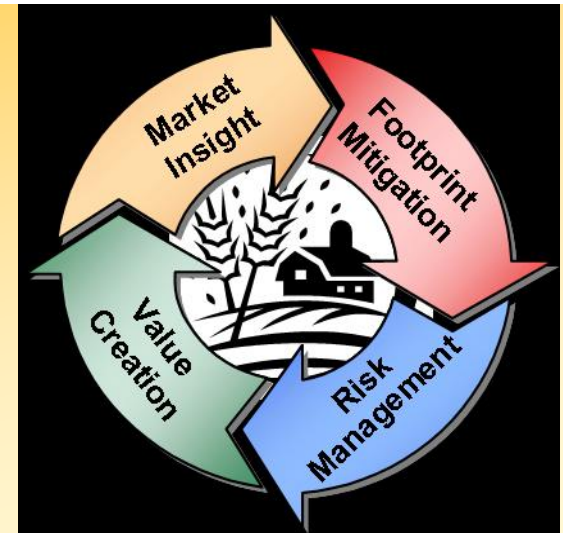




*An integrated agribusiness consulting and investment advisory firm*

# GIC's Agricultural Carbon Index (GIC-ACI)



A Presentation for  
The Society of Government  
Economists  
February 18, 2010



# Presentation Overview

**Introduction of the GIC Group**

**GIC's Ag Carbon Index and the Carbon Market**

**Index Applications and Investment Opportunity**



# GIC Group – Company Overview

GIC is a 29-year old international agribusiness consulting company





# GIC's Carbon Advisory Services

## Three Core Areas

### Market Consulting & Policy Analysis

- Climate Change Policy
- Kyoto Protocol
- US & International Legislation
- Carbon Markets
- Carbon Credit -- Allowance Trading Schemes

### Financial & Advisory Services

- Risk Management
- Investment Strategies
- Due Diligence
- Valuation Analysis
- Carbon Credit Offset Transaction Services
- Carbon Market Indexes

### Partnership with ClearCarbon Inc.

- Carbon Footprint Measurement
- Carbon Emissions Monitoring & Tracking
- Mitigation Strategies
- Analysis & Valuation of Carbon Mitigation Technologies & Products



# GIC's Ag Carbon Index – Overview

## GIC Agriculture Carbon Index GIC-ACI

- Captures GHG footprint of agribusiness worldwide
  - Input sector
  - Production agriculture
  - Value-added sector
- Transparent, ag sector-specific carbon price discovery tool.
- Hedging instrument for carbon offsets and allowances.
- Due diligence tool for balance sheet valuation in M&A transactions.
- Instrument for estimating and valuing ag-related carbon mitigation technologies.



# Agribusiness's GHG Profile

**Two sub-segments: Production Agriculture and the Secondary Industries, Input and Value-Added sectors.**

	<b>Developed Countries*</b>	<b>Advanced Developing Countries*</b>
Production Agriculture Ex: Livestock, crop cultivation	5 to 25 percent	20 to 35 percent
Secondary Industries (Input & Value-Added Sectors) Ex: Chemical manufacturers, feed companies, food and beverage producers, pulp and paper mills, biofuels	5 to 15 percent	5 to 15 percent

**Production agriculture and related secondary agro-industries are significant sources of methane, CO<sub>2</sub>, and N<sub>2</sub>O.**

**\*Data based on GIC's analysis of National GHG Inventory Reports Submitted to the UNFCCC**



# Forest Products Industries and Land Use Categories



## Forest Products also highly integrated

- Timber production (primary)
  - Lumber
  - Pulp & Paper
  - Flooring
  - Biomass/Biofuels
- (secondary)



## Land use, Land use change, and Forestry (LULUCF)

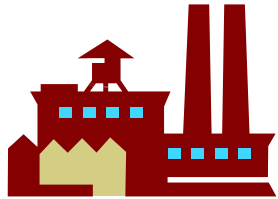
- Forest lands
  - Crops lands
  - Grasslands and Pasture
- Potential Carbon Sink

- US land-based carbon sinks reduce net emissions by 1.1 gigatons of CO<sub>2</sub> equivalent.
- Massive deforestation in Brazil and Indonesia accounts for 62% and 84% of each country's GHG emissions.



# Agribusiness's Emissions Map

## Industry Inputs



### Emissions Sources

#### Chemical & Fertilizer Producers

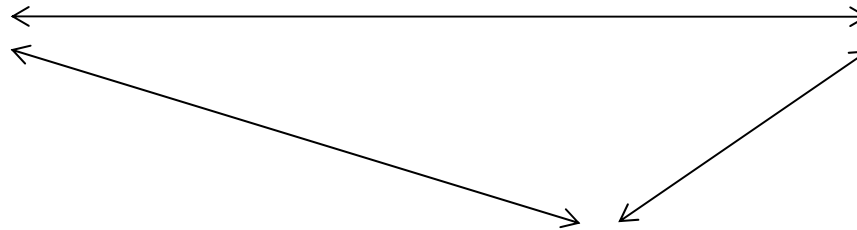
- Waste/by-products
- Energy consumption
- Chemical inputs

#### Seed, Feed & Biotech Companies

- Contribute to animal waste
- Require pesticides/fertilizers
- Energy consumption

#### Energy Suppliers

- Carbon intensive sources
- Waste/by-products (coal)



## Secondary Production



### Emissions Sources

#### Food & Beverage Producers

- Energy consumption
- Biomass waste/by products
- Chemical inputs

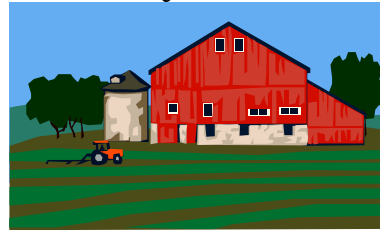
#### Biofuel Manufacturers

- Energy consumption
- Biomass waste/by-products

#### Slaughterhouse/Processors

- Biomass waste/by-products
- Energy consumption

## Primary Producer



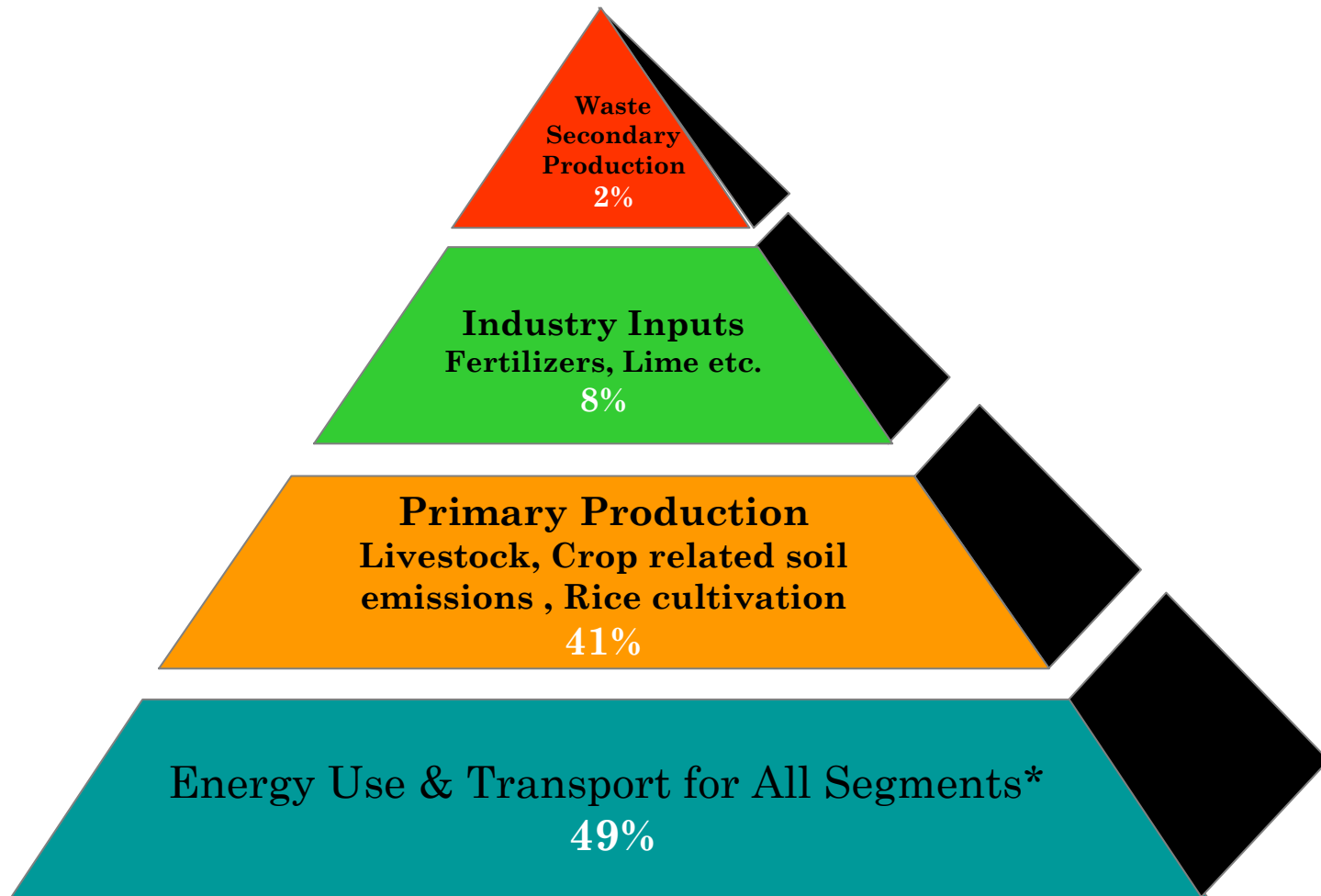
### Emissions Sources

- Animal waste
- Chemical use fertilizers/nitrogen
- Fuel/energy consumption
- Land use change
- Soil tillage
- Waste water
- Field burning of crop residues
- Rice cultivation





