State University of New York
College of Environmental Science and Forestry

Economic Impact of Incentive Payments on Willow Biomass Crops in NY

Thomas Buchholz[a], Timothy Volk[b], Lawrence Abrahamson[b], Michael Kelleher[b]

[a] University of Vermont, Rubenstein School of Environment and Natural Resources
[b] State University of New York, College of Environment and Forestry (SUNY-ESF)

Presentation to the
8th Biennal SRWC Operations Working Group
Syracuse, NY
October 17 - 19, 2010

- Economics of willow
- Types of incentives
- Objectives
- Incentive analysis
- CRP and BCAP
- Conclusions

BIOENERGY RESEARCH
DOI: 10.1007/s12155-010-9103-5 Online First

Improving the Profitability of Willow Crops—Identifying Opportunities with a Crop Budget Model

Thomas Buchholz and Timothy A. Volk

Download PDF (995.4 KB) View HTML Permissions & Reprints

Welcome to EcoWillow v1.4 (Beta)

ESF State University of New York
College of Environmental Science and Forestry

An Economic Analysis Tool for Willow Short-Rotation Coppice for Wood Chip Production


Photo: Thomas Buchholz


Photo: Timothy Volk


Photo: Timothy Volk


Photo: Lawrence Smart

Project Name	
Location	
Acres (min. 20)	20

Begin

Tutorial

We acknowledge support of NYSERDA, USDA CSREES, and the State of New York, Dept. of Agriculture and Markets

Download the model at: http://www.esf.edu/willow/download.htm

ESF

Economics of Willow Biomass Crops in NY

- **Base Case (Buchholz and Volk 2010)**
  - 10 ha
  - 12 odt/ha/year over 22 years
  - 40 km haul distance
  - Planting density of 14,300 cuttings/ha at $0.12/cutting
  - Headlands: 8% of area
  - Row length: 200m
  - 3 year rotation length
  - 112 kg N/ha application after every harvest

Base Model Input Assumptions

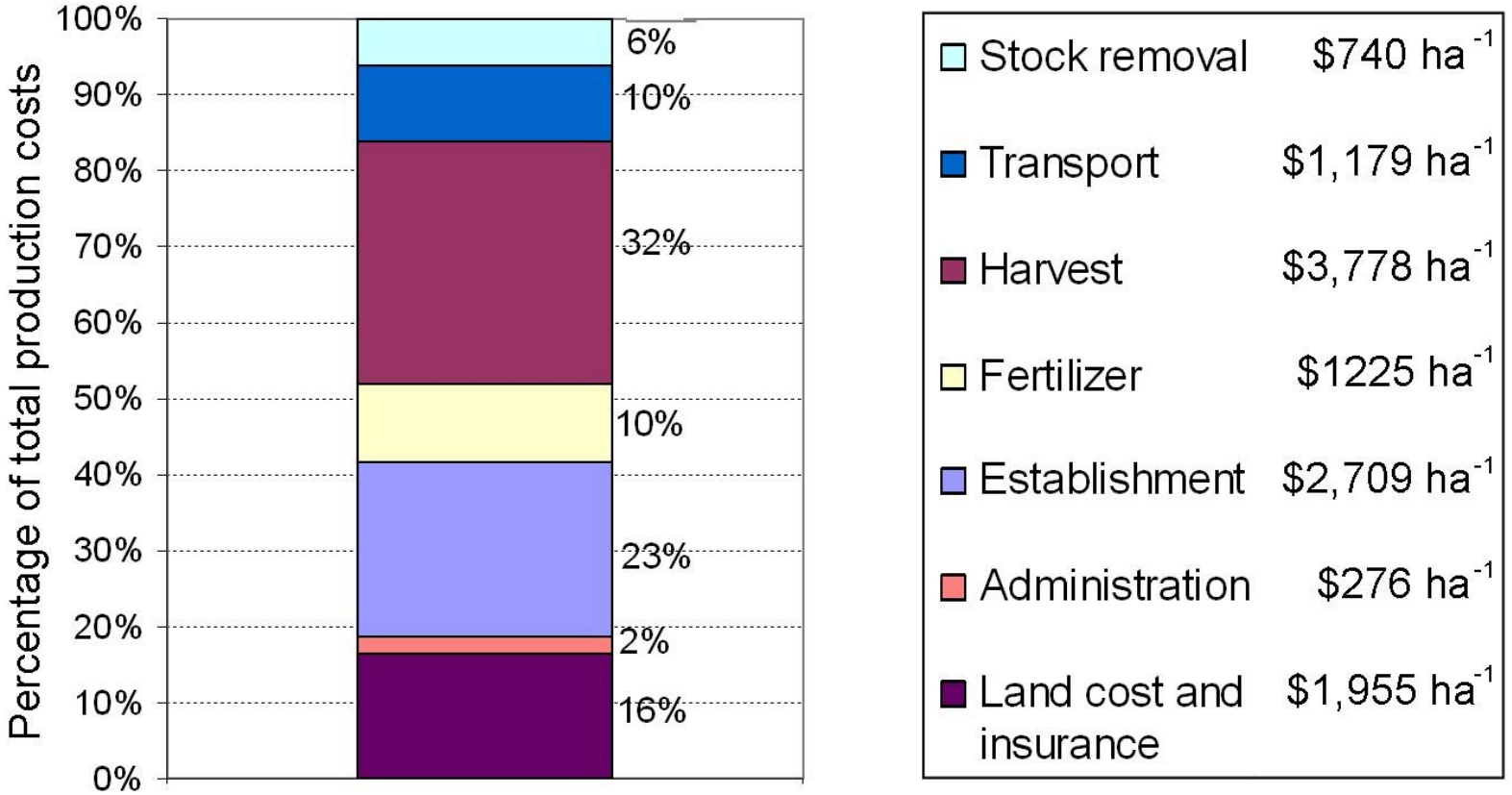
- Delivered wood chip price: $60/odt
- NH single pass cut and chip forage harvester is model harvesting system
- Harvester cost of $180/hr
- Diesel Fuel cost: $0.56/L ($0.62/L with road tax)
- Land costs: $85/ha
- Removal of willow after seven rotations: $740/ha

