NEWTRIENT™
INNOVATIVE SOLUTIONS IN RESOURCE RECOVERY

Monetizing Manure Projects

Georgia Dairy Conference
January 17, 2024

NEWTRIENT™

REPRESENTING NEARLY ALL U.S. DAIRY FARMERS

NEWTRIENT'S MISSION

To reduce the environmental footprint of U.S. dairy and make it economically viable to do so

SUSTAINABILITY IS NOW TABLE STAKES

TODAY'S CONSUMER EXPECTATIONS

Source: The Hartman Group, September 2019; Nielsen, November 2018; Futerra, November 2018; Innova Market Insights, October 2019

PRESSURE INTENSIFIES TO LOWER CARBON EMISSIONS

INVESTOR GROUPS

BlackRock, Vanguard, State Street

GLOBAL DAIRY SUPPLY CHAINS

Starbucks, Ahold Delhaize, Coca-Cola, Mars

GLOBAL DAIRY LEADERS

Arla, Danone, Fonterra, Nestlé, Unilever

COUNTRIES

MARKET DRIVERS

- Companies setting **aggressive carbon reduction goals** or seeking to green their portfolio
- **Increased regulations** on certain sectors (i.e. transportation)
- **Increased support from government programs** for the adoption of climate-smart practices (Inflation Reduction Act, Climate-Smart Commodities, etc.)

AGGRESSIVE CARBON REDUCTION GOALS

BRIEF: Microsoft to purchase up to $2m in carbon credits from Land O'Lakes

February 8, 2021 Jack Ellis

Booming Airline Traffic Could Force Carriers to Buy Carbon Offsets as Early as 2024