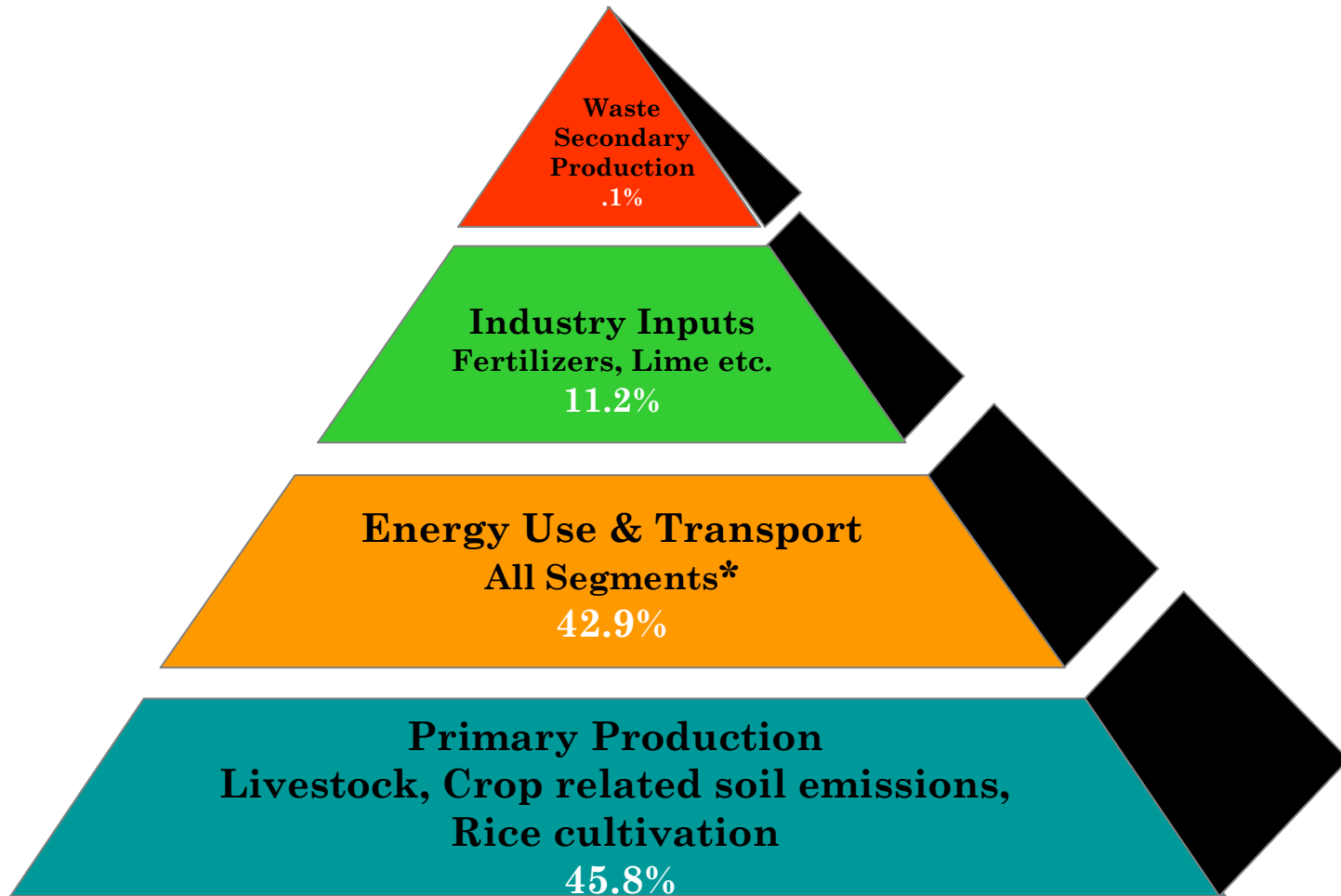
# U.S. Agribusiness Emissions Pyramid



*\* Includes the carbon emissions from biofuels and ethanol production and usage*



# EU-27 Agribusiness Emissions Pyramid

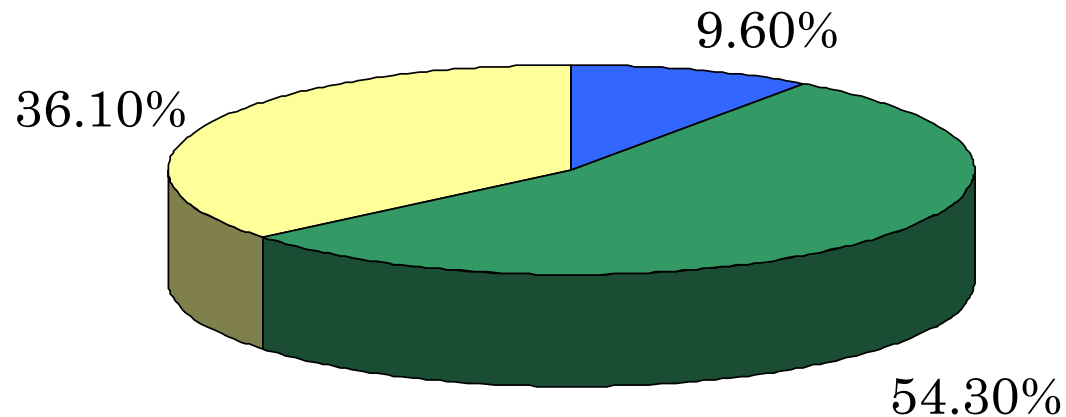


*\* Includes the carbon emissions from biofuels and ethanol production and usage*



# Breakdown of U.S. Ag Emissions

## Share of U.S. Agribusiness GHG Emissions\*



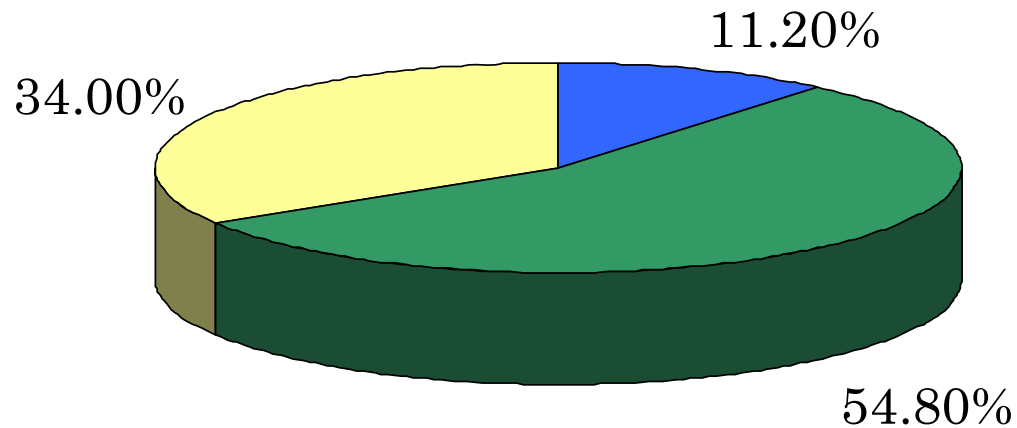
- Industry Inputs
- Production Agriculture
- Secondary Value-Added Production/Processing

\*Data based on GIC's analysis of National GHG Inventory Reports Submitted to the UNFCCC



