Resilient Agriculture Conference 2014
Ames, Iowa
August 5-7, 2014

Market Demand for Commodities with a Light Environmental Footprint

American Carbon Registry

WINROCK INTERNATIONAL

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ENVIRONMENTAL RESOURCES TRUST
WINROCK INTERNATIONAL

Presentation Objective

Stimulate thinking about how to enable markets that provide incentives and rewards for farmers who are able to deliver a differentiated set of products with desirable environmental attributes.

What Makes Environmental Markets Work?

Essential ingredients:

- **Willing customer**
  - e.g. motivated by health, environment, biodiversity, humane treatment, non-GMO, etc.
- **Clear definition of what is being traded and how it will be measured**
  - Grounded in established science
  - Transparency
  - Easy access to trustworthy information
- **Willing seller**
- **Clear policy**
- Clear chain of ownership
- Ability to meet quality standards
- Understanding of delivery schedule
- Fungibility of traded units

Market Examples

- Commodity markets for products with environmental attributes
- Markets for greenhouse gas (GHG) emission reductions and removals
- Water quality markets
- (Supply chain initiatives) ??

Commodity Markets

- Mercaris –new Trading Platform for organic, non-GMO & identity-preserved commodities
  - Standard and reverse auctions
  - Spot and forward auctions

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MERCARIS

Recent Price Data (August 4, 2014)

	Organic Corn (Mercaris)	Conventional Corn (CME)
National	$ 14.42 (Old Crop)	$3.55 (Sep)
	$ 12.49 (New Crop)	$3.65 (Dec)

	Organic Soybeans (Mercaris)	Conventional Soy (CME)
National	$ 27.23 (Old Crop)	$10.76 (Sep)
	$ 24.47 (New Crop)	$10.61 (Nov)

