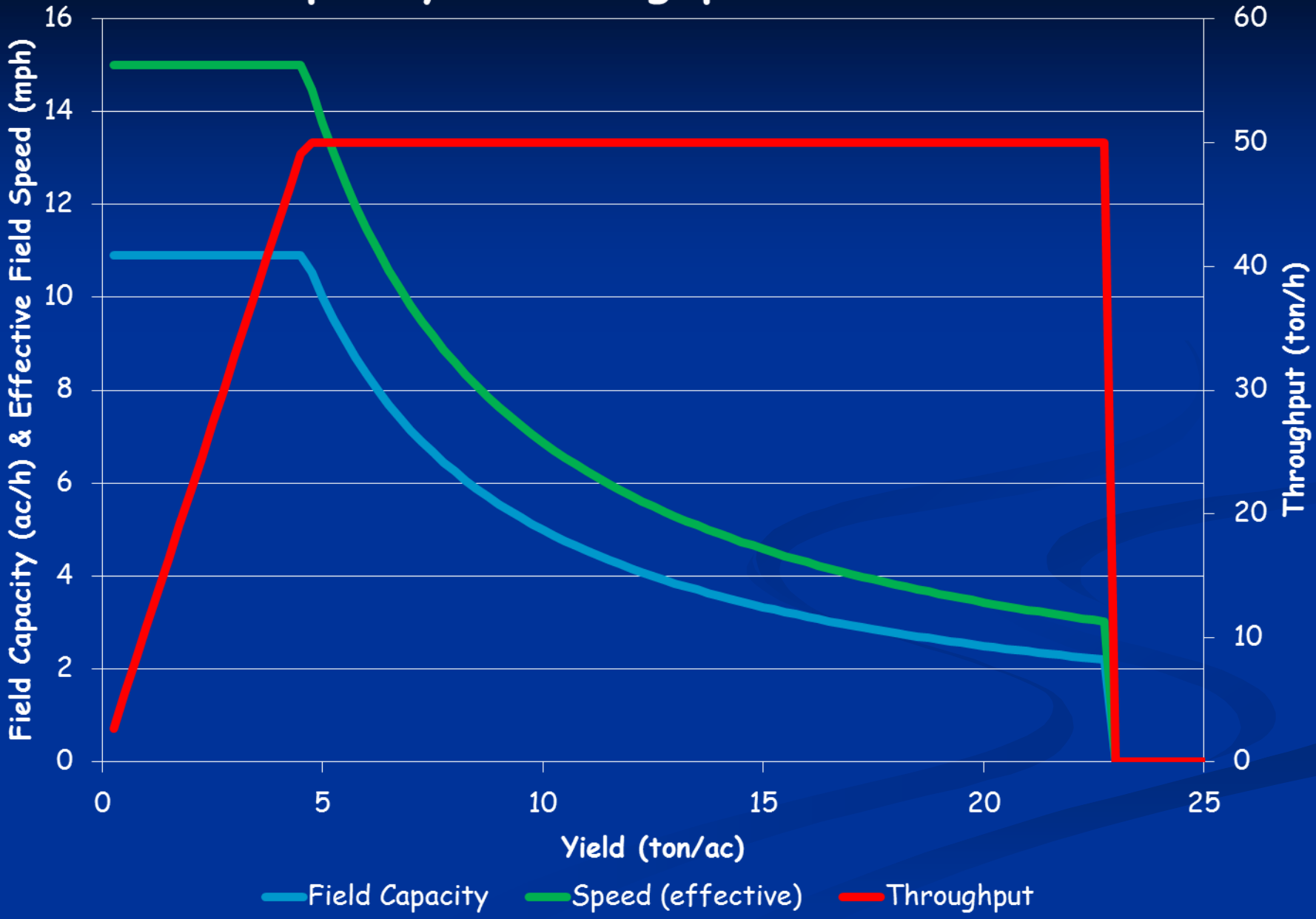
- If "Rain?" = YES (1) then "no go"
  - else if "$Prec_{lag}$" > 3 (AE2) then "no go"
    - else If "Sum of factors (pWD)" < -25 (AB2) then "no go"
      - else If "Sum of factors (pWD)" > 0 (AF2) then "Full Day" (AG2)
        - else "Half Day" (AG2/2)