# Breakdown of EU-27 Ag Emissions

Share of Eu-27 Agribusiness  
GHG Emissions\*

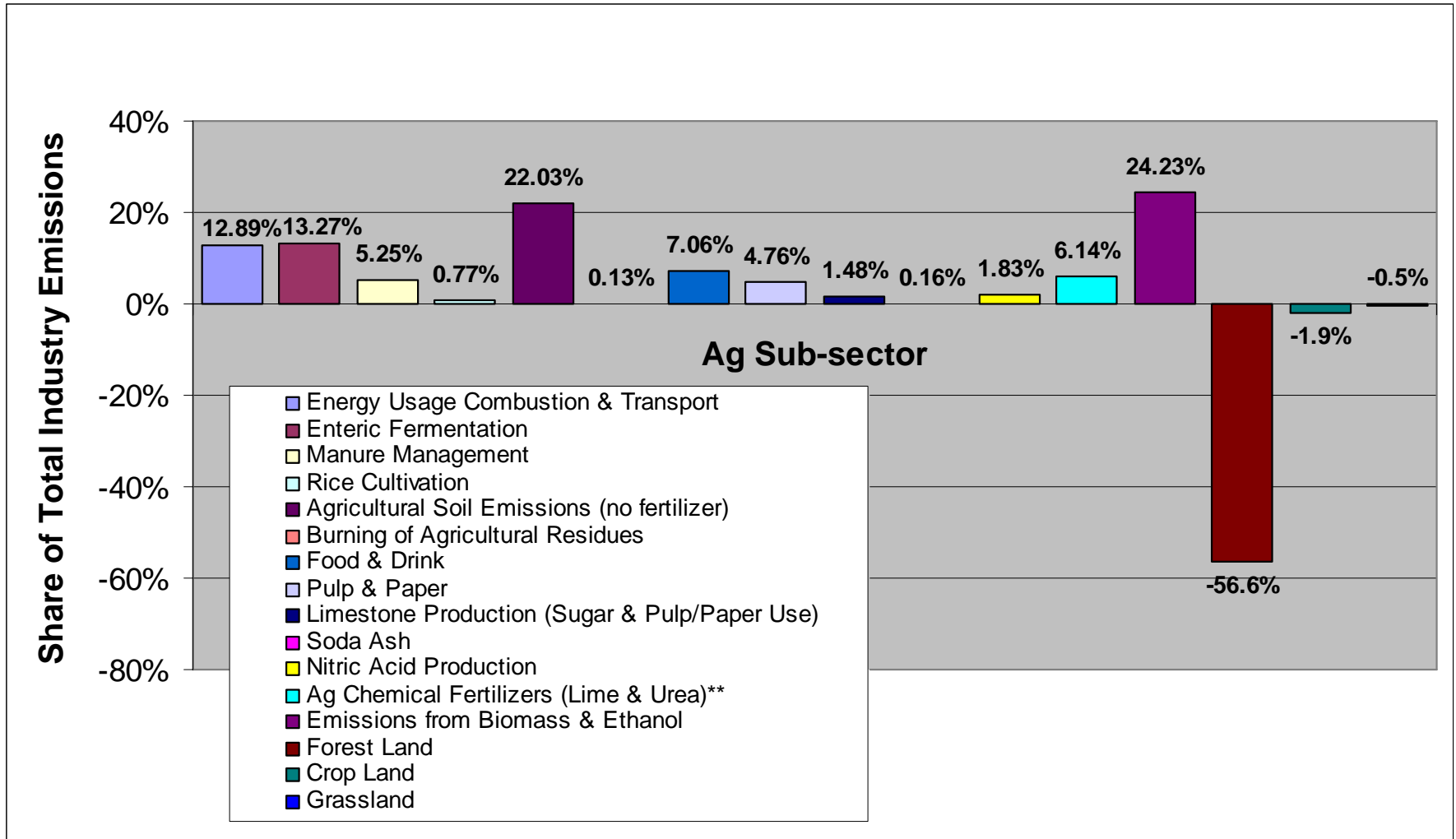


- Industry Inputs
- Production Agriculture
- Secondary Value-Added Production/Processing

\*Data based on GIC's analysis of National GHG Inventory Reports Submitted to the UNFCCC



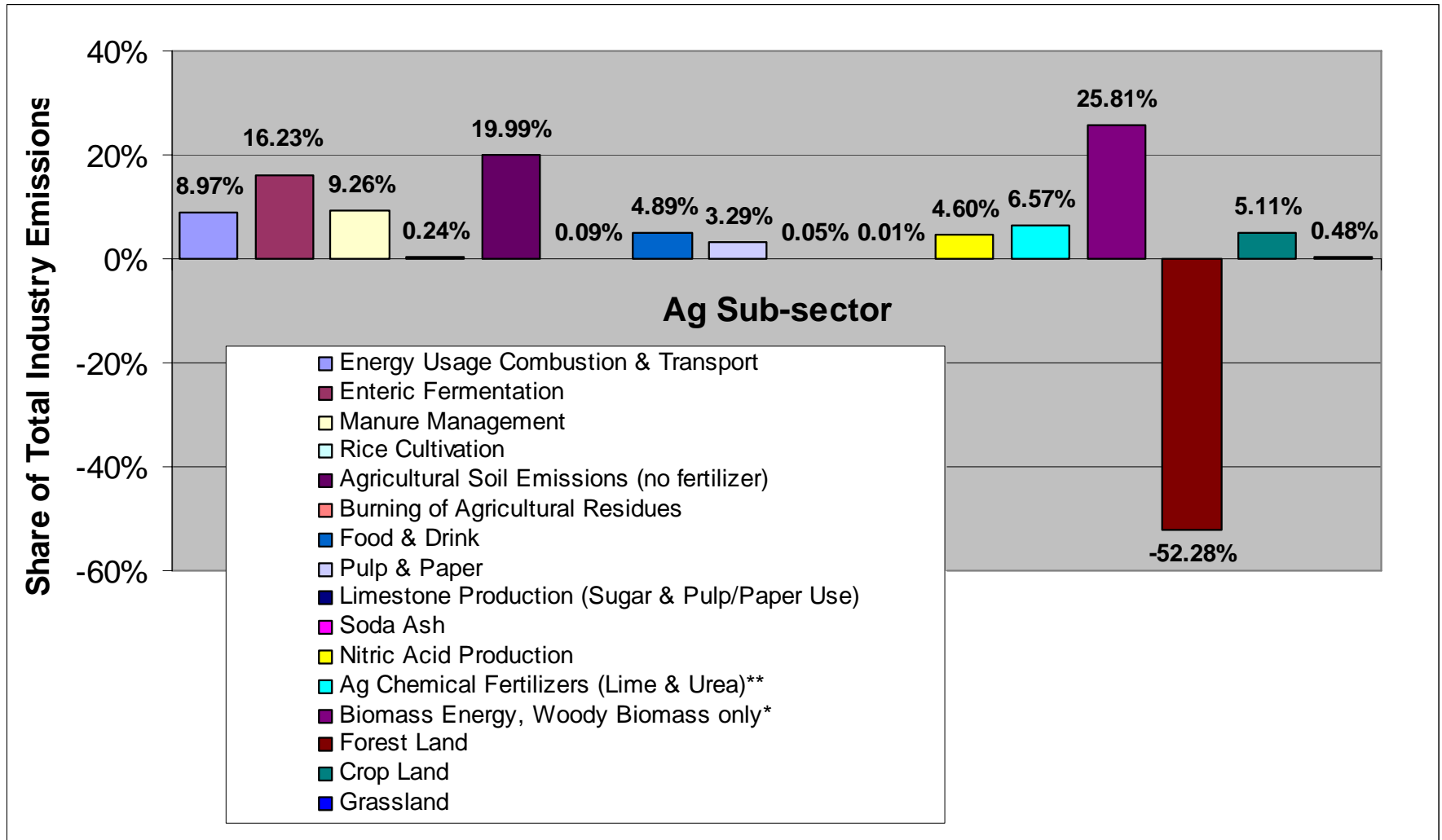
# US Agribusiness Emissions by Sub-sector



\*Data based on GIC's analysis of National GHG Inventory Reports Submitted to the UNFCCC



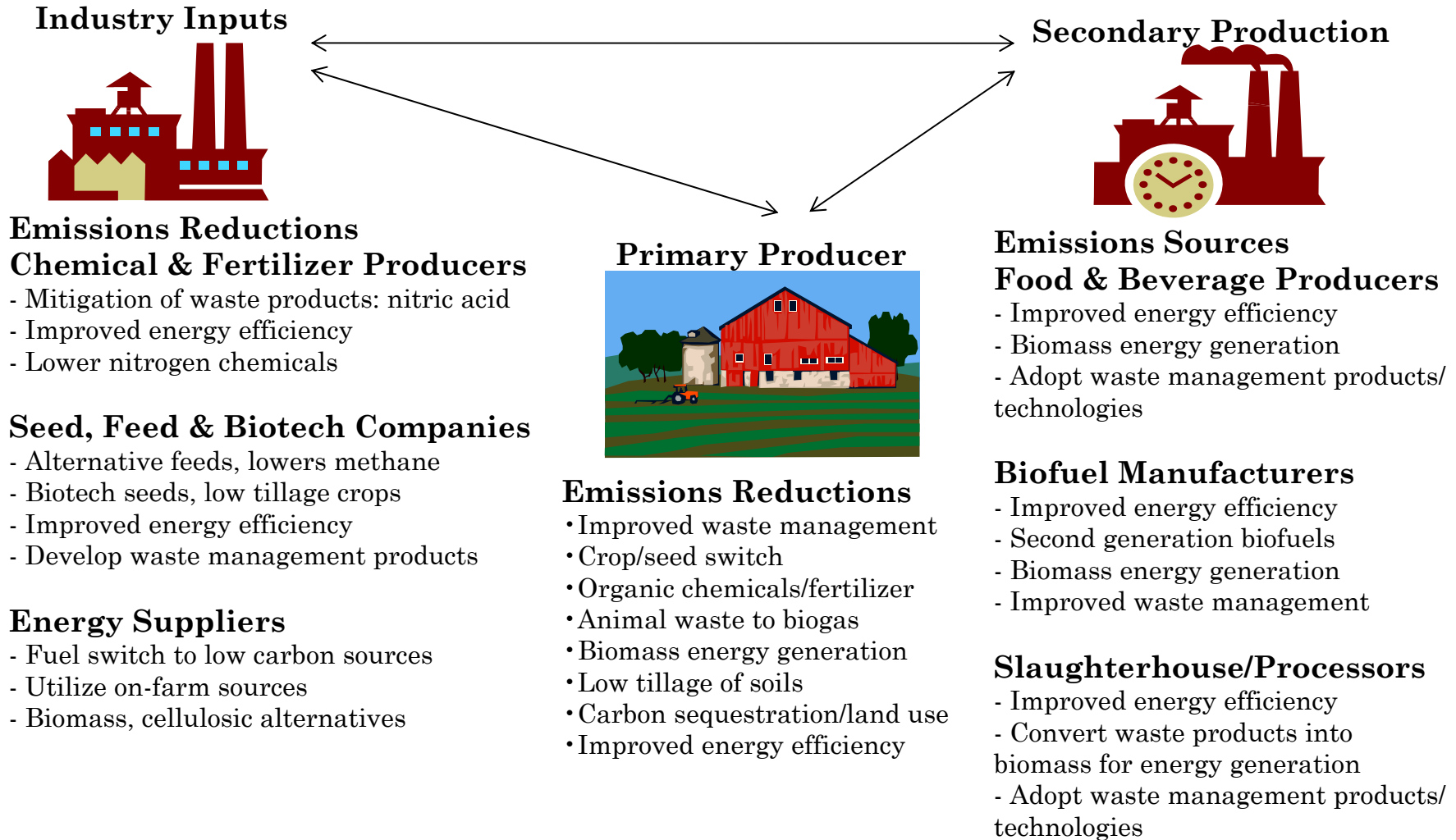
# EU-27 Agribusiness Emissions by Sub-sector