Skift

Nestle moves closer to GHG emission reduction goal

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INCREASED REGULATION

BIOMASS MAGAZINE

Dominion Energy, Vanguard Renewables partner on dairy RNG

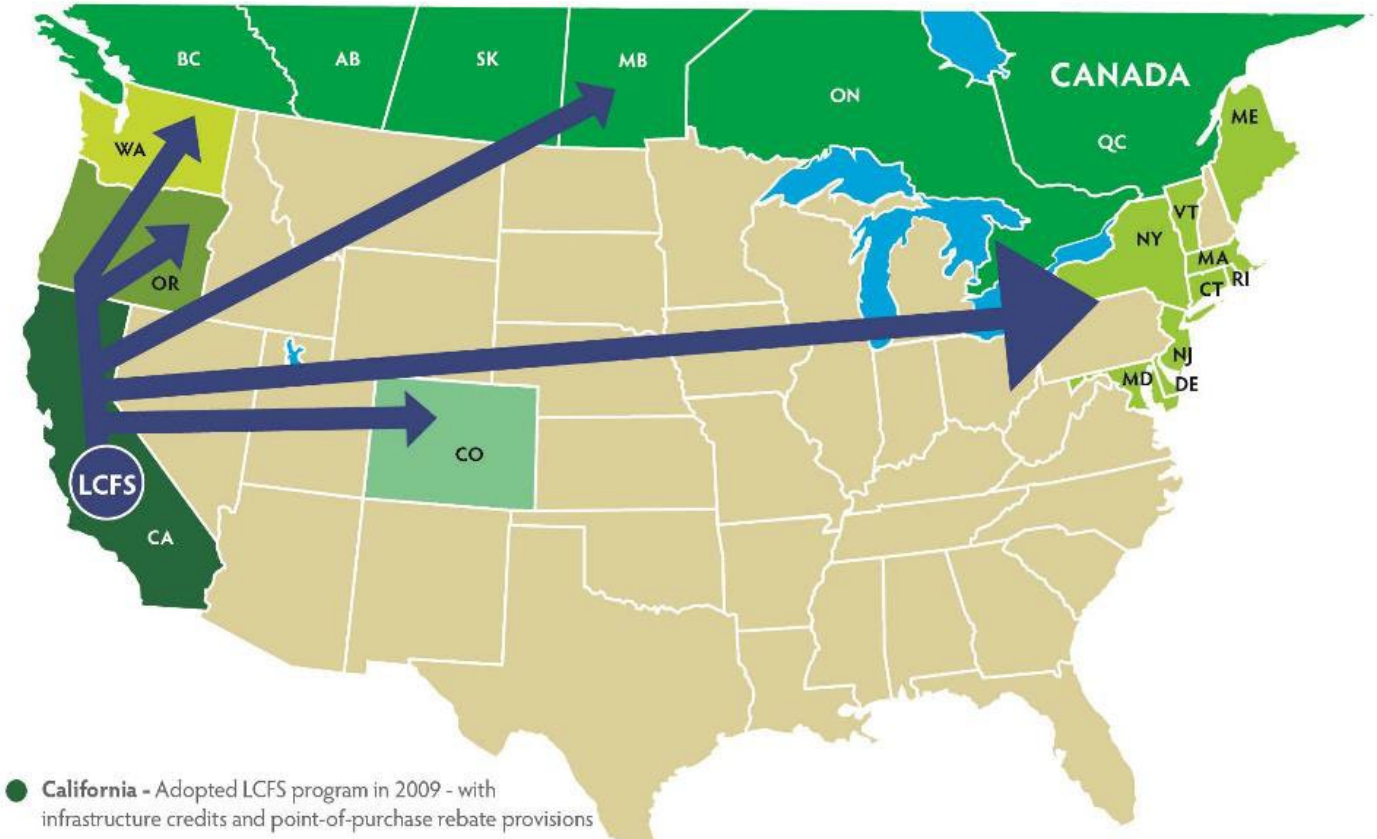
By Dominion Energy | December 11, 2019

Dominion Energy and Vanguard Renewables announced today a more than $200 million, nationwide strategic partnership to convert methane from U.S. dairy farms into clean, renewable natural gas (RNG) that can heat homes, power businesses and fuel vehicles. Multiple projects are under development in Georgia, Nevada, Colorado, New Mexico, and Utah with additional projects planned