Available Working Days

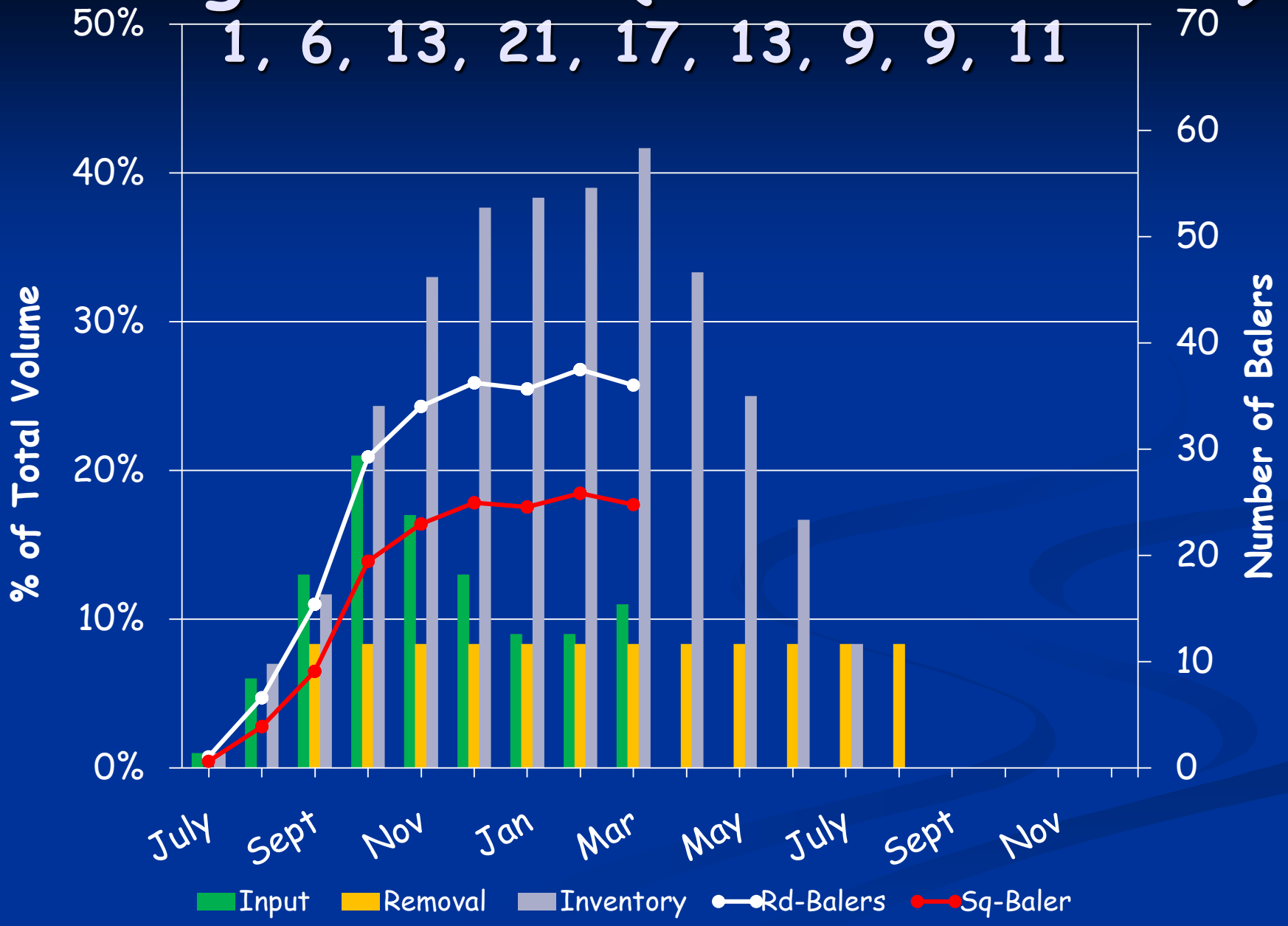



Bale Capacity & Throughput Related to Yield
Field Capacity (ac/h) & Effective Field Speed (mph)
Throughput (ton/h)
0
2
4
6
8
10
12
0
5
10
15
20
25
30
0
2
4
6
8
10
Yield (ton/ac)
Field Capacity
Speed (effective)
Throughput
Cost ($/ton)