ESF

Base Model Output

- IRR of 5.5% for 3yrs rotation (6.2% 4yr rotation)
- Breakeven cash flow in year 13
- Startup costs $3,097/ha
- Harvest costs $16.3/odt
- Transport costs
  $5.1/odt
- Earnings per ha
  $101/ha
- Earnings per ton
  $10/odt

Willow Production Cost Structure



Source: Buchholz and Volk 2010

Potential Incentives to Improve Economics

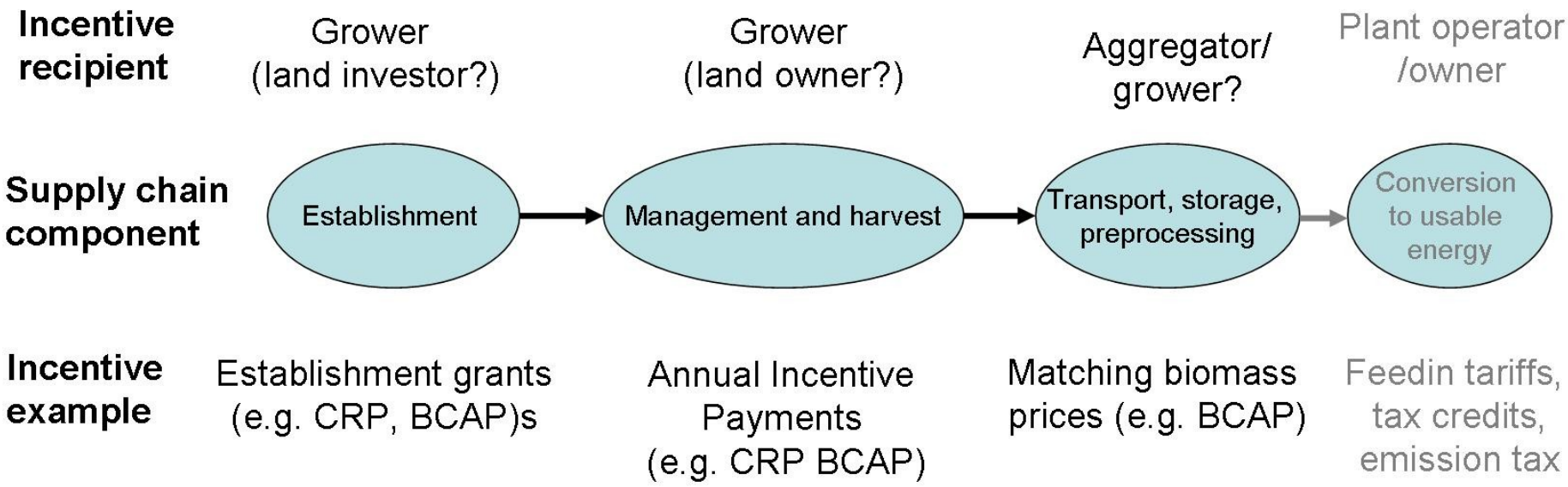
- What incentive mechanisms are available?
  - Establishment grants (EG)
  - Annual incentive payments (AIP)
  - Startup loans
  - Biomass matching grants
- Examples:
  - Conservation Reserve Program (CRP)

    Willow is an approved cover for CRP in NY

    50% EG; $124 -$136/ha AIP for NY counties
  - Biomass Crops Assistance Program (BCAP)

    75% EG; AIP up to 15 yrs, match of up to $50/odt (metric) delivered

Who Receives Incentives?