Source: Mercaris Data Service

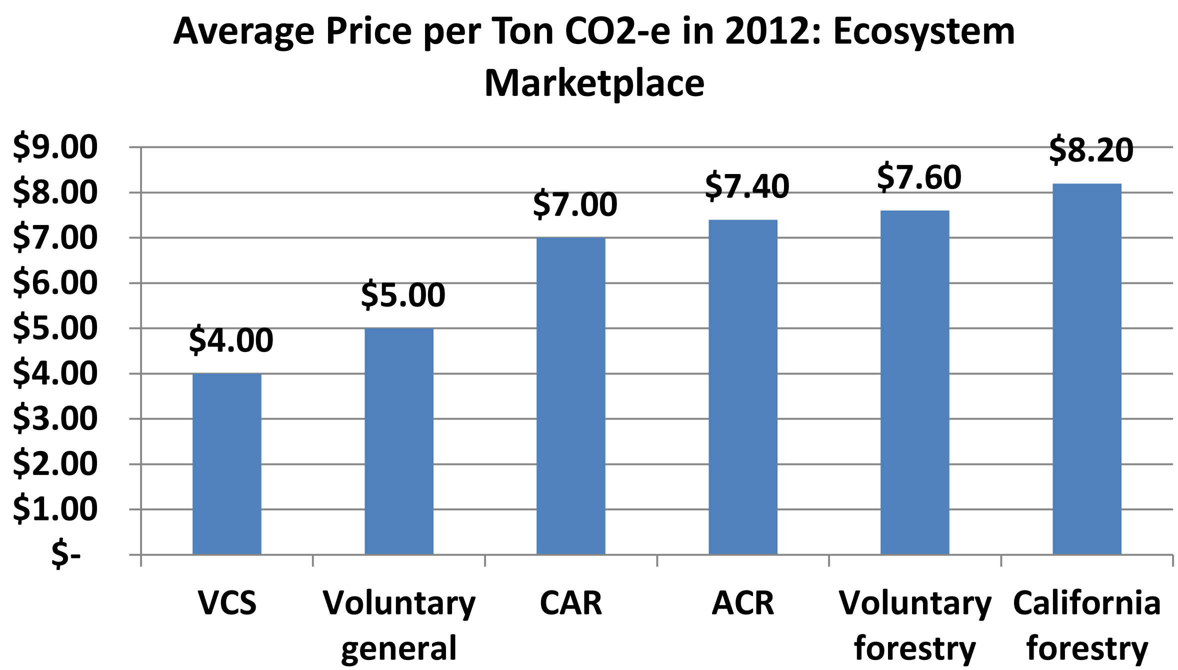
Ontario: Identity-Preserved Soybeans

- Market requirements (OAC Kent soybeans):
  - Buy certified seed
  - Meet all contract requirements
  - Deliver satisfactory quality to elevator:
    - e.g. moisture content, no contaminants, no GMOs
- Payment terms 2014:
  - Market price for OAC Kent soybeans +~$3/bushel

Source: Don McCabe, Ontario Federation of Agriculture

Greenhouse Gas Markets

- California compliance market
  - ~200 million tons through 2020
  - Allowance floor price 2014: $11.34/tCO_2e$
- Voluntary market



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- Began serving voluntary markets in 1996
- Approved Offset Project Registry (OPR) for the California compliance market in 2012
- Special interest to develop agriculture and forestry methodologies
- Over 40 million tons registered