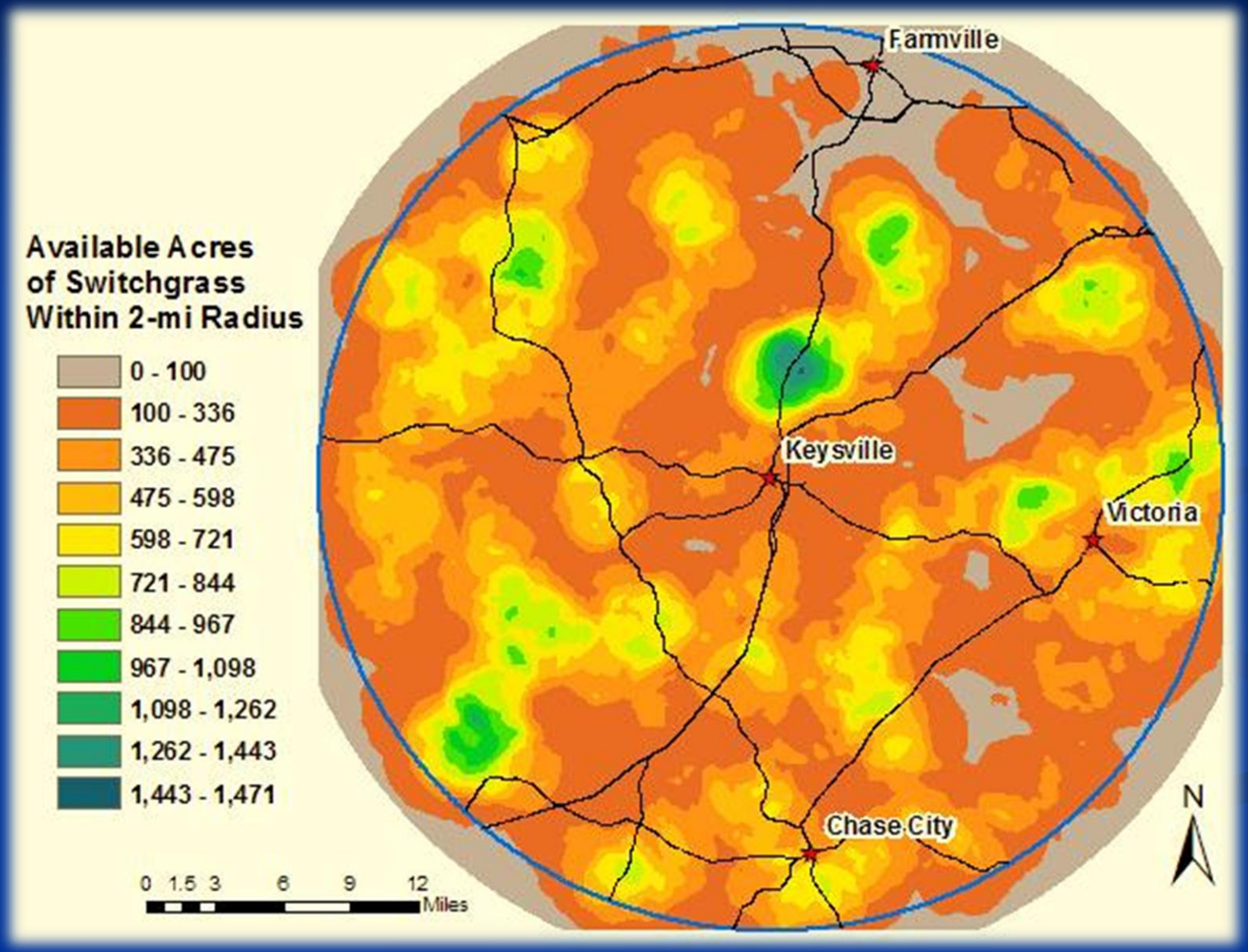
Bale Capacity & Throughput Related to Yield



Baling Rate %: (minimize balers)