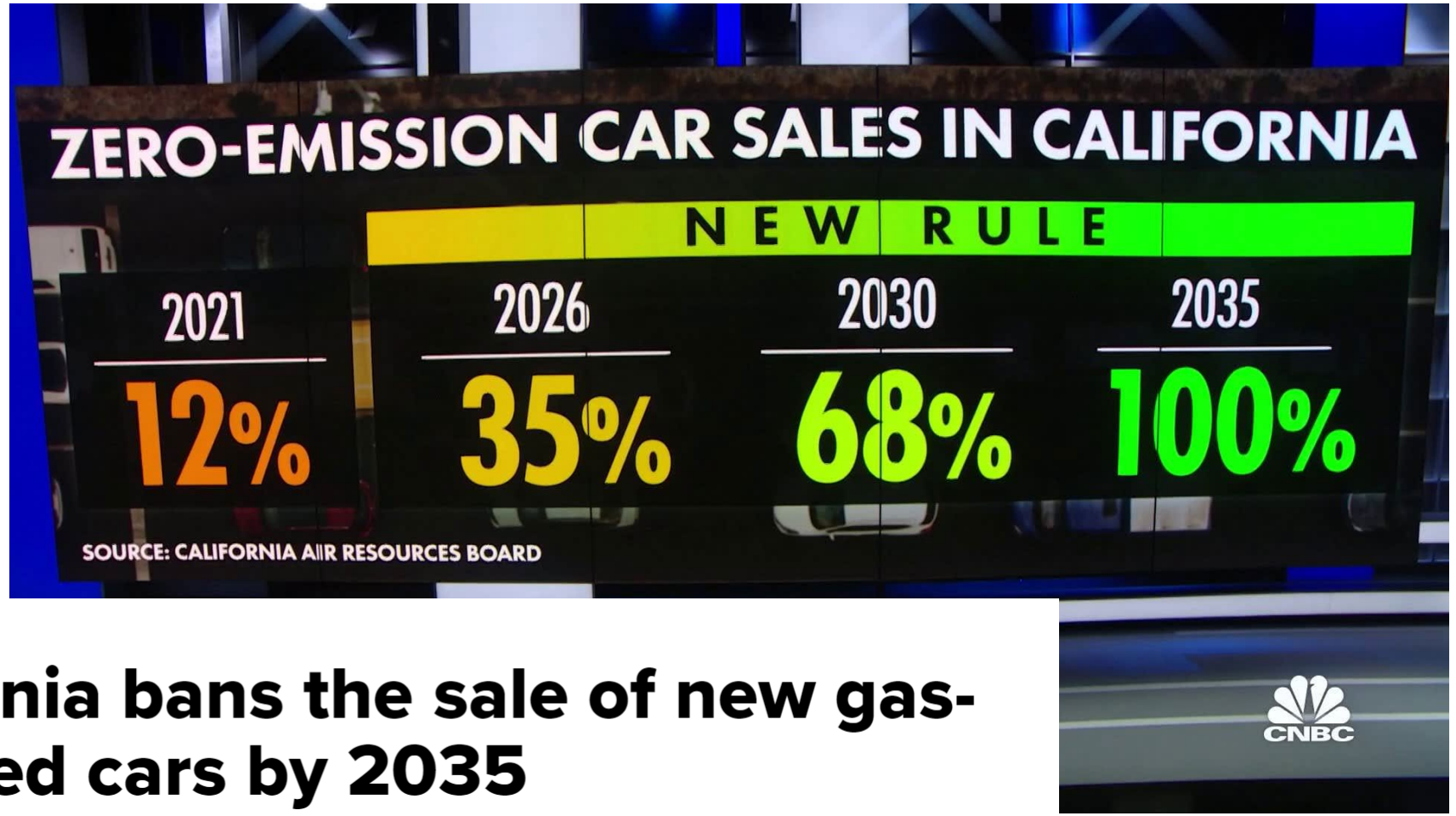
The Washington Post

Turning manure into money

Farmers and utilities are burning methane for energy — and curtailing a powerful greenhouse gas in the process



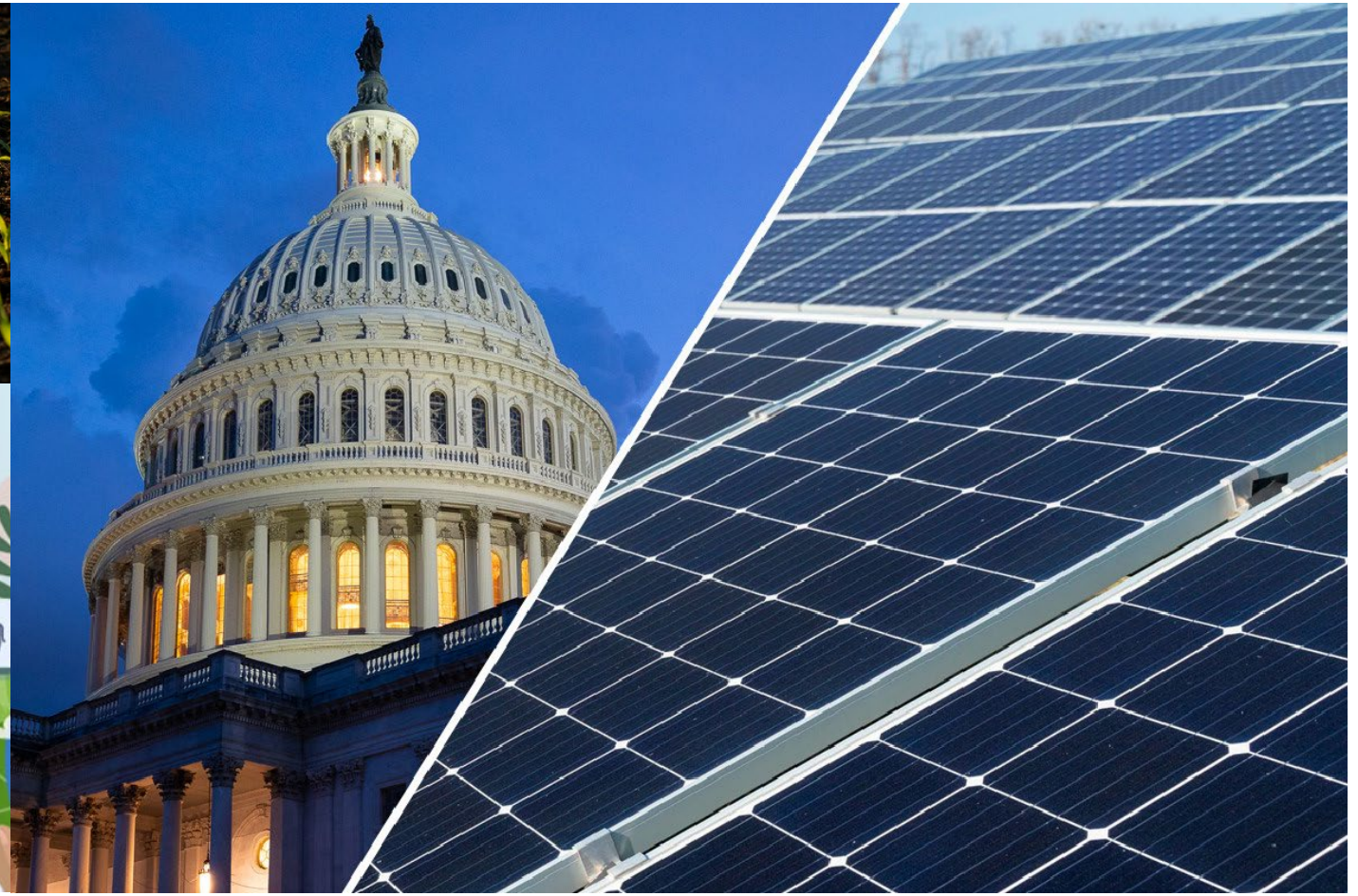
- **California -** Adopted LCFS program in 2009 - with infrastructure credits and point-of-purchase rebate provisions
- **Oregon -** Implemented "Clean Fuels" in 2016 - a program similar to LCFS, without infrastructure credits and point-of-purchase rebate provisions
- **Connecticut, Maine, Maryland, Massachusetts, New Jersey, New York, Oregon, Rhode Island, and Vermont -** Adopted ZEV mandate
- **Canada -** *Environment Canada* released the regulatory design paper for a national "Clean Fuel" program in late 2018
- **Washington -** Considering implementing program similar to Oregon's "Clean Fuels"
- **Colorado -** Considering adopting ZEV mandate