\*Data based on GIC's analysis of National GHG Inventory Reports Submitted to the UNFCCC

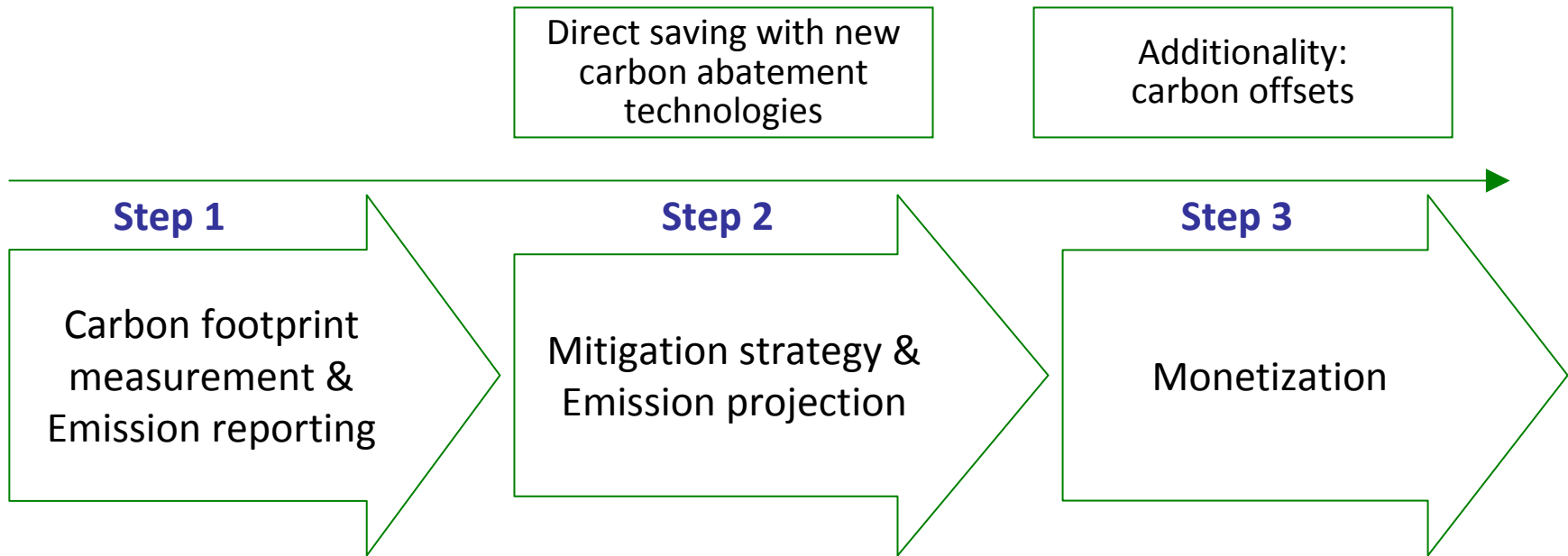


# Agribusiness's Opportunity





# Financial Gains From Introduction of Abatement Technologies



➤ Expected cost to comply with the EPA reporting requirements to the private sector

Total cost ( <i>million</i> )- <i>estimated</i>		Number of facilities	Ave. cost per facility	
First year	Second year		First year	Second year
\$115	\$72	10,000	<b>\$11,500</b>	<b>\$7,200</b>





# Financial Gains From Introduction of Abatement Technologies

## Biotech rice seed

Yield Increase			
Average Yield MT/Ha	Increase of Yield MT/Ha	\$/MT Value	\$/Ha Increased Value
4.63	0.69	\$ 365.20	\$ 253.45

Nitrogen Efficiency			
Average Application kg/ha	Reduced N Usage kg/ha	Nitrogen Cost \$/kg	Nitrogen Usage Savings \$/Ha
145	29	1.09	\$ 31.61

GHG Emission Offsets			
Reduced N Usage kg / ha	GHG Emission Reduced (kg CO2e / ha)	Emission offset price (\$/CO2e)	Carbon Reductions Value (\$ / ha)
29	654.6	\$ 10.00	\$ 6.55

China's Rice Acreage (ha)	Total Financial Gains (Million \$)
29,200,000	\$ 8,515

China's Rice Acreage (ha)	Carbon Reductions Value (\$ / ha)	Total Value of Carbon Offsets (Million \$)
29,200,000	\$ 6.55	\$ 191.26

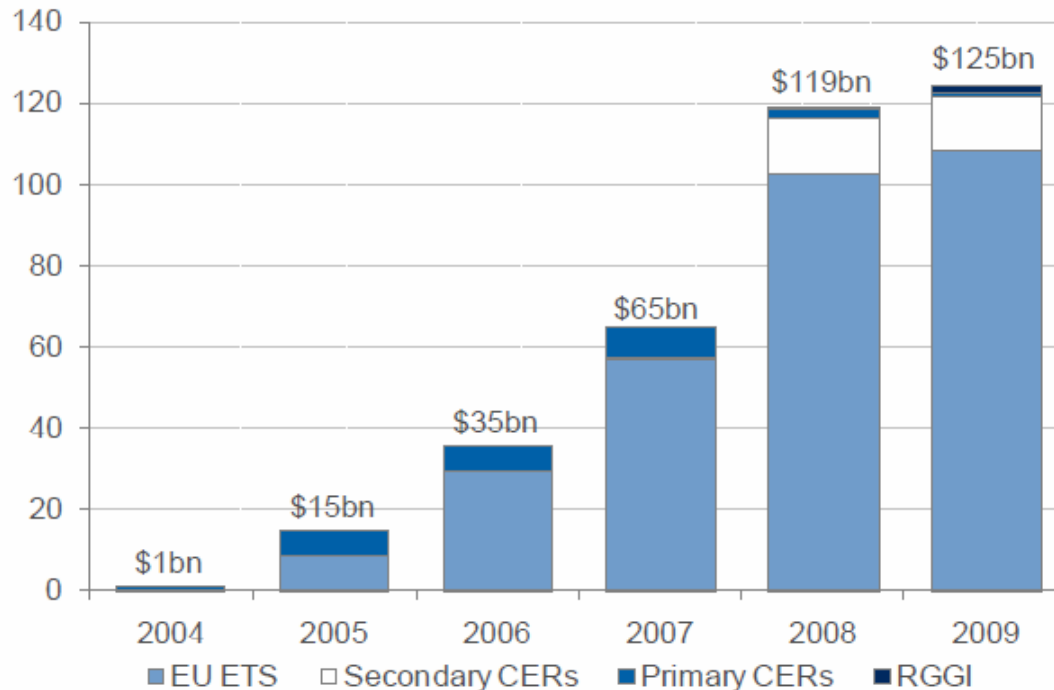
GIC-ACI is used as a global carbon price discovery mechanism for agribusiness

According to results of the trials conducted in China.