Field Density Maps



http://atlas.agr.gc.ca/bimat

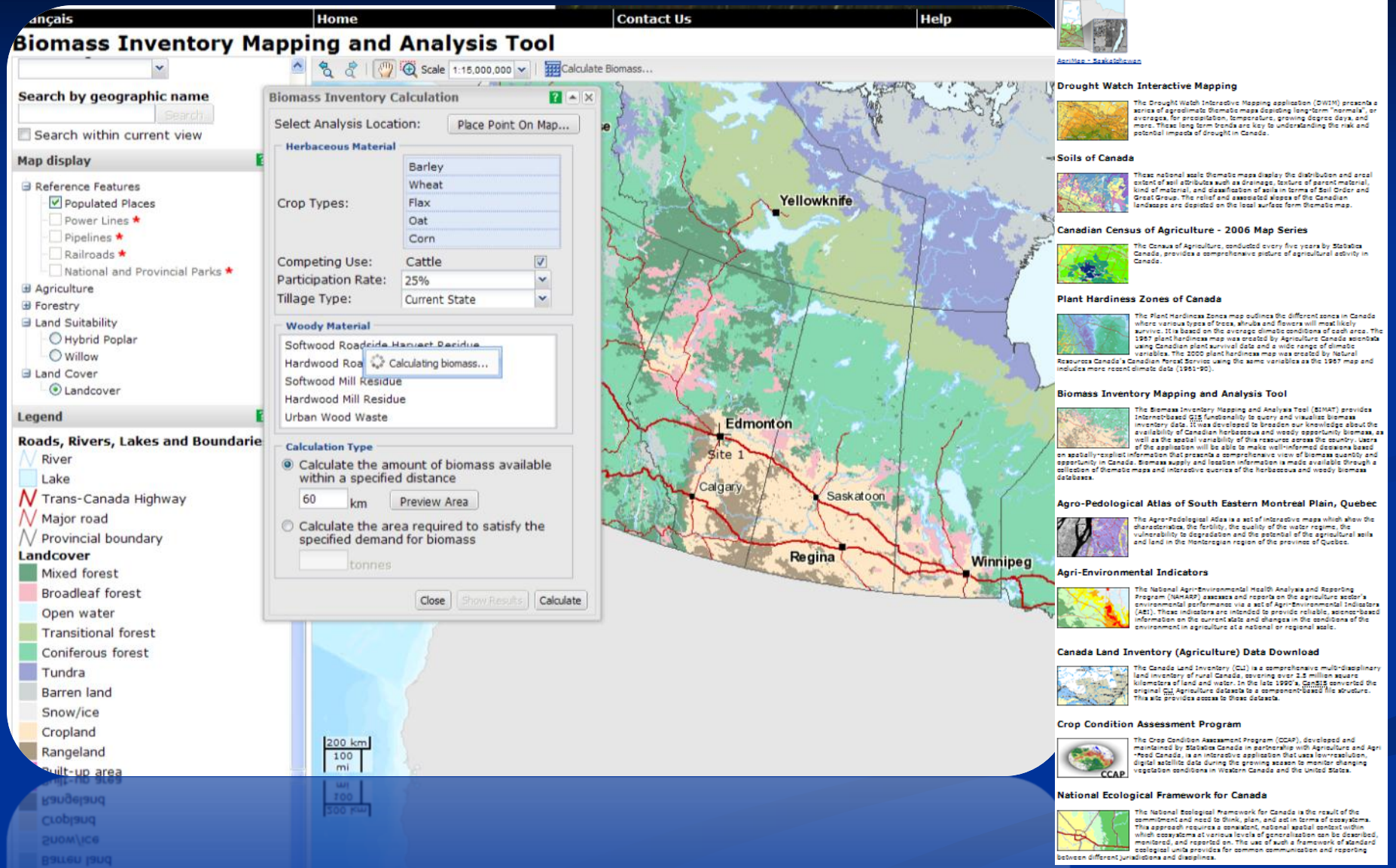
BIMAT

Biomass Inventory Mapping and Analysis Tool

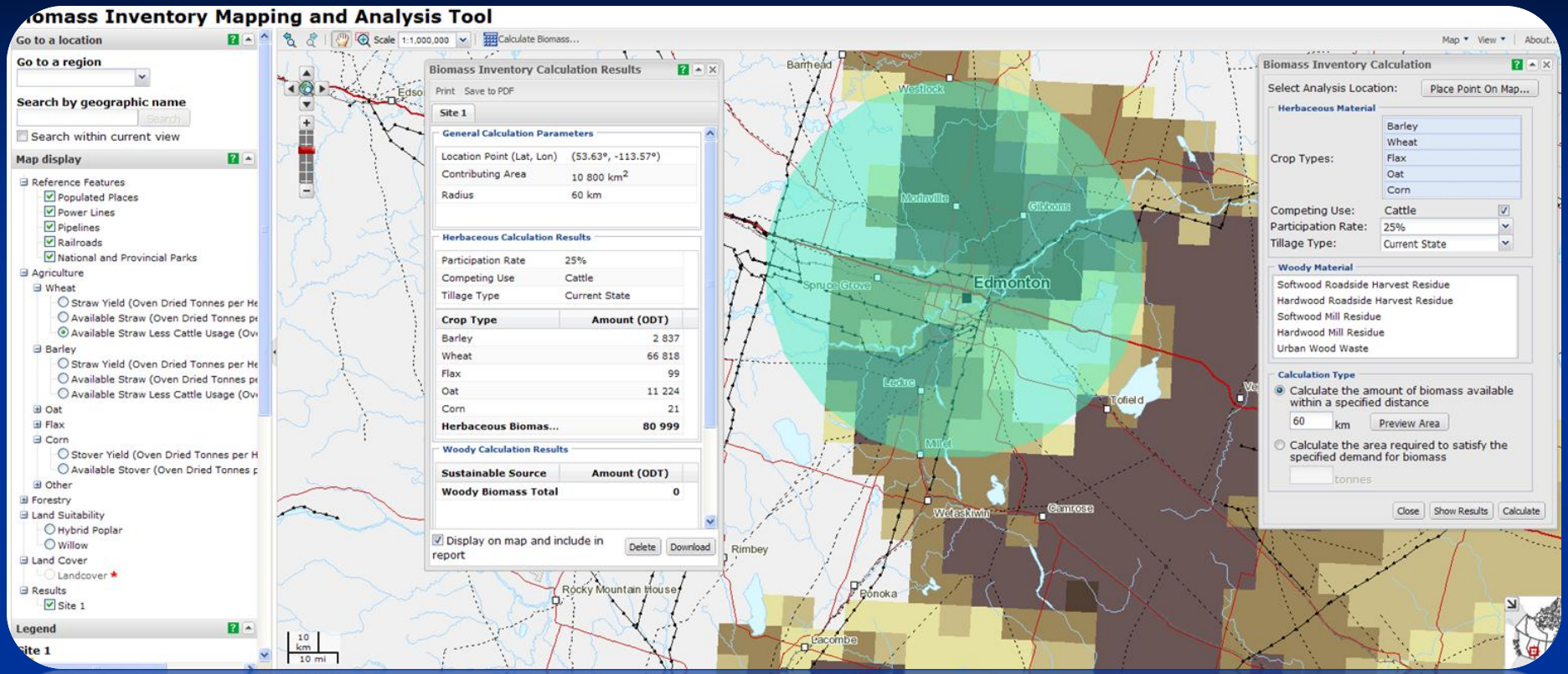
Why did Canada build it?

- Provide access to accurate and reliable Canadian biomass and landscape information via the Internet.
- Facilitate analysis of biomass inventory and impact of exploitation of selected agricultural, forestry, and municipal woody biomass.

