

# Introduction to Tradable Permits and Credits Generated Through Land Management Changes

Richard T. Woodward

and

Bruce A McCarl

## The genesis of tradable permits

- Crocker (1966) and Dales (1968) were the first to propose the use of a market-based approach to dealing with pollution
- Foresaw many of the challenges that we continue to address today.
- Dales application was to water quality

## The simple economic intuition for tradable rights

- An “asset unit” must be defined
  - pounds of phosphorus reaching a location
  - pounds of CO<sub>2</sub> emitted nationally
  - tons of SO<sub>2</sub> emitted by power plants
- A total load allocation or “Cap” is set by government
- An initial allocation of rights among sources is established
- Trading is permitted

### Example: Two ways to reduce pollution by 1,000 lbs

	<b>Plant A</b>	<b>Plant B</b>
Cost of an equal reduction	\$30,000	\$25,000
Unequal Reduction	700 lbs	300 lbs
Cost of unequal reduction	\$32,000	\$20,000
Cost difference	+\$2,000	-\$5,000

## Some benefits of tradable permits

- Pollution goals still met
- Cost efficiency is achieved
- Lowering costs of compliance makes it politically possible to achieve higher environmental standards
- Incentives created to find ways to reduce pollution instead of avoid regulations

## Milestones in the history of transferable discharge permits

<b>Year</b>	<b>Program Description</b>
1970's	EPA programs of "netting, offsets, bubbles and banking"
1976	EPA's "Offset Policy" - new sources in nonattainment areas if offsetting reductions were achieved
1982	Program to reduce the amount of lead in refined gasoline
1984	Lake Dillon (Colorado) water quality trading program
1990	SO <sub>2</sub> trading program, Title IV of the Clean Air Act
1993	California's RECLAIM (Regional Clean Air Incentives Market)
1997	Kyoto Protocol negotiated. Includes some trading
1998	EPA's NO <sub>x</sub> State Implementation Plan (SIP)

## Basic Requirements for a trading

- **Demand:** There must be a credible and enforced cap on aggregate emissions that encourages demand for credits
- **Supply:** Those that have an economic incentive to generate offsets.
- Supply and demand require clear rules and accountability
- **A Market**

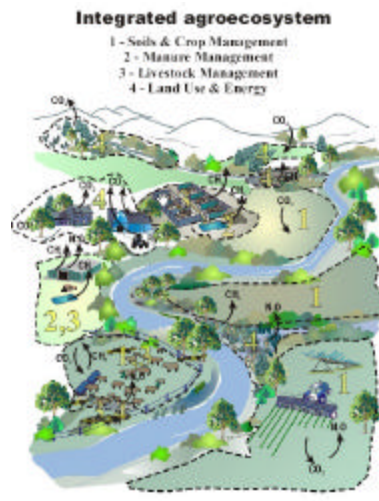
## What makes a market?

- “Markets can only exist within a social and legal system that has consciously set out to create ordered domains of exchange” (Bromley 1997)
  - Authorization for trading
  - Monitoring and reporting of trades
  - Enforcement of obligations
  - A “marketplace”

## Cap & Trade vs. Baseline & Credit

- Comprehensive cap on emissions
- Monitored emissions
- Mandatory
- Partial cap and voluntary participation
- Predicted emissions
- Voluntary

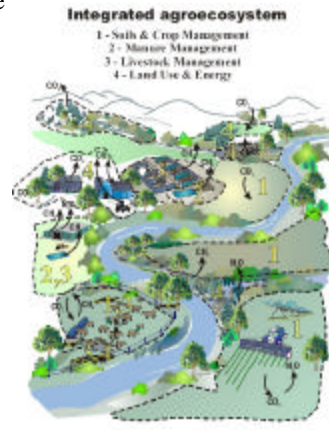
## Now for the Sticky Land Part



From Alberta government page [http://www1.agric.gov.ab.ca/\\$department/deptdocs.nsf/all/c19706](http://www1.agric.gov.ab.ca/$department/deptdocs.nsf/all/c19706)