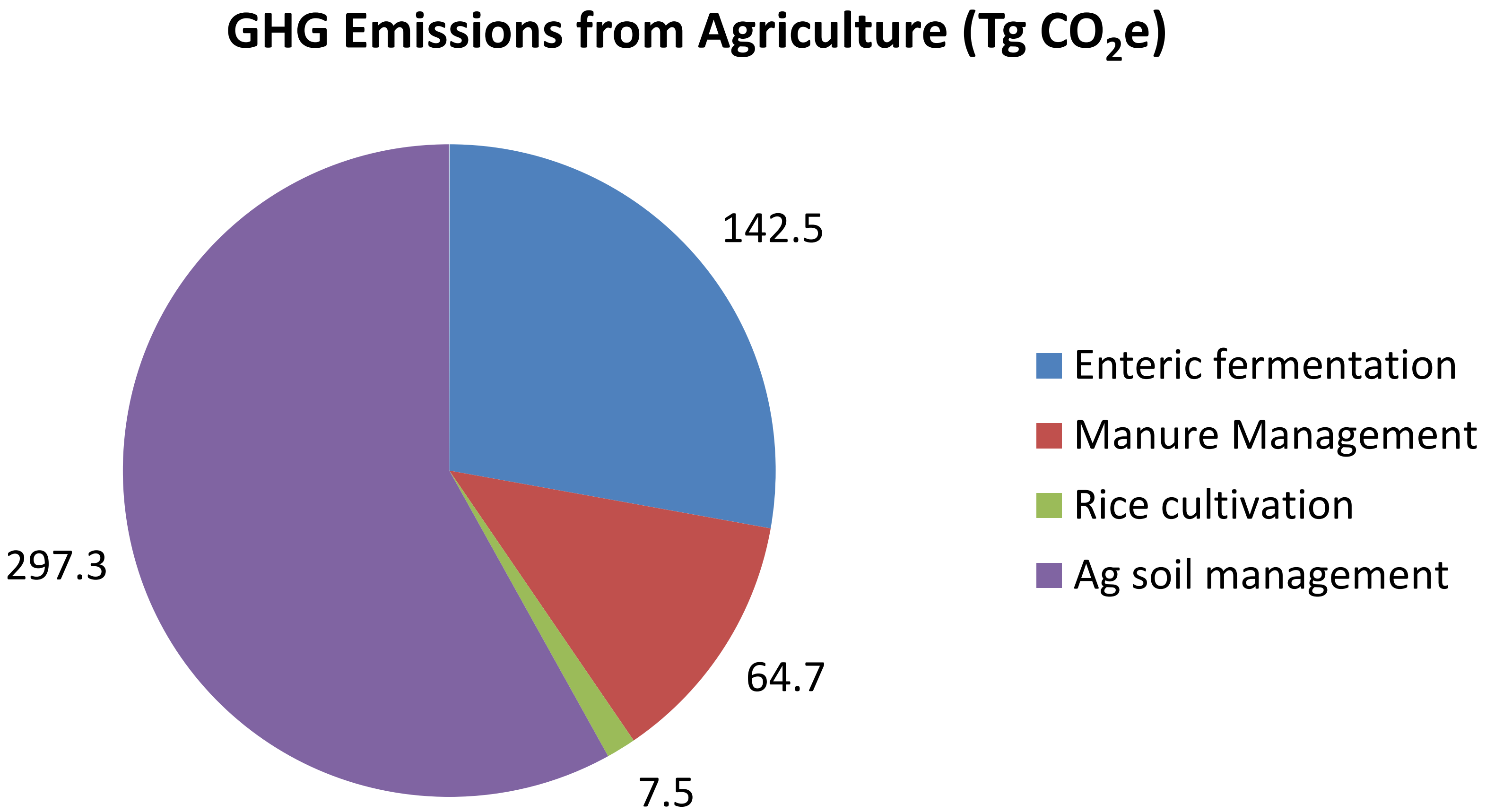
Registry Purpose

- Review and register projects
- Oversee independent third party verification
- Strengthen market confidence
- Innovate and motivate

Offsets from Agriculture

- Chicago Climate Exchange (CCX) experience
  - What caused loss of willing buyer?
- Challenging for agriculture to define and measure what is being traded
  - Agriculture sources and sinks
  - Changing science
  - Can we afford to measure and verify?
  - *Can we distinguish signal from noise?*

Agriculture Emissions by Category



Inventory of U.S. Greenhouse Gas emissions and Sinks 1990—2012, (April 2014) EPA 430-R-14-001.

Agriculture and Land Use Sources

Table 6-1: Emissions from Agriculture (Tg CO_2 Eq.)

Gas/Source	1990		2005		2008	2009	2010	2011	2012
CH_4	**177.3**		**197.7**		**206.5**	**204.7**	**206.2**	**202.4**	**201.5**
Enteric Fermentation	137.9		142.5		147.0	146.1	144.9	143.0	141.0
Manure Management	31.5		47.6		51.5	50.5	51.8	52.0	52.9
Rice Cultivation	7.7		7.5		7.8	7.9	9.3	7.1	7.4
Field Burning of Agricultural Residues	0.3		0.2		0.3	0.2	0.2	0.3	0.3
N_2O	**296.6**		**314.5**		**336.9**	**334.2**	**327.9**	**325.8**	**324.7**
Agricultural Soil Management	282.1		297.3		319.0	316.4	310.1	307.8	306.6
Manure Management	14.4		17.1		17.8	17.7	17.8	18.0	18.0
Field Burning of Agricultural Residues	0.1		0.1		0.1	0.1	0.1	0.1	0.1
Total	**473.9**		**512.2**		**543.4**	**538.9**	**534.2**	**528.3**	**526.3**

Inventory of U.S. Greenhouse Gas emissions and Sinks 1990—2012, (April 2014)
EPA 430-R-14-001.

GHG Emission Sources and Sinks

- “Clear definition” of the Global Warming Potential (GWP) for carbon dioxide, methane, nitrous oxide is evolving.

	GWP_{100} IPCC 2^{nd} Report	GWP_{100} IPCC 5^{th} Report	GWP_{20} IPCC 5^{th} Report
Carbon Dioxide	1	1	1
Methane	21	34	86
Nitrous oxide	310	298	268

US GHG Inventory still uses Global Warming Potential (GWP) values published in the IPCC Second Annual Assessment Report (1996).