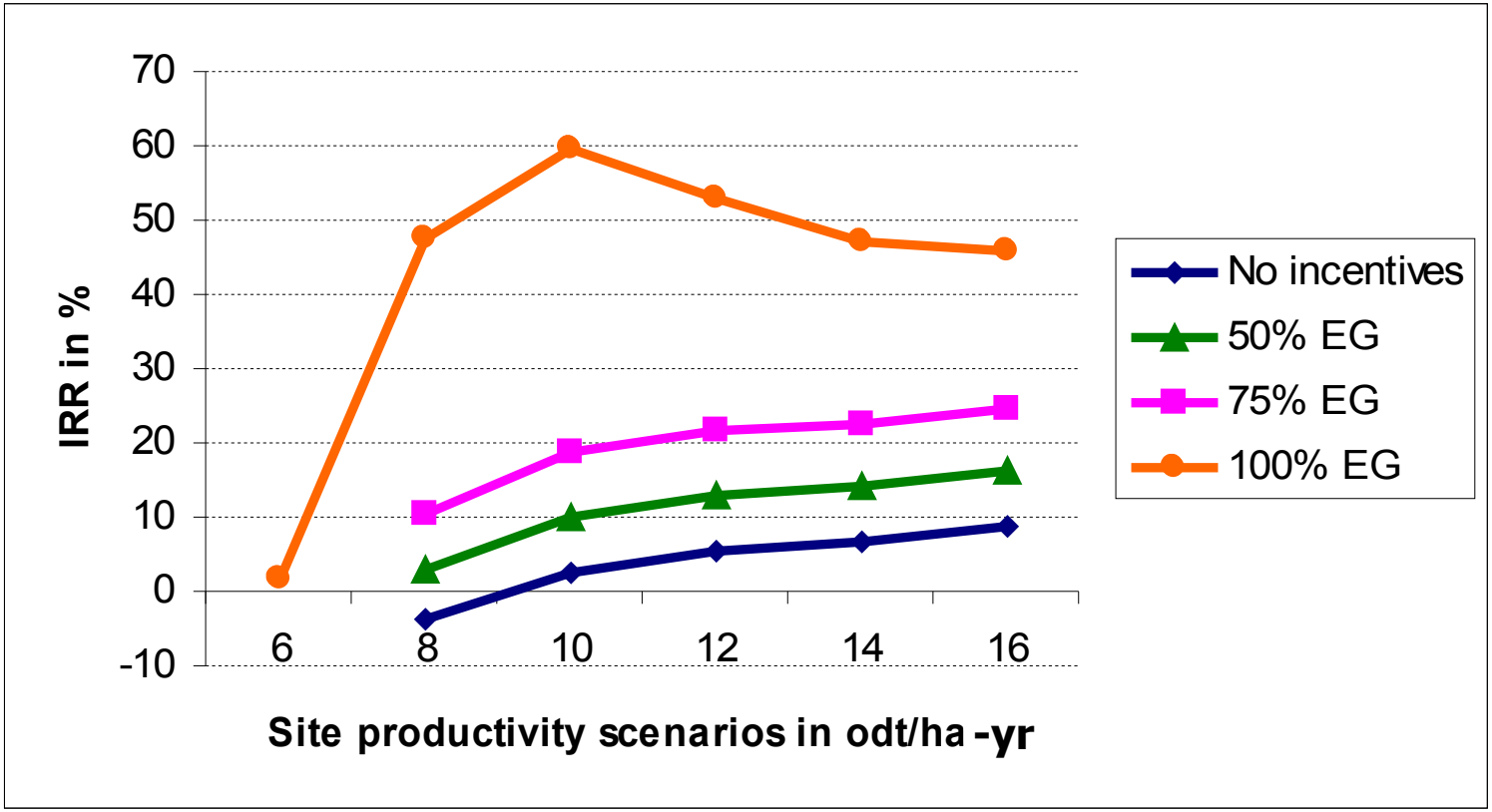


Objectives

- Compare different incentive approaches
  - NPV framework (hypothetical $1,000,000 fund available at 6% discount rate)
  - Quantitative: IRR, payback period, earnings per ha, area and tons incentivized
  - Qualitative: recipient's potential preferences
- Analyze relation of site productivity and incentives
  - How can incentives be tailored to site specific productivity?