# Overview of Global Carbon Market

Global carbon market size 2004–09 (\$bn)



Source: Trading figures taken from ECX, Bluenext, EEX, Reuters, CCX, LEBA

**The global carbon market increased 5% in 2009 in terms of value, compared with 83% in 2008.**

— In spite of the recession and associated decline in buyer appetite for carbon products, value increased across all major markets, including the EU ETS and the secondary CER market



# 2009 Changes in the Carbon Market

Growth in carbon market, value (\$bn)

		2008	2009	% change
EU ETS	Exchange traded	40	58	45
	OTC, cleared across exchange	8.6	8.1	-6
	OTC	54	42	-22
	Auctioned	—	—	—
<b>Total</b>		<b>103</b>	<b>108</b>	<b>5</b>
sCERs	Exchange traded	4.1	3.8	-7
	OTC, cleared across exchange	1.8	1.6	-11
	OTC	7.9	8.3	5
<b>Total</b>		<b>13.9</b>	<b>13.6</b>	<b>-2</b>
pCERs		2	0.8	-60
<b>Total CER market</b>		<b>15.9</b>	<b>14.4</b>	<b>-9</b>
AAUs <sup>1</sup>		0.57	1.6	181
RGGI	Exchange	—	2.3	—
	Auctioned	0.15	0.33	120
CCX		0.3	0.01	-96
NSW		—	—	—
Voluntary market		0.07	0.04	-43
<b>Total</b>		<b>119.9</b>	<b>126.6</b>	<b>5.5</b>

Source: Bloomberg New Energy Finance, trading figures taken from ECX, Bluenext, EEX, Reuters, CCFE, LEBA

Carbon market volume (MtCO<sub>2</sub>e)

		2008	2009	% change
EU ETS	Exchange traded	1,155	2,928	154
	OTC, cleared across exchange	236	409	73
	OTC	1,521	2,090	38
	Auctioned	44	72	64
<b>Total</b>		<b>2,956</b>	<b>5,499</b>	<b>86</b>
sCERs	Exchange traded	151	211	40
	OTC, cleared across exchange	68	91	34
	OTC	300	474	58
<b>Total</b>		<b>519</b>	<b>776</b>	<b>50</b>
pCERs		117	73	-37
<b>Total CER market</b>		<b>636</b>	<b>849</b>	<b>33</b>
AAUs		48	136	183
RGGI	Exchange	8.2	700	—
	Auctioned	40	109	173
CCX		69	41	-41
NSW		31	33	6
Voluntary market		8.7	8.3	-5
<b>Total</b>		<b>3,797</b>	<b>7,375</b>	<b>94</b>

- Source: New Energy Finance, January 2010



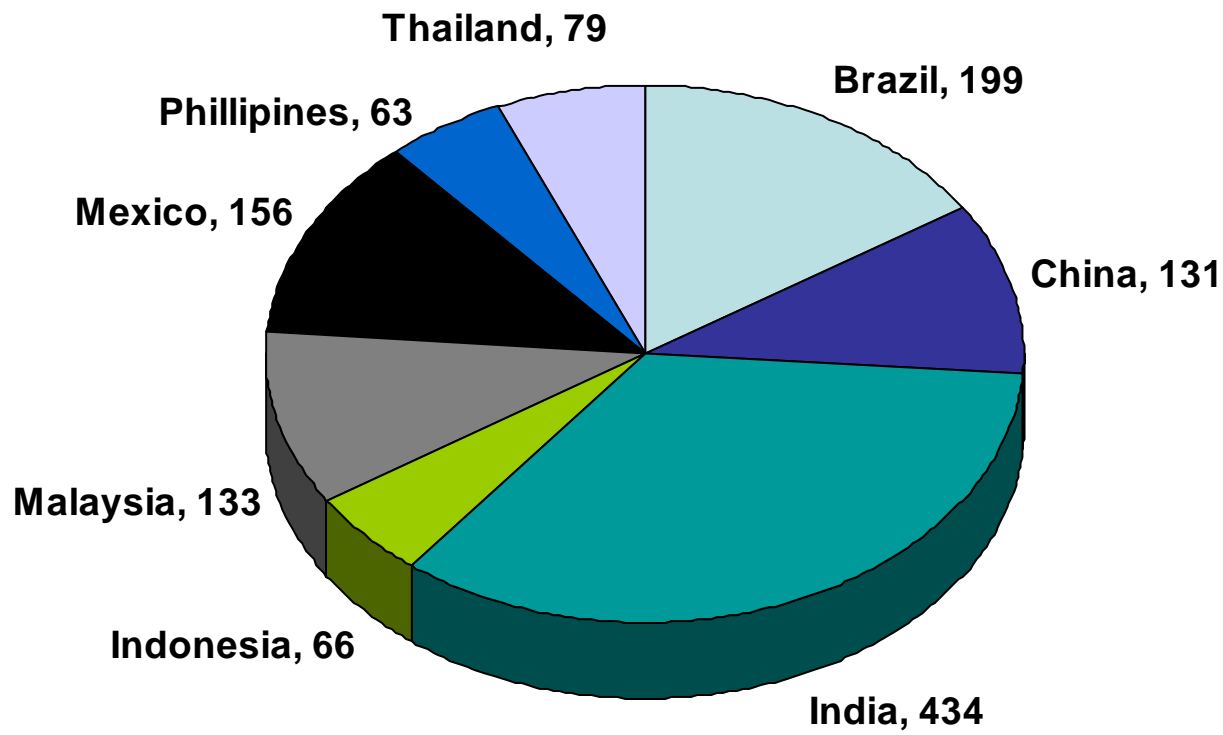
# Agribusiness in the CER Market: Overview

- **CDM project pipeline has 1460 ag-related projects, 2009**
  - A total of 471 have been registered, of which 159 have received CERs.
  - Total issued CERs ag projects amount to 17.6 million or 8.1% of the total.
  - Estimated value at spot price of 11.20 Euro is over 197 million Euro.
- **Long-term trends and projections for Ag-related CERs by 2012**
  - Cumulative Ag-CERs by 2012 is 457 million and by 2020 1.1 billion Euro.
  - Est. cumulative value by 2012 is 5.2 billion Euro & 12.2 billion Euro by 2020.
  - Ag-related CERs will grow to 15% of the total value of the CDM pipeline.



# Agribusiness in the CER Market: Breakdown by Country

Eight countries account for 86% of the ag-related projects in the CDM Pipeline





# Agribusiness in the EUA Market: Overview

- European Union Emissions Trading Scheme (EU-ETS)
  - Primarily covers CO<sub>2</sub> emissions\*
    - \*Netherlands added allocations for 3 nitric acid plants in Phase II
  - Only secondary agro-industries (food and beverage, pulp and paper, and chemical manufacturing), in the scheme.
    - \*Account for about 4% of EU emissions.
  - Production agriculture (**not covered**) accounts for 10% of all EU GHG emissions and other GHGs from secondary ag industries are about 5% of total EU GHG emissions.
  - In Ireland, France, Denmark, Spain and Sweden, production agriculture accounts for more than 10% of all GHG emissions.



# New International Opportunities for Agriculture & Carbon

- Mexico, a major destination for CDMs, has called for binding emissions targets at the national level, as well as the creation of a NAFTA-wide cap & trade system.
  - California-based Climate Action Reserve (C-CAR) recently authorized new protocols that allow for Mexican based landfill and livestock methane destruction projects to register for offset credits.
  - Mexico has also pushed forward the idea of developing a \$10 billion global climate fund to support offset activities and technology transfers to developing economies.
- Canada's new baseline and credit system allows for purchase of international offsets of up to 10% of emission reduction requirements.



# US Marketplace: Current Opportunities and Cap & Trade

- **RGGI, first US regional cap & trade scheme**
  - 110 million allowances sold in four auctions worth more than \$366 million
  - Just power sector is covered.
  - Offsets projects in production agriculture: livestock, biomass/fuel switch projects, afforestation
- **US Cap & Trade: American Clean Energy & Security Act (ACES)**
  - Up to 2 billion offsets for compliance. 1 billion domestic & up to 1.5 billion international. International offsets discounted 1.25/1.
  - USDA responsible for offset categories and requirements.
  - A five-year moratorium on including an indirect land-use charge for biofuels. The USDA, EPA, and DOE will study and calculate impact of indirect land-use in the lifecycle GHG emissions profile of biofuels.



