Dynamic Integration of an Economic Model with SWAT

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CEAP Objective 4: Economic Analysis

Selection and placement of conservation practices to optimize:

1) Profit maximization at the farm level

2) Environmental outcome at the watershed level

3) Program efficiency
Optimization of Multiple Objectives

Objective 1

Objective 2
Data Envelopment Analysis

Price ratio

Output

Input
Economic comparison of alternative technologies
Data envelopment analysis model of cow-calf production
Linkage of Economic and Environmental Models

**Static Link:** Run economic (optimization) model, use results in environmental model

**Dynamic Link:** Information passed between environmental model and economic model during optimization.
Static integration of DEA and SWAT

Land Use

Soils

Elevation

Nonparametric Regression

DEA model

nitrogen fertilizer

seed chemicals
custom operations
fuel, lube, and electricity
repairs
labor
taxes and insurance
interest

barley

wheat

production process

SWAT

biomass over-ride

(wheat, barley)
nitrogen

Map: dollars / kilogram / hectare

Legend:
0 - 289
289 - 478
478 - 678
greater than 678

Map of distribution:
Red indicates areas with higher dollar values.
Links from Economic Model to SWAT

Static Links
Crop
Chemical inputs to production

Yield: BIO_TARG – biomass target
   HITAR – harvest index target

Dynamic Links
Runoff from fields (SWAT outputs)
Hill Climbing Optimization Algorithms
Multi-objective Optimization Using a Genetic Algorithm
If the objectives are evaluated (YES), proceed to...