GHG Potential for Various Ag Practices

Practice	Potential (tCO_2e per acre per year)	Potential area (million acres)
Reduce N rate 15%	0.36	168
Change fertilizer source (ammonium to urea)	0.42	91
Slow-release fertilizer	0.11	230
Change placement	0.37	156
Change timing	0.20	131
Nitrification inhibitors	0.63	227
Winter cover crops	1.57	162
Change rice water management	1.81	3.2
Lower-GHG rice cultivars	0.76	3.2
Rotational grazing on pasture (soil C only)	1.17	103

Olander, Lydia et al Nov 2011. T-AGG report and policy brief: *Assessing GHG Mitigation Opportunities and Implementation Options for Agricultural Land Management in the United States*.

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Current ACR Methodologies for Agriculture

- Fertilizer N management
- Rice management
- Grazing land
- Avoided conversion of grasslands
- Enteric methane
- Wetlands

Agriculture and Land Use Sinks

Table 7-1: Net CO_2 Flux from Carbon Stock Changes in Land Use, Land-Use Change, and Forestry (Tg CO_2 Eq.)

Sink Category	1990		2005		2008	2009	2010	2011	2012
Forest Land Remaining Forest Land[a]	(704.6)		(927.2)		(871.0)	(849.4)	(855.7)	(867.1)	(866.5)
Cropland Remaining Cropland	(51.9)		(29.1)		(29.8)	(29.2)	(27.6)	(27.5)	(26.5)
Land Converted to Cropland	26.9		20.9		16.8	16.8	16.8	16.8	16.8
Grassland Remaining Grassland	(9.6)		5.6		6.8	6.8	6.7	6.7	6.7
Land Converted to Grassland	(7.3)		(8.3)		(8.7)	(8.7)	(8.6)	(8.6)	(8.5)
Settlements Remaining Settlements[b]	(60.4)		(80.5)		(83.9)	(85.0)	(86.1)	(87.3)	(88.4)
Other (Landfilled Yard Trimmings and Food Scraps)	(24.2)		(12.0)		(11.2)	(12.9)	(13.6)	(13.5)	(13.0)
Total	**(831.1)**		**(1,030.7)**		**(981.0)**	**(961.6)**	**(968.0)**	**(980.3)**	**(979.3)**