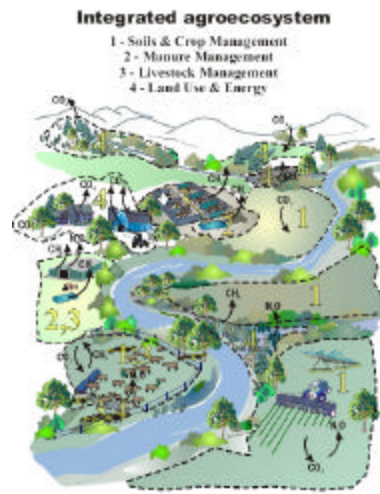
# What makes the land credits

- Soil, forest and crop management
  - Tillage, Buffer strips, Altered fertilization use and practice, Cover crops, Longer rotations
- Manure management
  - Cover/capture gasses, Digesters, Land applic, Wet vs. dry handling
- Livestock management
  - Herd size, diet quality, animal density, fencing of streams
- Land use change
  - Grassland/tree conversions, afforest, avoid deforest, wetlands mgt
- Energy use
  - Less tillage, better irrigation, less drying
- Energy Offsets
  - Biofuels and other emissions offsets



# Where are the land credits

- Dispersed across landscape
  - Nonpoint source
  - Every square inch
- Many land owners
  - Average US farm size is 462 acres
  - Average US non industrial forest holding is 50 acres
- Credits are often small in magnitude
  - Tillage  $\frac{3}{4}$  ton CO<sub>2</sub> per acre
  - Afforest 1 ton per acre



## Similarity and Distinctions Water Quality vs. Carbon

- Many sellers, few buyers
- Most often Nonpoint seller vs. Point buyer
- Local (a river) vs. Global
- Multi pollutant vs. Frequently one at a time
  - GWP multigas methodology
  - 1 CO<sub>2</sub>, ~300 N<sub>2</sub>O, ~20 CH<sub>4</sub>
- Regulated vs. unregulated
- Unequal practice potential
- Unequal importance of issues
  - Permanence/Saturation issue, leakage issue

## Where have programs been successful

- Trading has predominantly involved point source issues
  - SO<sub>2</sub>
  - European carbon – no land based except some hog manure
- In carbon
  - all nonpoint has yet to have rules developed or had crude rules
  - Land based stuff has involved point sources like manure lagoons

## Why is problem hard?

- The practices to be employed here are a lot like those used in soil conservation programs in place since the 1930's
  - Dust bowl, sod buster, set aside, CRP
  - In 1985 USDA arrived at the following conclusion  
In the soil erosion conservation programs up through the 1985 Farm Bill 40 percent of cropland treated for erosion was not in need of soil conservation, based on productivity and offsite impacts. These acres accounted for 1/3 of soil conservation expenditures.  
Source: "An Economic Analysis of USDA Erosion Control Programs: A New Perspective". Roger Strohbehn (Editor), Economic Research Service, USDA, Agricultural Economic Report No. 560.
  - About the same time Nielson estimated a much higher percentage – 90% as I recall
  - More recently incentive programs have been used like CRP and EQUIP

## Why is problem hard?

- More recently incentive programs have been used like CRP and EQUIP
  - In 1995 Iowa State estimated that on CRP lands using complying practices
    - more than 98 percent of surface water quality benefits are obtained by enrolling less than 27 percent of CRP land. So 2% of benefit from 73% of land.
    - about 90 percent of the total wind erosion and groundwater quality benefits come from 32 percent of the CRP land. So 10% of benefit from 68% of land.
    - about 90 percent of the total water erosion benefits come from 43 percent of current CRP land. So 10% of benefit from 58% of land.
    - Better targeting could improve efficient
  - Source: **Renewing CRP: Results from a Study of Alternative Targeting Criteria**, Bruce A. Babcock, P.G. Lakshminarayan, and Junjie Wu, CARD Briefing Paper 95-BP 6, February 1995, Center for Agricultural and Rural Development Iowa State University
  - To date virtually all programs pay for practices not saving in erosion
  - Fledgling programs don't use land history

## Why try to overcome land problems

- Fix an environmental problem
- Known practices and farming responsiveness
  - Known practices – short run implementation
  - Farmers jump on things
    - » PIK program
    - » Biofuels
  - Non ag practices take time and investment plus technological innovation
- Co-benefits
  - Carbon and water and wildlife
  - But don't forget possible co costs – coal plant emissions

## What we address in rest of workshop

- Obstacles
- Ways they have been overcome or are being planned to overcome
- Fungibility in face of
  - Permanence
  - Leakage
  - Uncertainty
  - Additionality
- Needed functions
  - Measurement
  - Aggregation

## What we skip in rest of workshop

- Property rights issues
- Co benefits and how to handle
- Completeness of perspective
  - Inefficiency of single-strategy advocacy
  - Regional comparative advantage