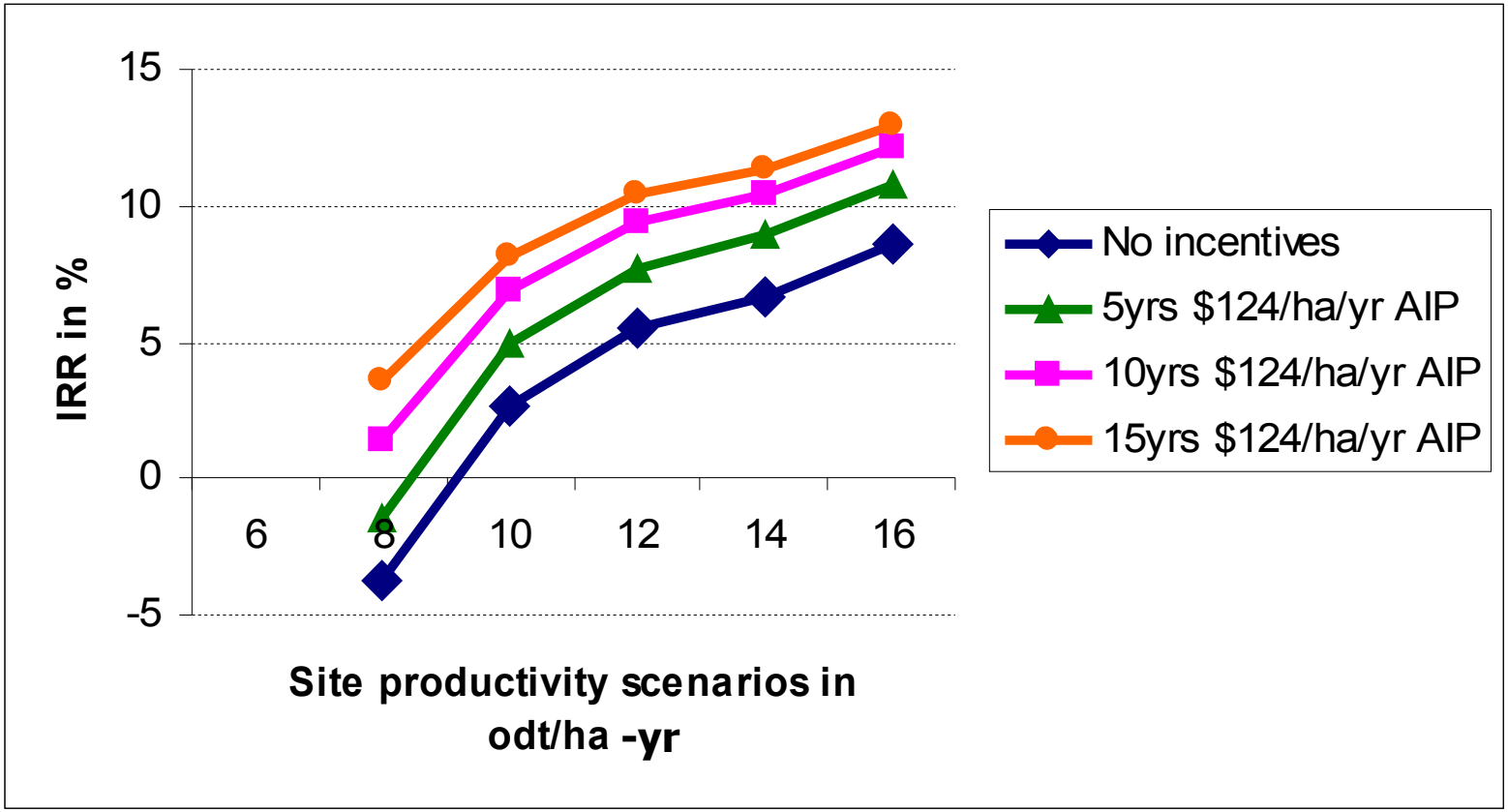
ESF

Establishment Grants



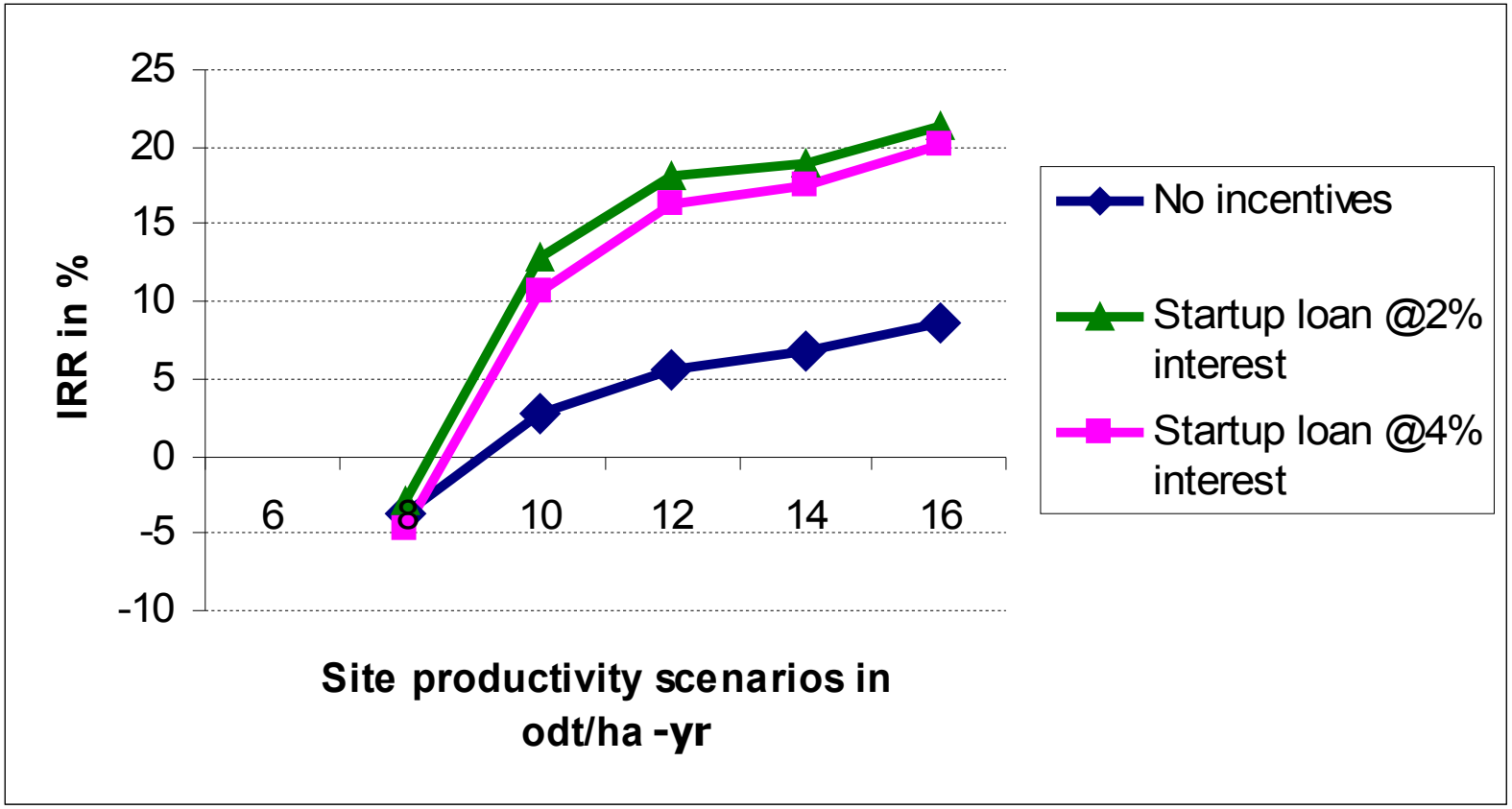
$5.7 - $15.2/odt incentives @ 75% EG