http://atlas.agr.gc.ca/bimat



http://atlas.agr.gc.ca/bimat



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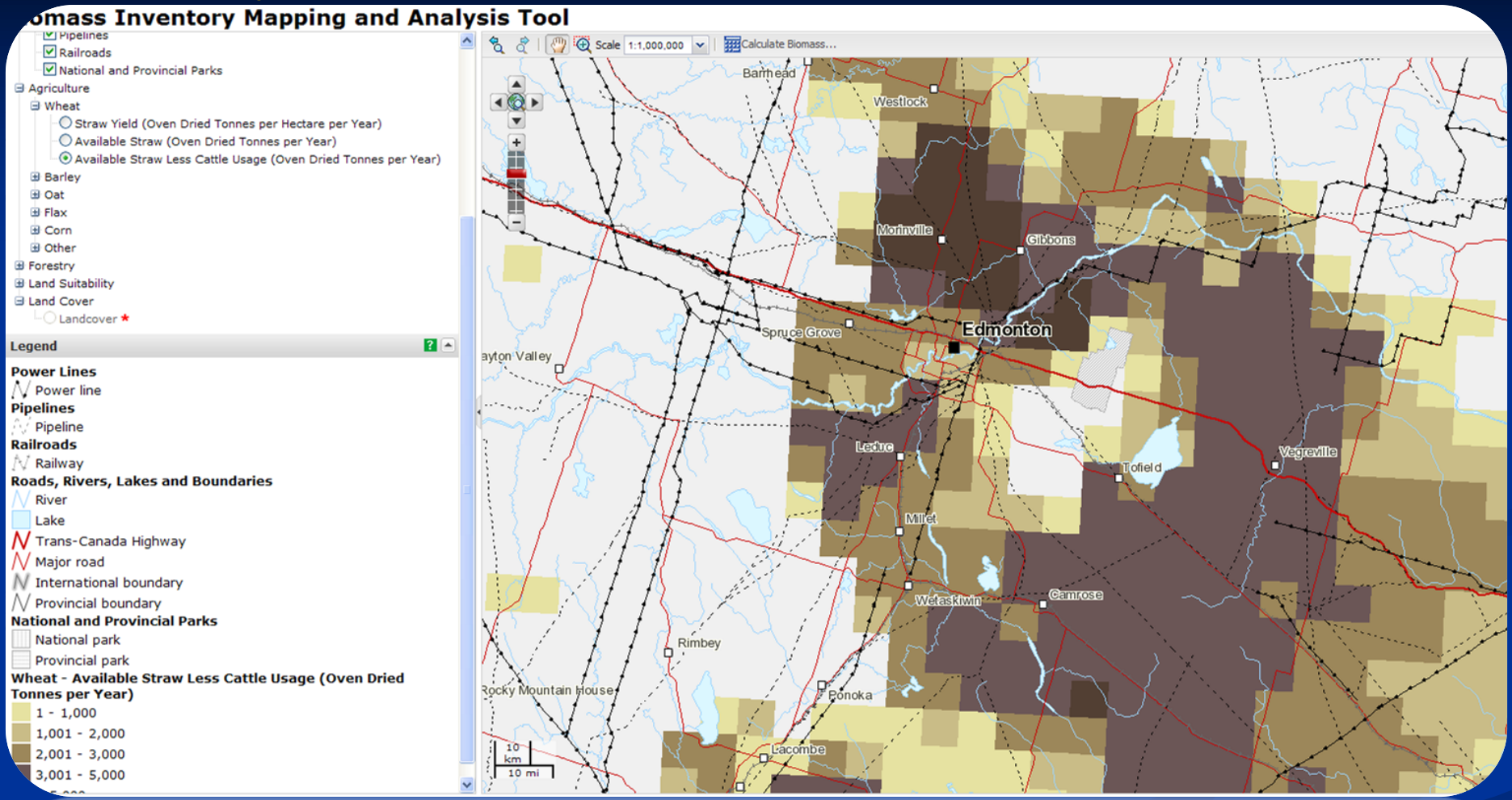
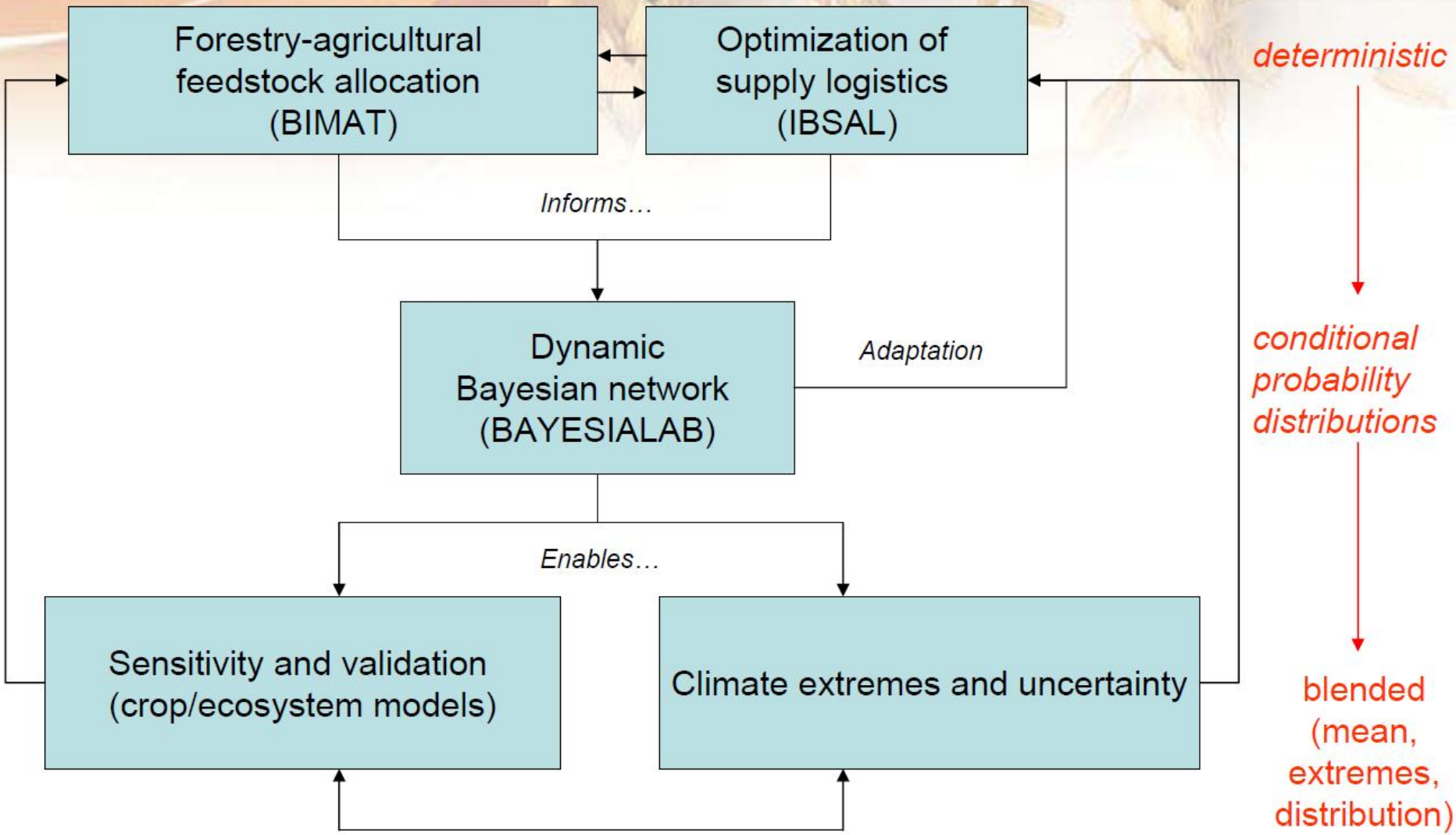