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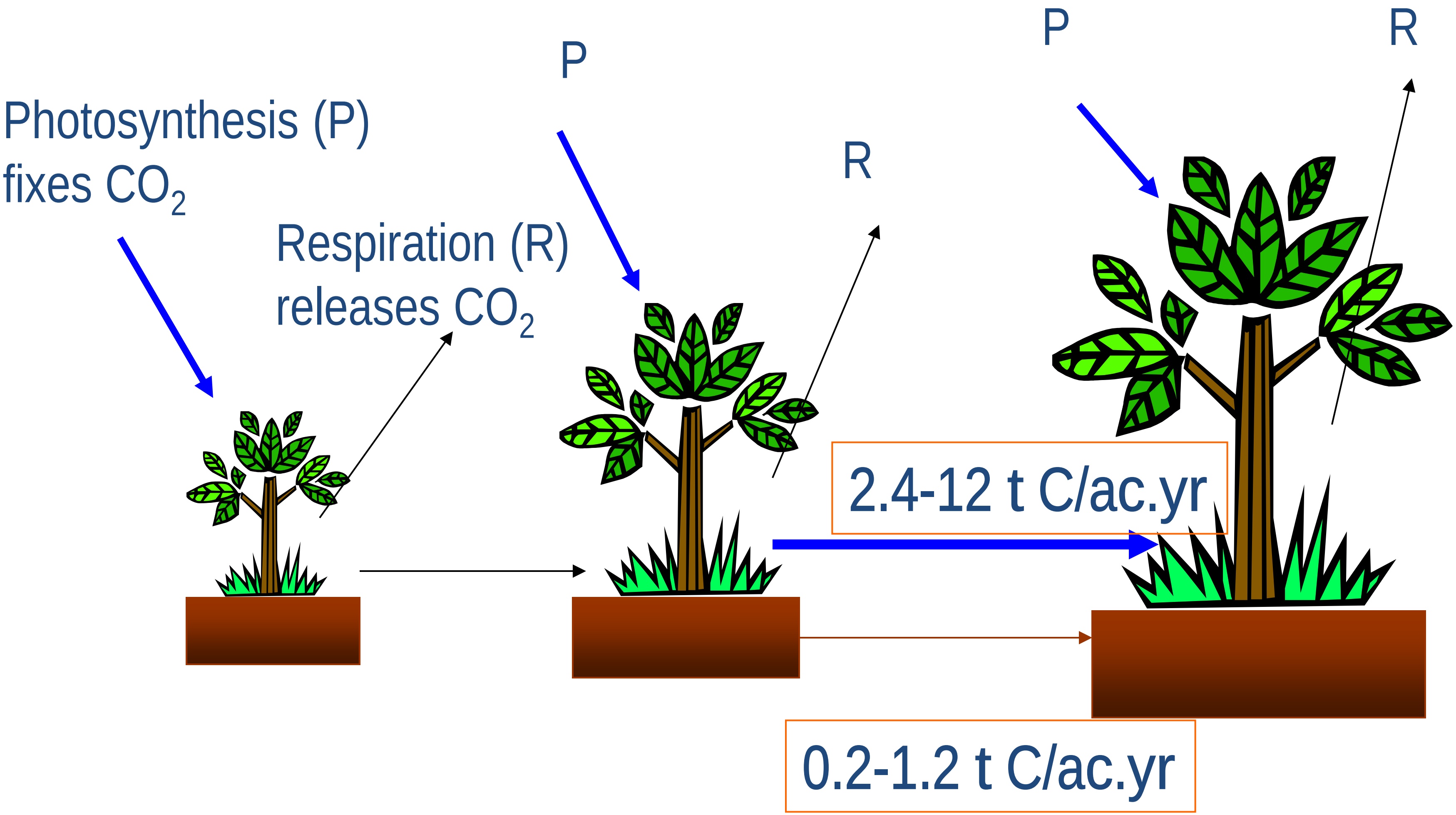
EPA 430-R-14-001.

At What Rate Does Carbon Accumulate?