Annual Incentive Payments



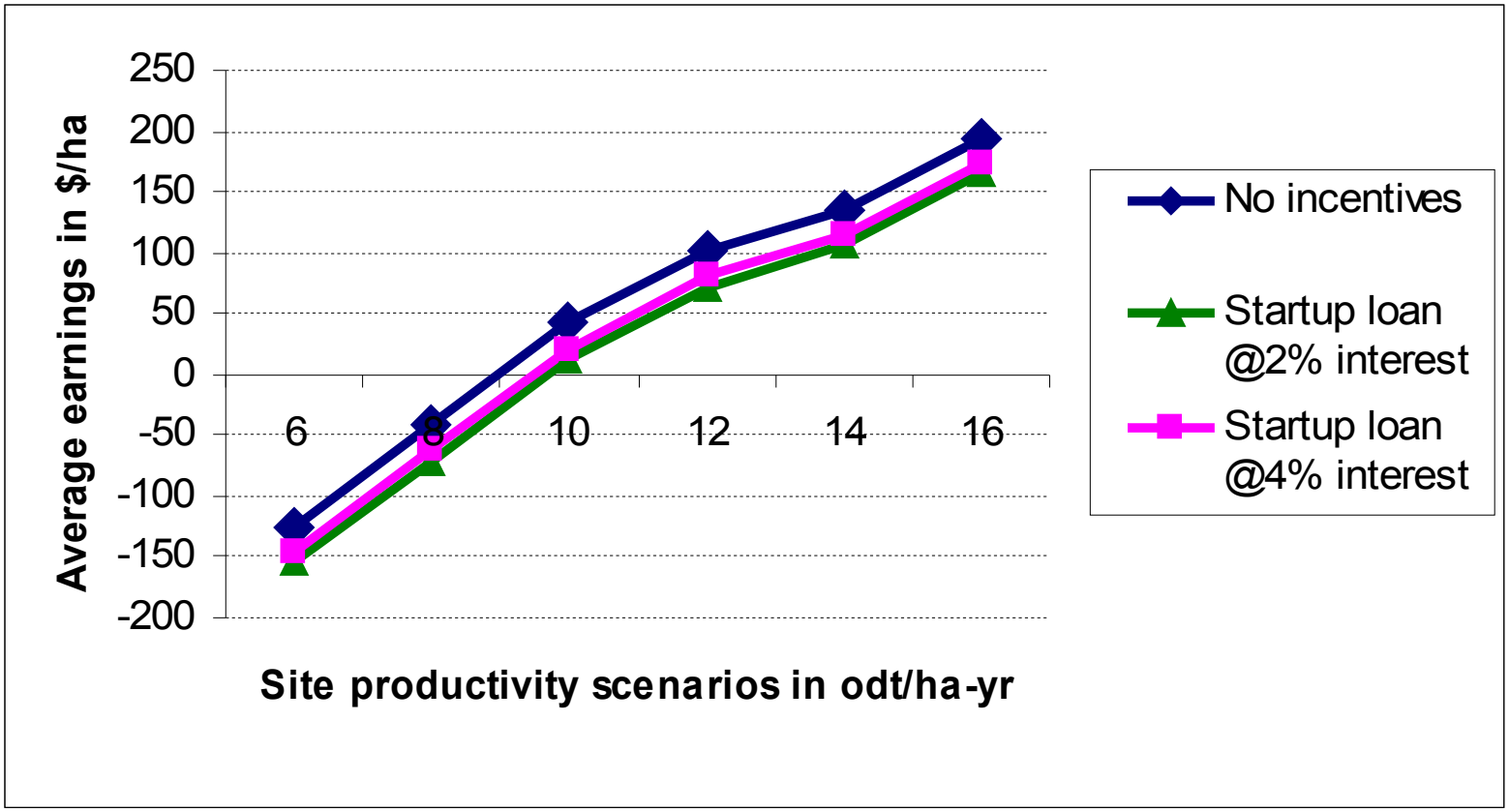
$2.8 - $7.6/odt incentives @ $124/ha/yr 10yr AIP