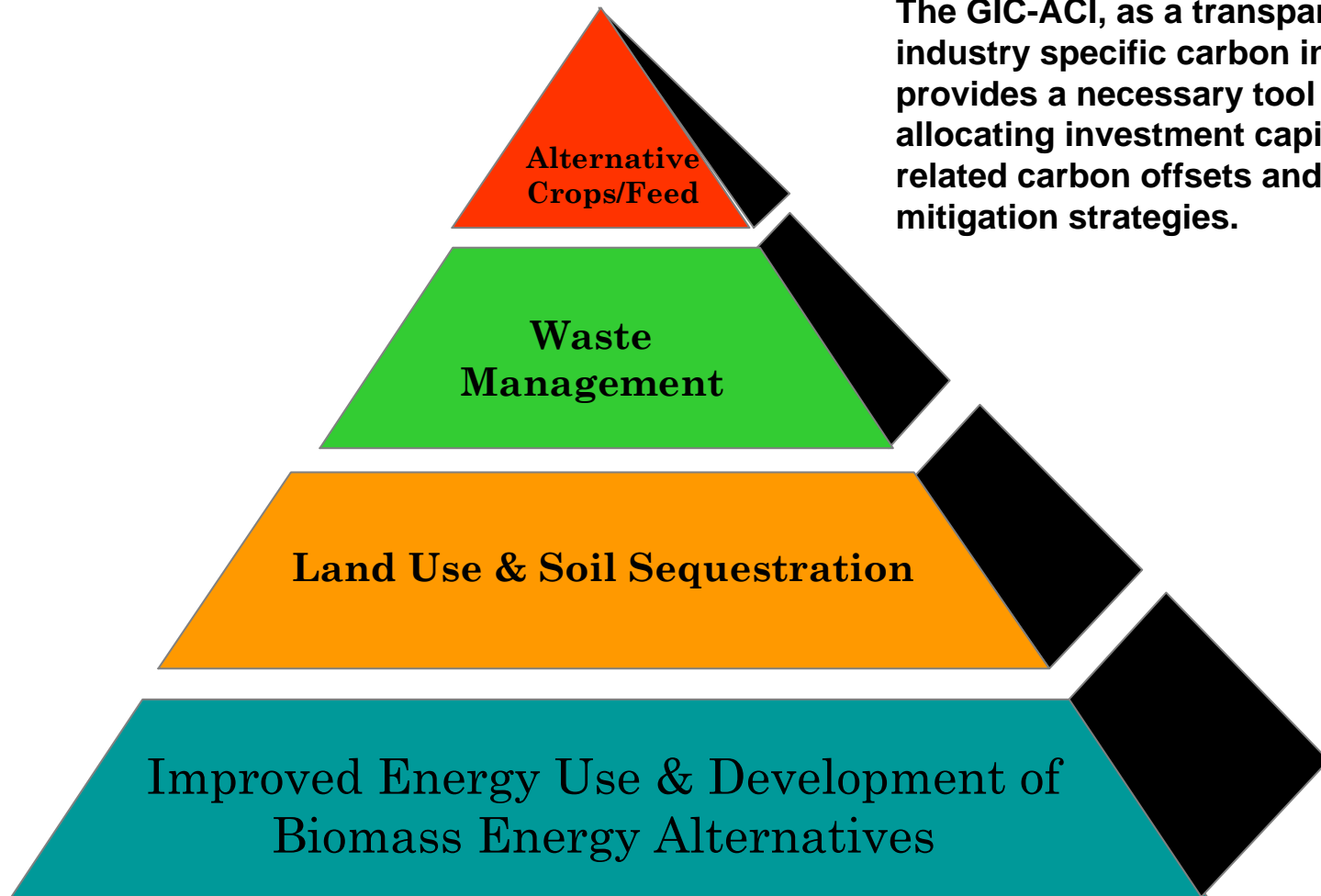


# GIC-ACI: Rationale for the Index

1. Production Ag and secondary industries treated separately in current schemes.
  - Integrated agribusiness companies need transparent valuation tool.
2. Economies of scale – “games changers” missing
  - CDM pipeline will only produce 1.4 billion offsets by 2013, US proposal calls for 2 billion per year.
  - Need a sectoral approach to encourage more offset methodologies/technologies.
3. Climate change will impact ag directly and affect food and feed prices.
4. US production ag emits 518 million metric tons of CO<sub>2</sub> equivalent per annum.
5. 25 to 50% avoidable in the near term with the right incentives.
6. Agribusiness, with projected lower marginal abatement costs, can become a major player in reducing global GHG emissions.
7. U.S. advances in mitigation technology/practices would provide farmers with offset credit premiums either through products that are grown with a particular mitigating technology or through the export of the mitigating technology/practice.
8. China with 30% of its GHG emissions tied to agribusiness has given only limited attention to the ag-sector. U.S. agriculture could utilize its comparative advantage in carbon efficiency and abatement technologies to gain a bigger foothold in this important market.



# GIC-ACI: Ag Opportunity Pyramid

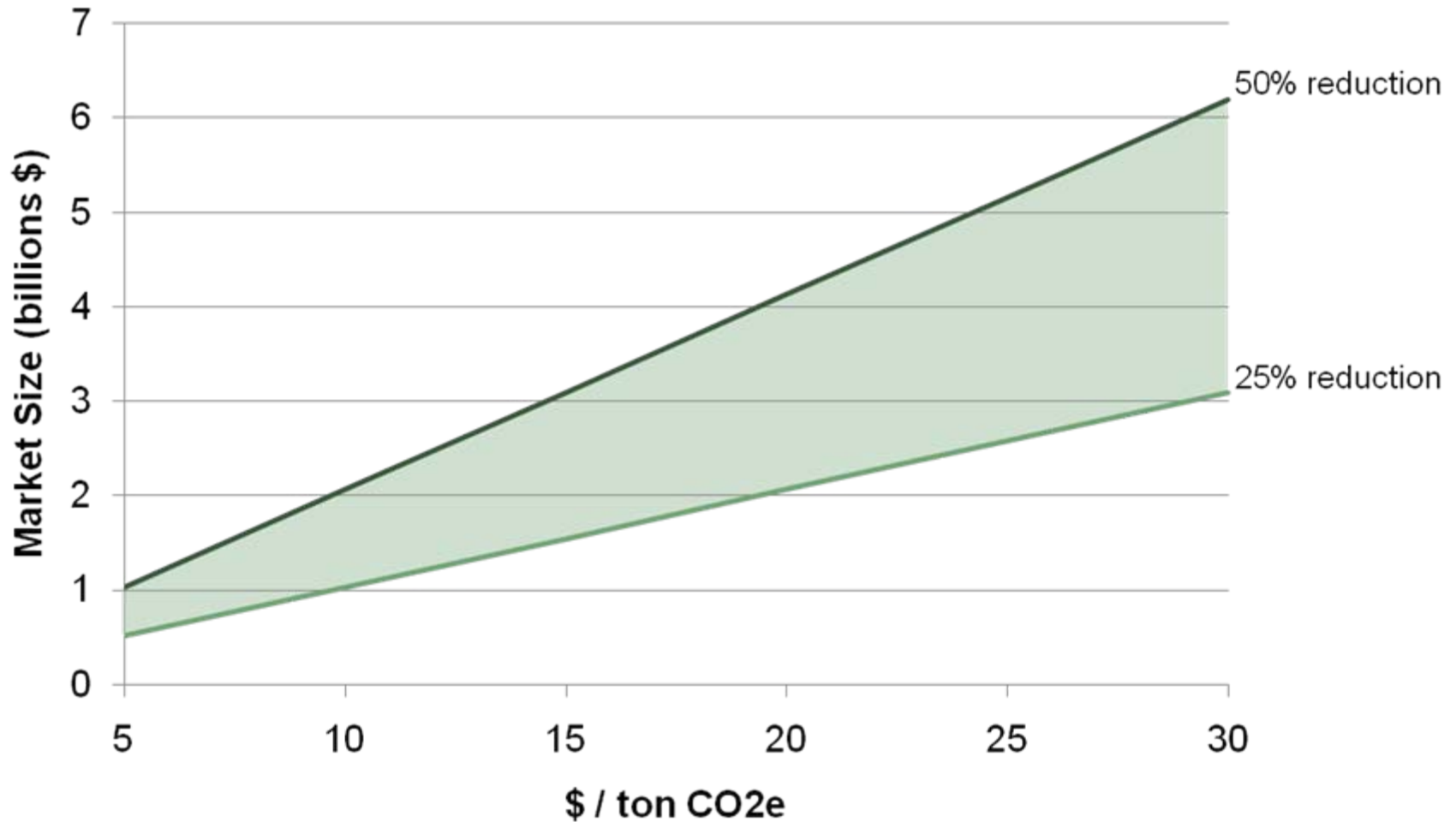


The GIC-ACI, as a transparent, industry specific carbon index, provides a necessary tool for allocating investment capital in ag-related carbon offsets and mitigation strategies.

*\*Order of Pyramid and Size/Value of Mitigation Opportunities Need to Be Determined*



# Potential Size of Offset Market for Production Ag in US





# GIC-ACI: Index Design

## Regional and Sectors Weightings for GIC-ACI

<b>Sector Weights</b>	<b>Production Agriculture*:</b> Ex. Crops & Livestock	<b>Secondary Industries*:</b> <b>Enhancement Sector</b> Ex. Fertilizers & Seed	<b>Secondary Industries:</b> <b>Value-Added Sector*</b> Ex. Food, Biofuels	<b>LULUCF* – Forest, Crop, Grazing and Pasture Land Acreage</b>
<b>Regional Weights</b>	EU-27	US	Large Advanced Developing Countries Brazil, China, India, Indonesia, Malaysia, & Mexico*	Rest of World – Developing & Developed Countries**

**\*Account for nearly 90% of ag related projects in the CDM pipeline\***

**\*\*Future versions will include weightings for Australia, New Zealand, Norway, Japan, and Russia and ROW (rest of world), as other regional components.**

**\*Data based on GIC's analysis of National GHG Inventory Reports Submitted to the UNFCCC**



# GIC-ACI: Index Design – Growth Factor Model

## GHG FACTOR GROWTH MODEL: 2 Sets of Components

### Macro-economic

- Domestic Output per Country/Region (Region in case of EU-27)
- Inflation\*
- Composite Index of Commodity Prices

\*For the advanced developing countries we have used CPI instead due to a lack of time series data for PPI.

### Fundamental

- Land endowment: arable land (including crop land, grasslands, pasture, and forest land)
- Annual fertilizer utilization/consumption.