Water Quality Markets

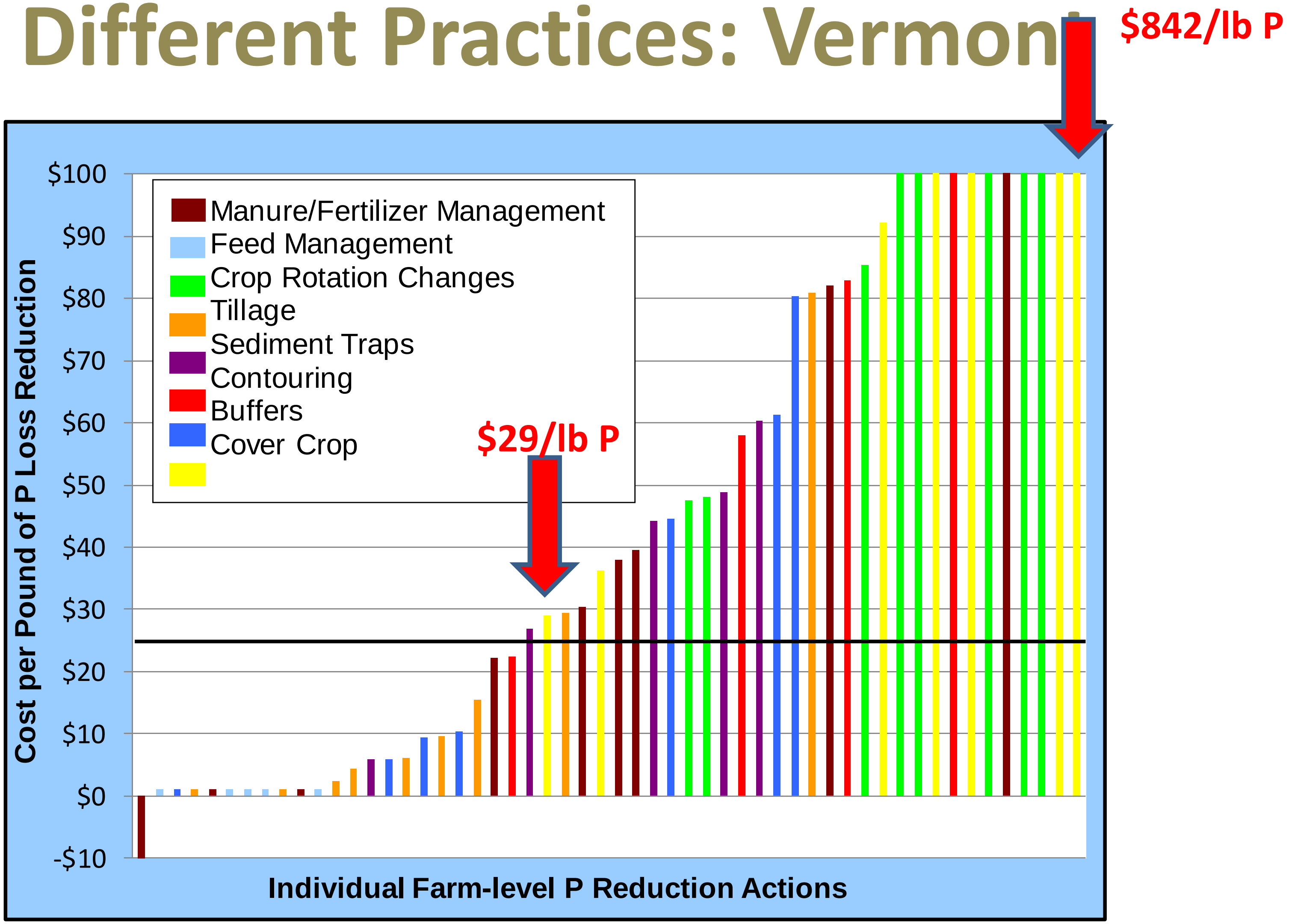
Are there willing buyers?

- Wisconsin Act 378 (passed this Spring)
  - Wisconsin Water Treatment Plants pay $50/lb of P loss abatement; at least 65% goes to farm ($32.50/lb)
- EPRI Ohio River Basin Water Quality Trading
  - Unbundle credit and they say that N and P are each worth $10/lb.