Startup Loans (i)



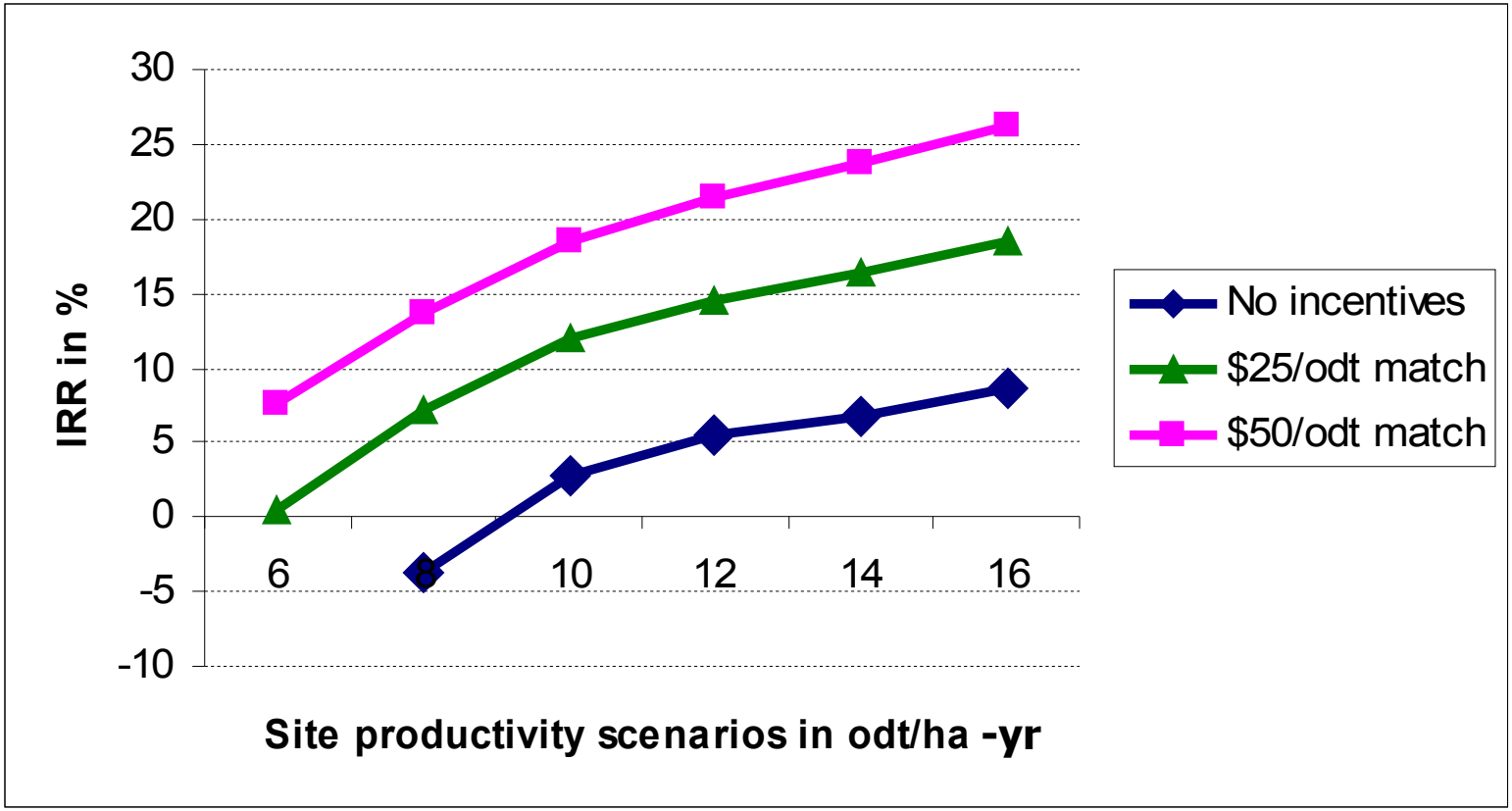
$2.5 - $6.6/odt incentives @ 2% startup loan

Startup Loans (ii)