### Application

- Regression growth model starts at Year 2007 and projects to 2020.
- Model's purpose is to project GHG emissions growth in the three sub-sectors by analyzing their response to the macroeconomic and fundamental variables.
- Growth model can be updated to incorporate new data and recalibrate growth trends.
- Model measures the supply/demand movement of GHG emissions/allowances.



# GIC-ACI: Index Model

- Base Year is 2008.
- Price based on a weighted average of current allowance and offset prices on listed future's contracts in Europe.\*
- Price escalated for inflation year-on-year and 3% growth rate based on annual reduction goals. Prices converted to dollars.

\*Index price calculation is being updated to include voluntary offset credits tied to agricultural projects worldwide.



# GIC-ACI: Market Projections/Assumptions

- EU-27 modeled to 2020 with applied goal of 20% emissions reduction.
- US reduction targets to year 2020, conforming to current proposed legislation at 17% below 2005 levels by 2020.
- Advanced Developing Countries (ADCs) modeled emissions to 2020 with reduction target set at current emissions levels for 2008 (base year).
- Developed three scenarios:
  - Production agriculture being covered/uncovered in cap and trade schemes
  - Creation of cap and trade schemes in ADCs versus Kyoto CDM
  - Harmonization of national systems and international trading of allowances and offsets



# GIC-ACI: Conservative Scenario

- ADCs continue on Kyoto type program.
- EU continues policy of limiting CDM offsets to 10% of emissions targets.
- EU expands coverage of allowance system to include all GHGs, which extends more allowances to secondary agribusiness segment.
- Production agriculture remains uncovered by EU system. However, production agriculture now eligible for offsets up to 15% of domestic compliance\*
- EU allows up to 15% in offsets for LULUCF domestic projects.\*
  
- US begins cap and trade scheme in 2012 either through legislation or the EPA implementation of finding that carbon dioxide “endangers the health and welfare of current and future generations”. Limits CDM offsets to 10% of compliance.
- US only includes 80% of all industries in cap and trade scheme. Production agriculture left uncovered. Only secondary agro-industries are included.
- Production agriculture can be a source for offset projects and provide up to 15% in carbon offsets.
- US allows up to 15% in offsets for LULUCF projects.

\* Assumed response to U.S. legislation





# GIC-ACI: Moderate Scenario

- Production agriculture receives the same treatment in the EU and the US as outlined in the conservative scenario.
- Offsets for domestic LULUCF projects in the EU-27 and the US mirrors conservative scenario.
- EU and US allow for greater use of CDM offsets up to 15% of emissions compliance targets.
- EU and US allow an additional 5% of offsets to come from LULUCF projects in developing countries.
- US begins cap and trade scheme on schedule outlined in the conservative scenario.

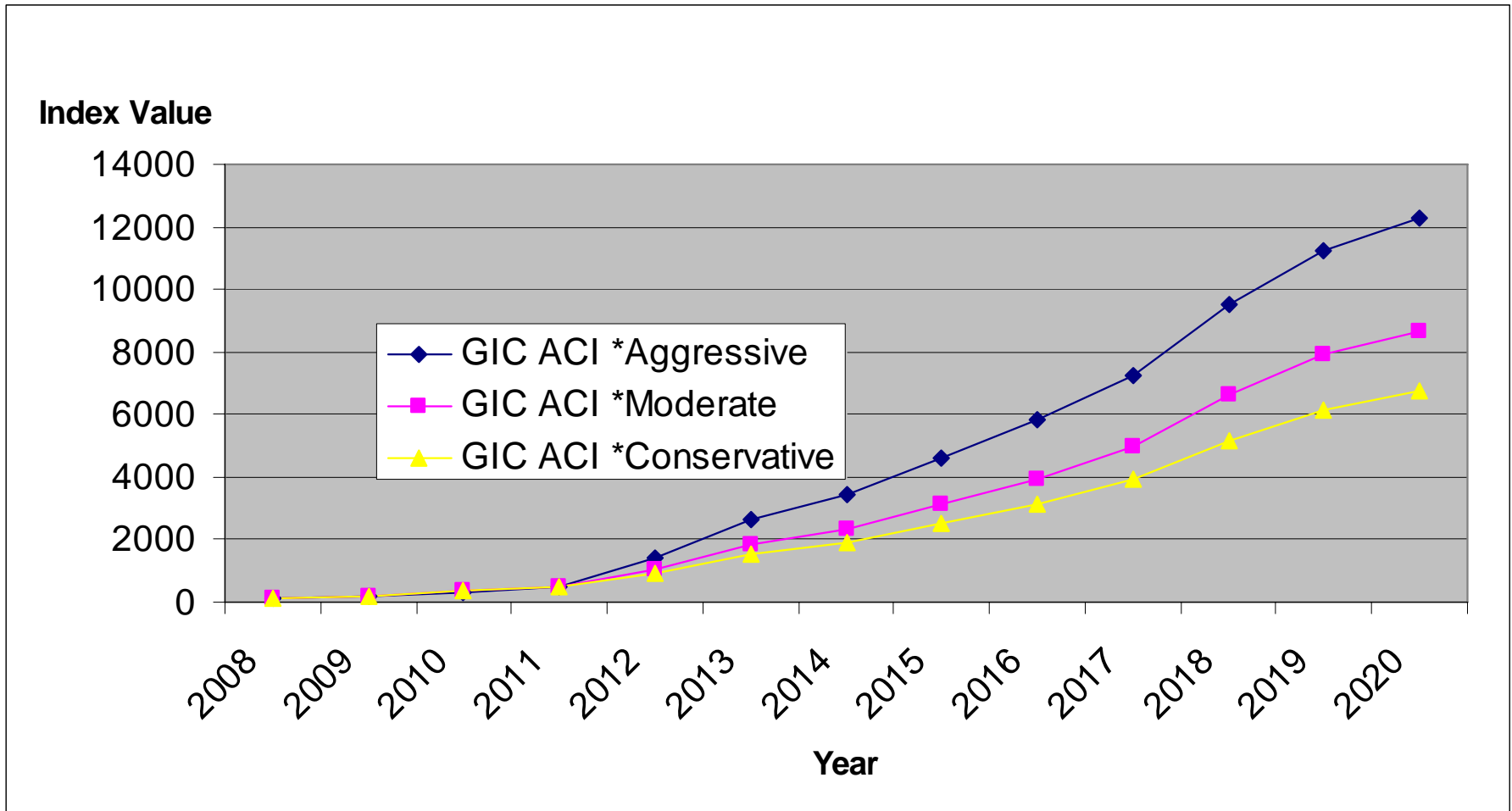


# GIC-ACI: Aggressive Scenario

- Kyoto revised after 2012. Large ADCs launch their own national cap and trade schemes. LULUCF offsets are not limited.
- EU establishes bi-lateral trade with large ADCs. Allowances can be exchanged across borders if cap and trade systems are harmonized.
- EU expands coverage of allowance system to include all GHGs from all economic sectors, including primary agriculture.
- EU allows up to 30% in offsets for domestic LULUCF projects.
- US begins cap and trade scheme in 2012. Establishes bi-lateral allowance trade scheme with individual large ADCs that have harmonized systems.
- US cover 100% of all industries in cap and trade scheme. Production agriculture is included.
- US allows up to 30% in offsets for LULUCF projects.