BIMAT Project Plan

Develop New Online Analytical Functions

1. Alternative crop residue harvest system modeling (2009/10)
2. Logistics and carbon accounting information: full-cost accounting of biomass from ripe crop through to the plant gate. (2011/12)
3. Sustainability measurement framework for carbon accounting and sustainability assessment of multiple biofuel systems. Saskatchewan will be used as the case study jurisdiction. (2011/12)
4. Include information on the conversion systems for fuels and other biomaterials as a user selected choice based on technology information provided by the industry and science partners. (2011/12)

Modeling approaches for logistics and carbon



BIMAT Future Plan

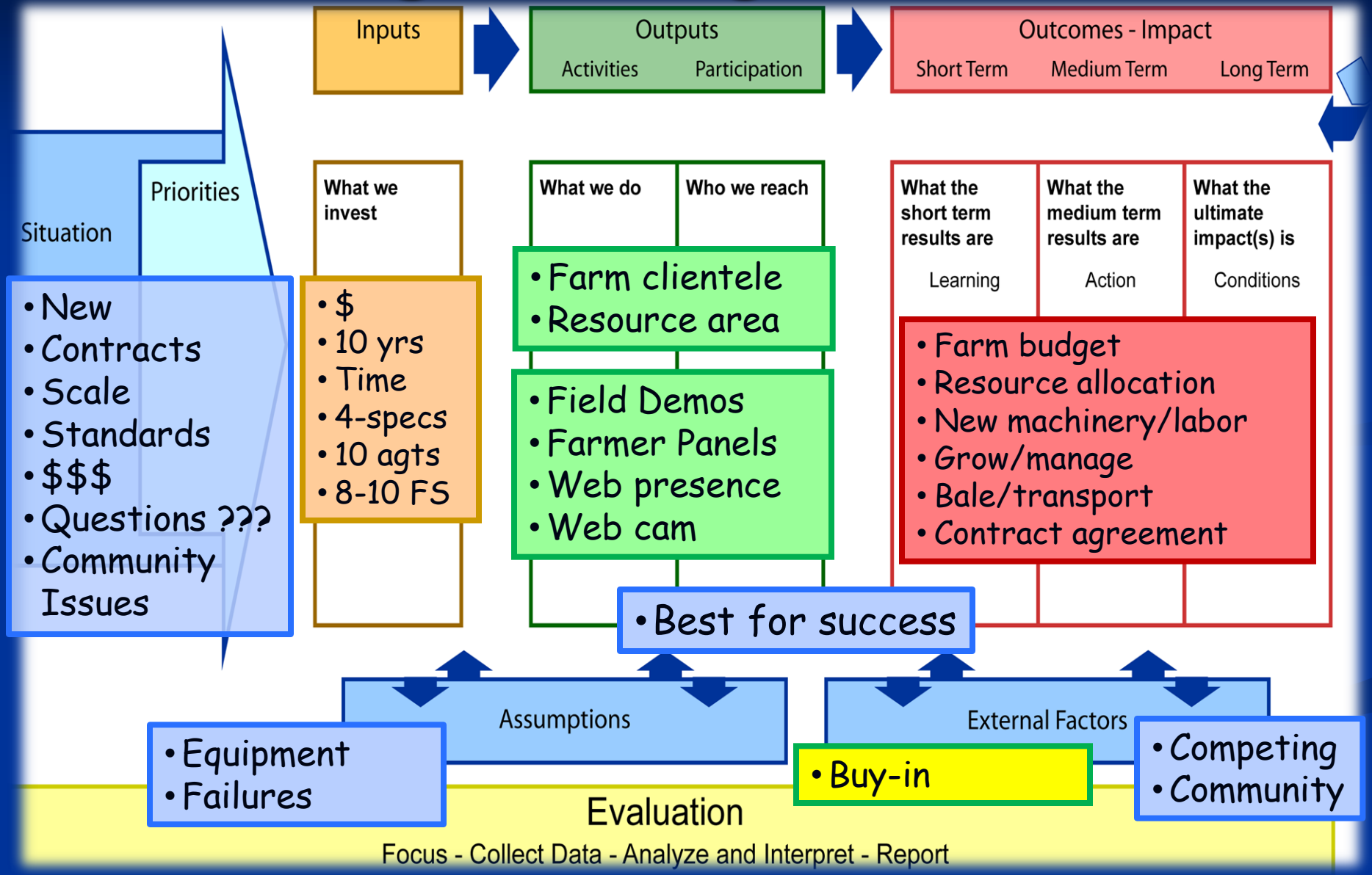
Improve and Expand Inventory

1. Estimates for grain production
2. Alternative crop residue harvest system modeling
3. Feedstock quality information for flax
4. Modeling of annual variability in biomass supply
5. Develop remote sensing tools and models to facilitate the within-year estimates of the biomass inventory
6. Land suitability information for the production of new forestry and forage crops for cellulosic feedstocks

Expand Biomass Reference Material

1. Add information about quality, conversion processes and life cycle evaluation

Program Logic Model



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