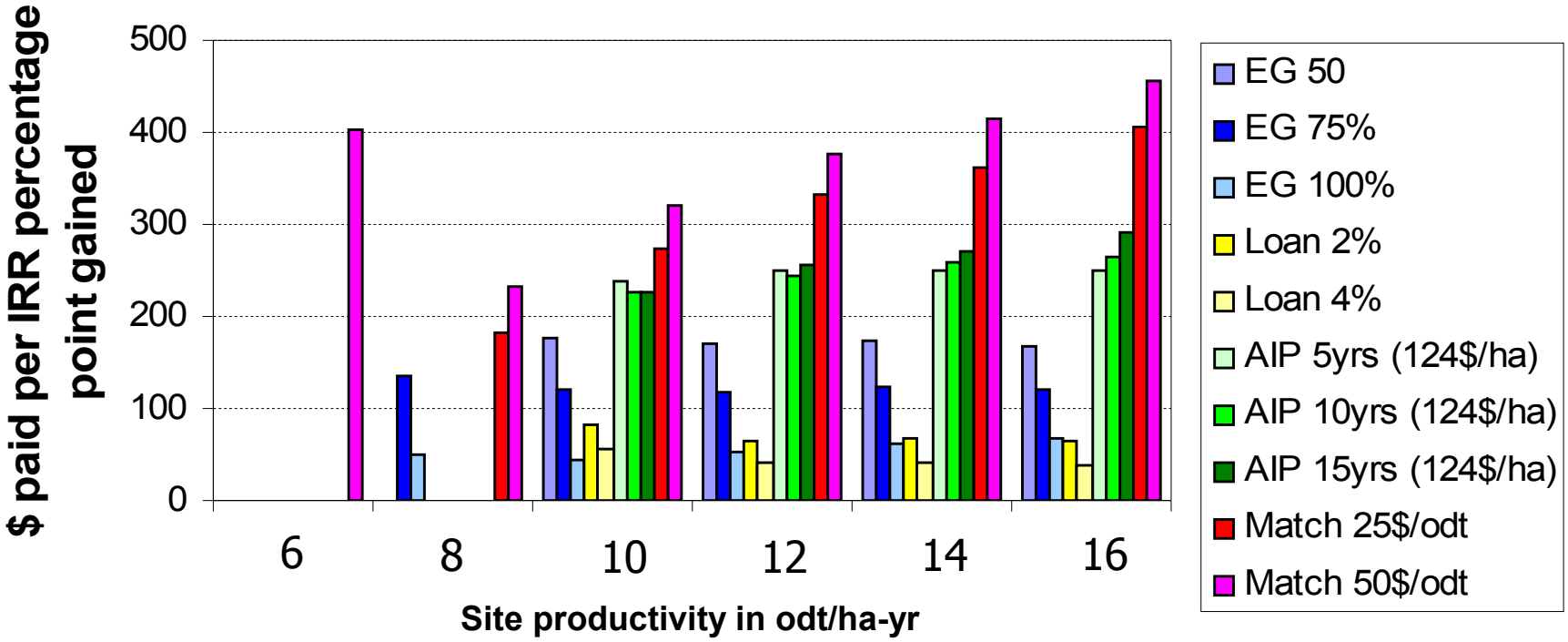
While loans might be of interest to investors, (small-scale) farmers might not be interested in loans

Biomass Match



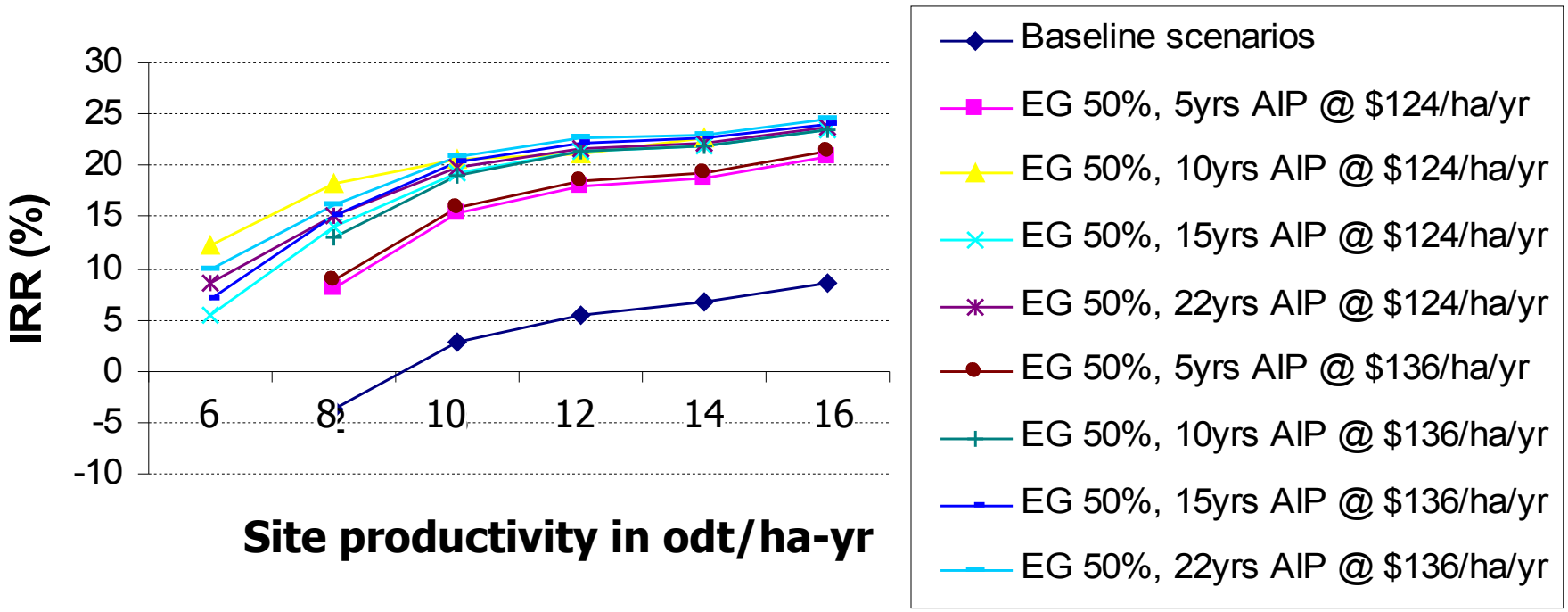
$12 and 23.9/odt incentives @ $25 and $50 match