Water Quality Markets

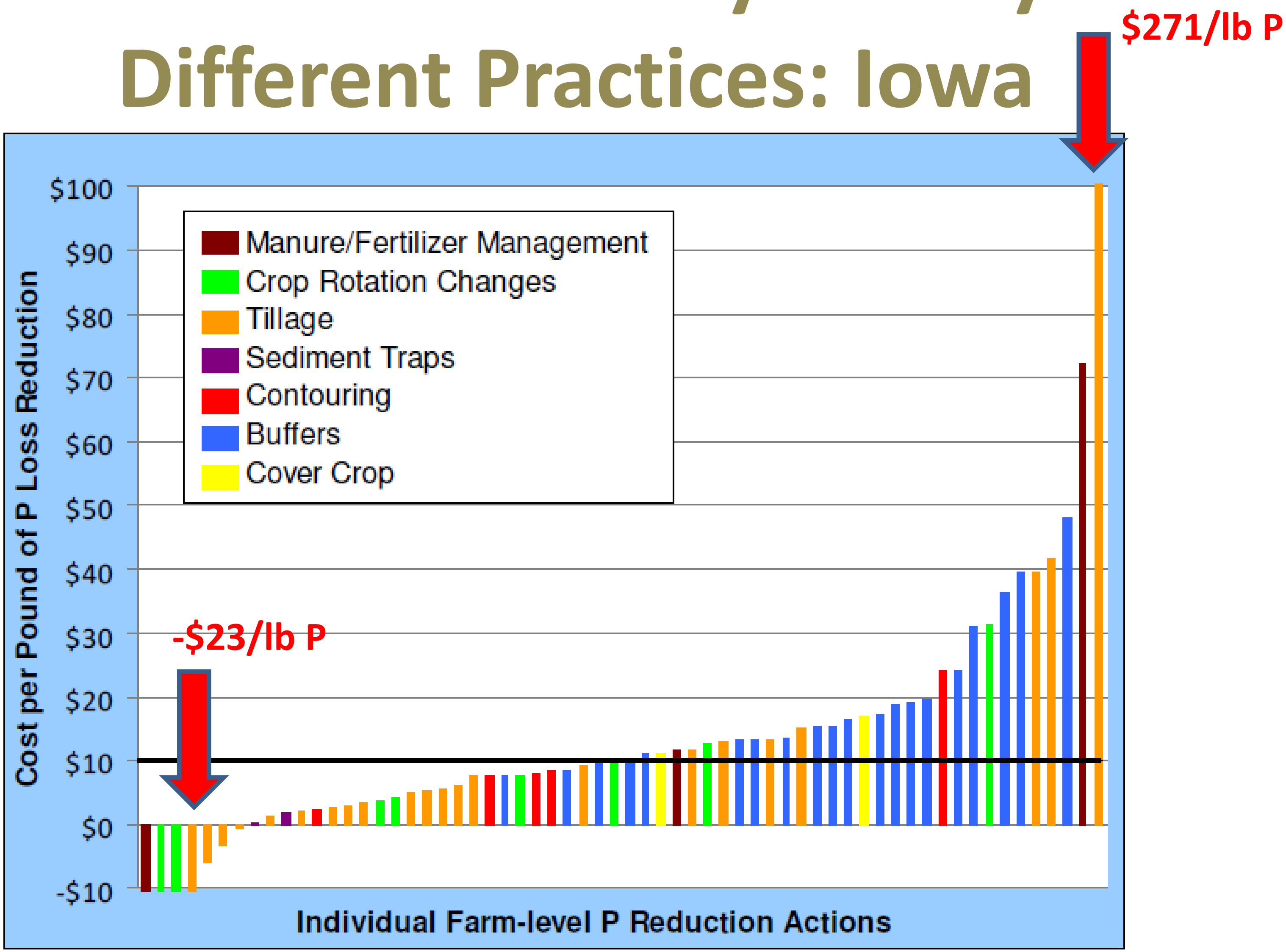
- Can we measure performance?
  - Different practices have different results depending on where they are applied
  - Can models accurately quantify phosphorous or nitrogen reductions for a specific practice carried out in a specific field?
  - Are there meaningful proxy measurements?
  - Payment is made for performance not for practice

Reduction Costs Vary Widely for Different Practices: Vermont



Results from pilot tests in Vermont of pay-for-performance approaches to reducing phosphorous under a USDA Conservation Innovation Grant 2006-2010.

Reduction Costs Vary Widely for Different Practices: Iowa



Results from pilot tests in Iowa of pay-for-performance approaches to reducing phosphorous under a USDA NRCS Conservation Innovation Grant 2006-2010.

Variables Affecting Performance

- Physical Factors
  - Slope
  - Soil P concentration
  - Distance to surface water
  - Soil type
- Management Factors
  - Tillage method and timing
  - Fertilizer method, timing, placement
  - Crop rotation

Note: these are just a subset…..

Supply Chain Initiatives

- Where is willing customer?
  – Many recent corporate announcements committing to "sustainable" supply chains
  – Primary actions to date focus on reporting requirements and data collection
- How will "sustainability" be sold and how will it be measured and assured?

Summary

- Market mechanisms offer the most cost effective way to achieve environmental objectives
- U.S. farmers need better differentiation of products to capture value of superior environmental performance
- Science and measurement can do more to strengthen market confidence