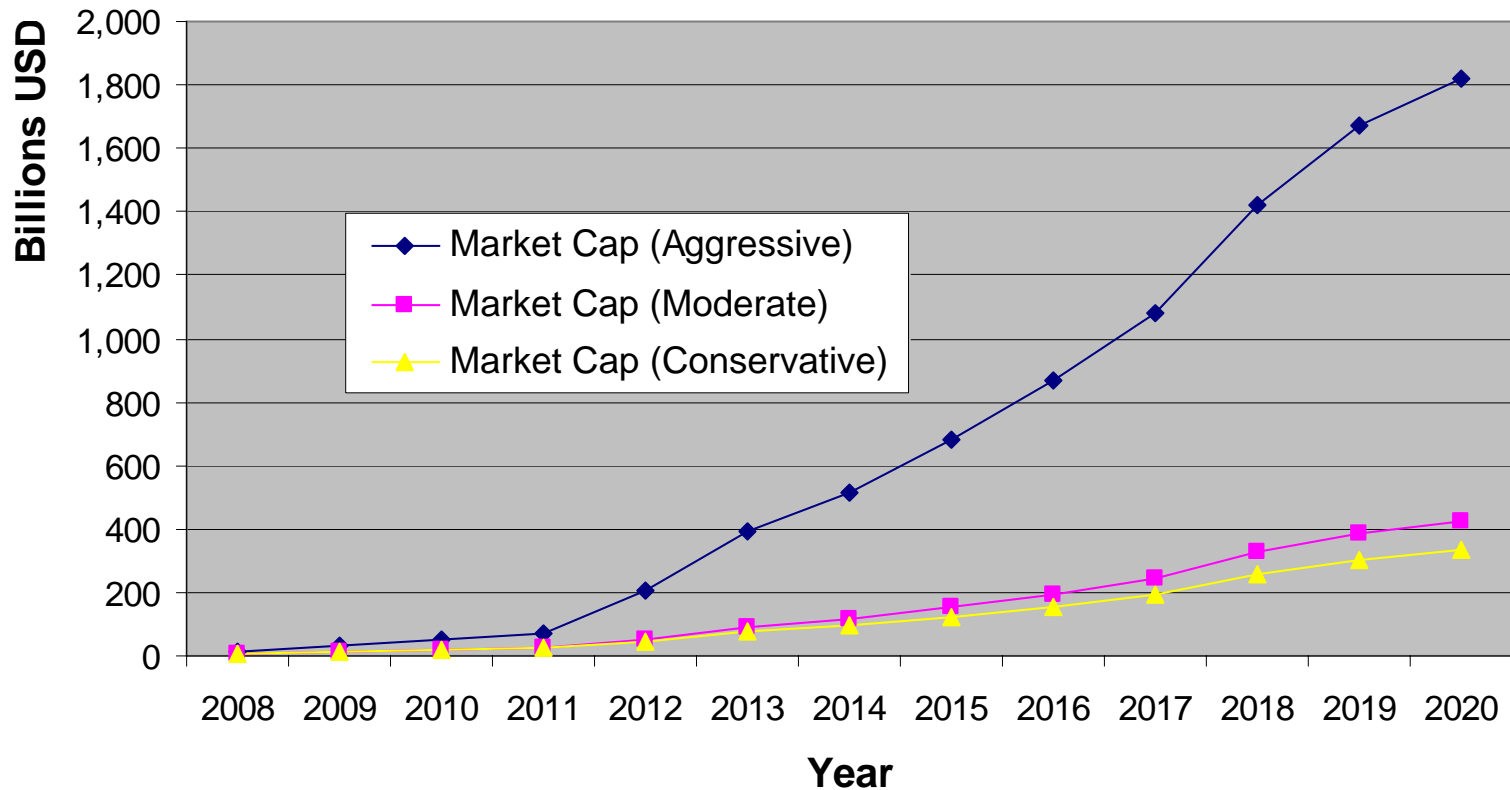
# GIC-ACI: Scenario Analysis





# GIC-ACI: Market Cap Growth

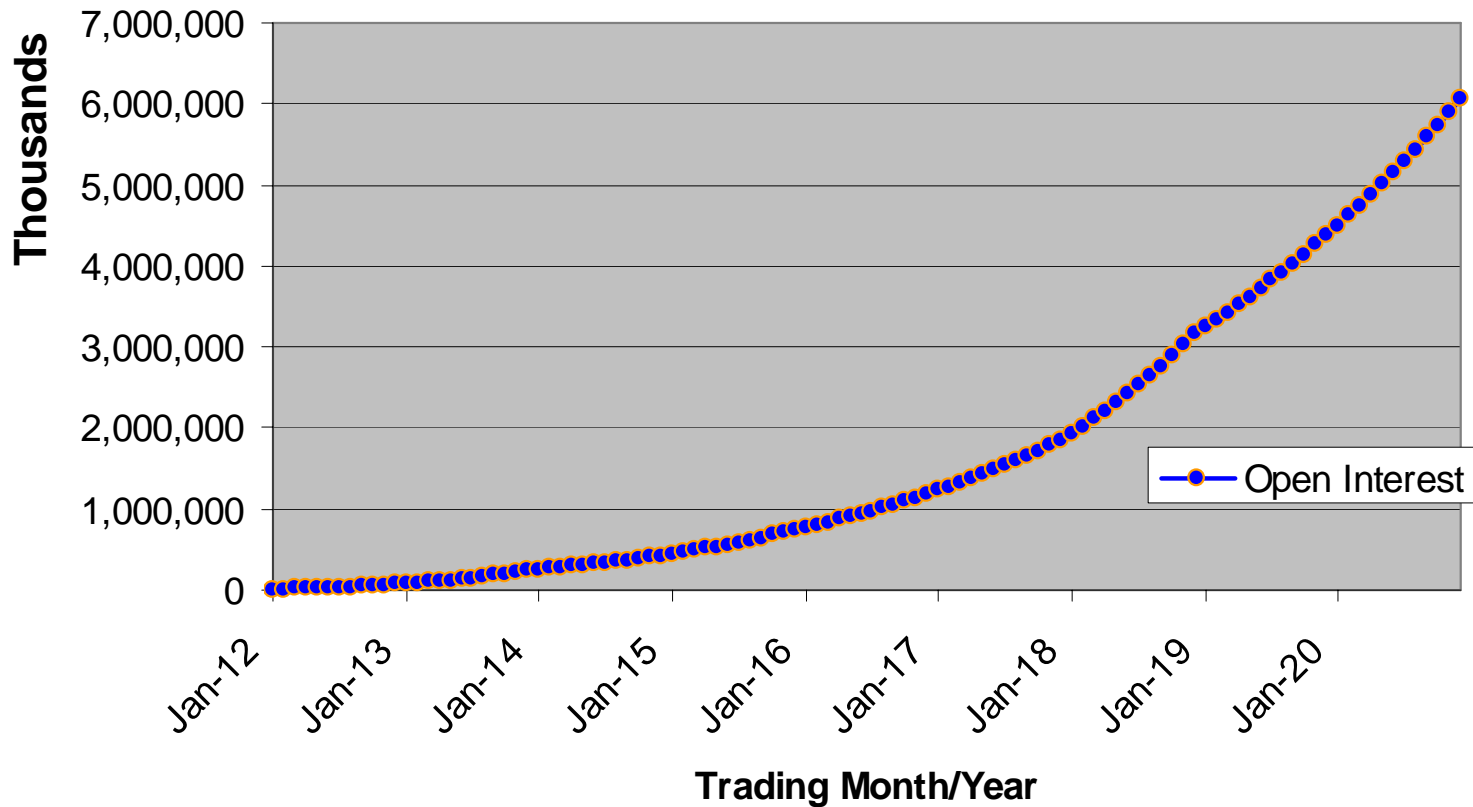
GIC-ACI Index  
Growth In Market Capitalization: Three Scenarios





# GIC-ACI: Projected Volume Growth

## Estimated Growth in Transaction Volume 2012-2020





# GIC-ACI: Cumulative Market Valuations US & EU-27

*Figures in Billions of USD*

*Discount Rate: 8.5%*

EU-27 Moderate & Conservative Scenarios (80% Coverage)	Cumulative NPV \$684,890.73 USD Credits and Offsets
US Moderate & Conservative Scenarios (80% Coverage)	Cumulative NPV \$428,529.12 USD Credits & Offsets
EU-27 Aggressive Scenario	Cumulative NPV \$1,364,324.11 USD Credits & Offsets
US Aggressive Scenario	Cumulative NPV \$692,831.83 USD Credits & Offsets



# GIC-ACI: Cumulative Market Valuations ADCs

*Figures in Billions of USD*

*Discount Rate: 12.00%*

Advanced Developing Countries Conservative Scenario	Cumulative NPV \$115,045.48 USD Only Offsets
Advanced Developing Countries Moderate Scenario	Cumulative NPV \$172,717.62 USD Only Offsets
Advanced Developing Countries Aggressive Scenario	Cumulative NPV \$2,159.563.76 USD Credits & Offsets



# GIC-ACI: Evolution and Future Development



- GIC's GHG Growth Factor model and related weights for the agribusiness sub-sectors will be updated quarterly as new forecasts and official data for the five factors become available.
- The weights for each sector (production, secondary, and LULUCF) will be updated annually based on official UNFCCC data.
- The weights for issued allowances and credits will be updated monthly.
- Recalibrate the input price and weights for offsets and allowances to include current voluntary offsets related to agribusiness.
- The index will become part of a risk analysis tool, which can be utilized to value a firm's potential GHG footprint liability.





# Value Proposition of the Index



- Emissions from agricultural soils account for 29% and 26% of all agribusiness related GHG emissions in the US and EU-27, respectively.
- Soil emissions are about 45% of the total. Emissions from livestock are 30 to 35% of the total.
- New seed, feed, or energy use efficient technologies could generate more carbon offsets opportunities for U.S. agriculture.
- The GIC-ACI can be utilized to size and properly value the reduction potential of such technologies and create an improved monetization mechanism for U.S. producers
- Index can be used to value, trade, and cross-hedge grain and/or agricultural products derived from the new mitigation technologies.



# Relevance of the Index to U.S. Agriculture



- U.S. production agriculture more efficient in terms of GHG emissions and output.
- U.S. averages about 1.26 tons of CO<sub>2</sub>eq per hectare of agricultural land, the EU-27 about 2.6, and China about 2.1 tons per hectare.
- China's emissions per hectare increased 3.5x from 1990.
- Other emerging markets, like Africa with poor agricultural efficiency already emit about .5 ton per hectare.
- U.S. agriculture has a competitive edge. Farmers could garner a premium for their lower carbon footprint produce by tying the offset credit to the crop.
- U.S. agriculture could become a global leader in exporting carbon efficient technologies to other markets with substantial high GHG emitting ag-industries.

## ***GIC Group***

**1434 Duke Street  
Alexandria, VA 22314 USA**

**Tel. 703-684-1366**

**Fax: 703-684-1369**

**web: [www.gicgroup.com](http://www.gicgroup.com)**



**The GIC Group**

- **Agribusiness consulting services**
- **Investment advisory services**
- **Global Food Safety Forum (GFSF)**
- **Carbon advisory services**