Comparative Cost Analysis of Incentives



Only scenarios generating profits (IRR >4%) after incentives are reported

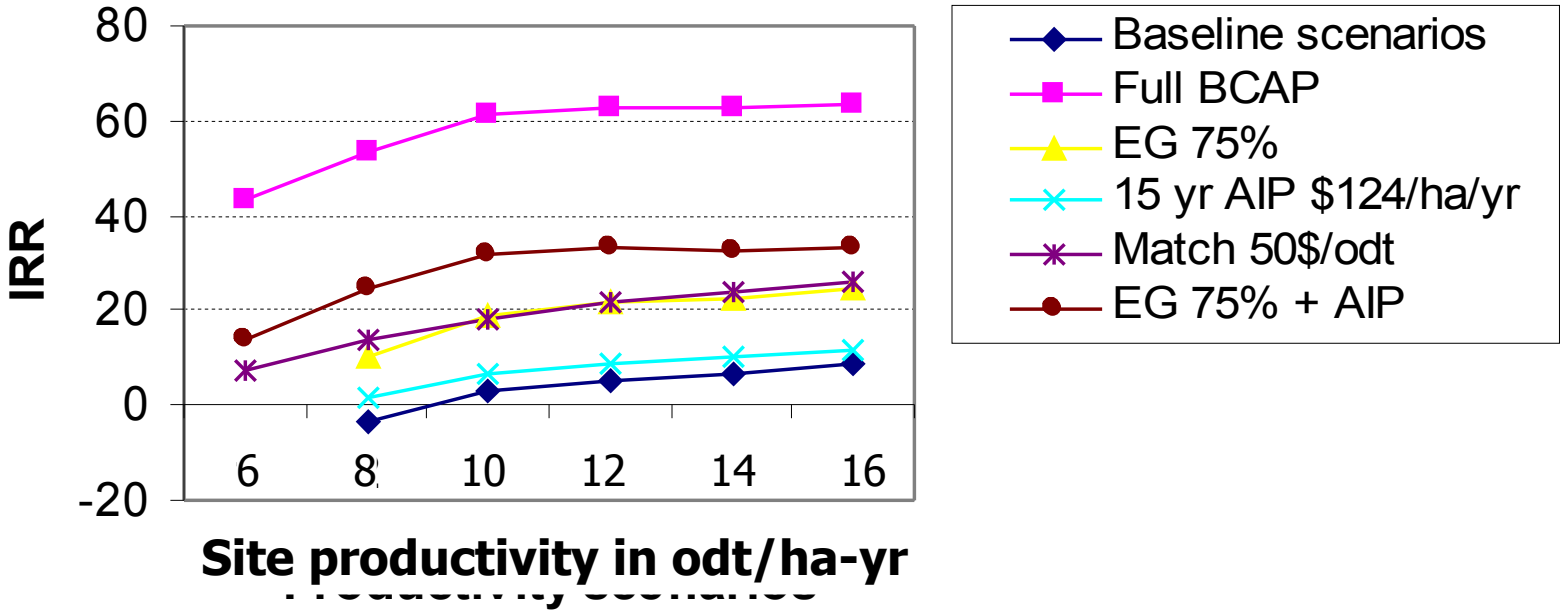
Conservation Reserve Program (CRP)



Neglible difference of AIP $124-136

Neglible difference if AIP paid for 10 to 22 yrs with increasing productivity

Biomass Crop Assistance Program (BCAP)



The BCAP program provides IRRs of over 43% across all productivity scenarios analyzed.

The EG and match contribute most to these high profits with fairly equal shares.

Conclusions

- Of all incentives analyzed **low-yielding** sites (~6 odt ha^{-1} yr^{-1}) can only be profitable with a match program providing \$50 odt^{-1} delivered **or a combination of incentives**
- **Medium- to high-yielding** sites return reasonable profits with75% establishment grants or incentivized loan programs
- Loan programs are very cost effective but decrease earnings per ha
- Match programs are very expensive and do not contribute to overcoming the investment hurdle during crop establishment.

Conclusions

- **Incentive programs should be tailored to grower's needs** (e.g. small or large scale, investor, farmer) and sponsor's intentions (max. biomass, focus on low-productivity sites, min. admin costs).
- **From a grower's as well as a sponsor's perspective EGs of 50% to 75% with AIPs for medium to low productivity sites are a good fit.**
- **It might be useful for sponsors to establish profit targets** for a specific yield estimate and then tailor an incentive approach to this envisaged profit while considering potential preferences of growers towards some incentive approaches.
- Incentive programs are expensive and need to be tied to proper crop establishment to ensure that funds are used to produce significant quantities of biomass.

ESF

Comments…questions!

Thank you for your attention!

Thomas Buchholz
thomas.buchholz@uvm.edu

Timothy Volk
tavolk@esf.edu

Free download of EcoWillow v 1.4 (Beta) at:
http://www.esf.edu/willow/download.htm