CLIMATE

California bans the sale of new gas-powered cars by 2035

INCREASED SUPPORT FROM GOV PROGRAMS



How is the Value Determined?

Current Manure Value as Fertilizer

* Calculations based on ASABE Standards for 75 lbs./day milk production (305 day lactating & 60 days dry)

Fertilizer Value Per Ton as Excreted

2,000	lbs in a ton
49,077	lbs manure/cow/year[1]
24.54	Wet Tons/Cow/Year
$10.82	**Fertilizer value per wet ton**
4	X Concentration in drying to >80% DM
$43.29	Raw manure value of dry manure
27%	Reduction for loss of Volatile Nitrogen[2]
$31.46	**Fertilizer value per dry ton**

[1]ASABE values based on for 305 days lactating, 40 days dry cow, 20 days heifer before first calving.

[2]Assumes 100% loss of volatile nitrogen as NH_3

Data Updated November 03, 2022

Potential Revenue from Carbon Reductions

**Annual manure costs for a 3,500-cow dairy farm*

Avoided Manure Application Costs 2019 - Scrape to Lagoon

3,500	cows
36	gallons/cow/day
365	days
45,990,000	gallons/year
30,813,300	gallons/year through pivots
$0.01	cost per gallon through pivots
$308,133	cost per year through pivots

15,176,700	gallons/year by
$0.025	cost/gallon custom applicator
$379,418	cost/year custom applicator
$687,551	Total cost per year
3500	Cows
86	lbs per cow
305	day milking per year
91,805,000	lbs per year
918,050	CWT's per year

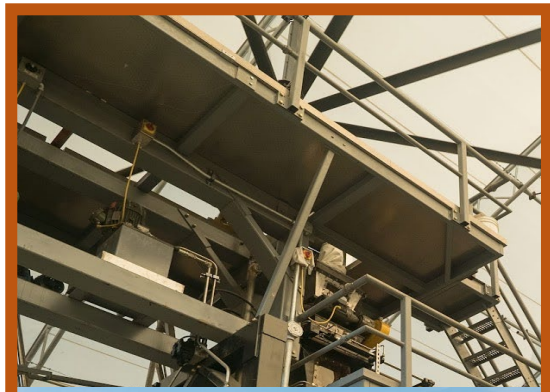
$0.75 Cost per CWT

$196.44 Cost per Cow

Costs Include

- **Equipment**
- **Labor**
- **Utilities**
- **Consumables**
- **Services**
- **Management**

Potential Revenue from Carbon Reductions



$ Practice/ Tech Changes

- LCFS Credits
- Payments for Carbon Reductions
- Manure-based products (fertilizers)

← New Profit Stream

$196.44/ cow/ year

← Reducing Annual Costs of Manure Management

TODAY'S ACTIVE MANURE MARKETS

Carbon Markets Snapshot

January 8, 2024

US$ per RIN (Renewable Fuel Standard) 2023	
D3	$3.350
D4	$0.805
D5	$0.795
D6	$0.803
US$ per Metric Ton of CO2e (State LCFS Programs)	
Oregon Clean Fuels Program (CFP) Credit	$92.00
California Low Carbon Fuel Standard (LCFS) Credit	$68.50
EU€ per Metric Ton of CO2e (EU ETS Allowance)	
EEX EU Allowances (EUA)	€66.49

US$ per Metric Ton of CO2e (Voluntary Carbon Offsets) *Source: AlliedOffsets*	
Agriculture	$16.87
Biochar	$218.12
Chemical Processes	$2.56
Energy Efficiency	$3.12
Forestry	$5.72
Household Devices	$6.26
Renewable Energy	$1.92
Transportation	$2.55
Waste Disposal	$3.47
Carbon Removal	$0 - $3,700

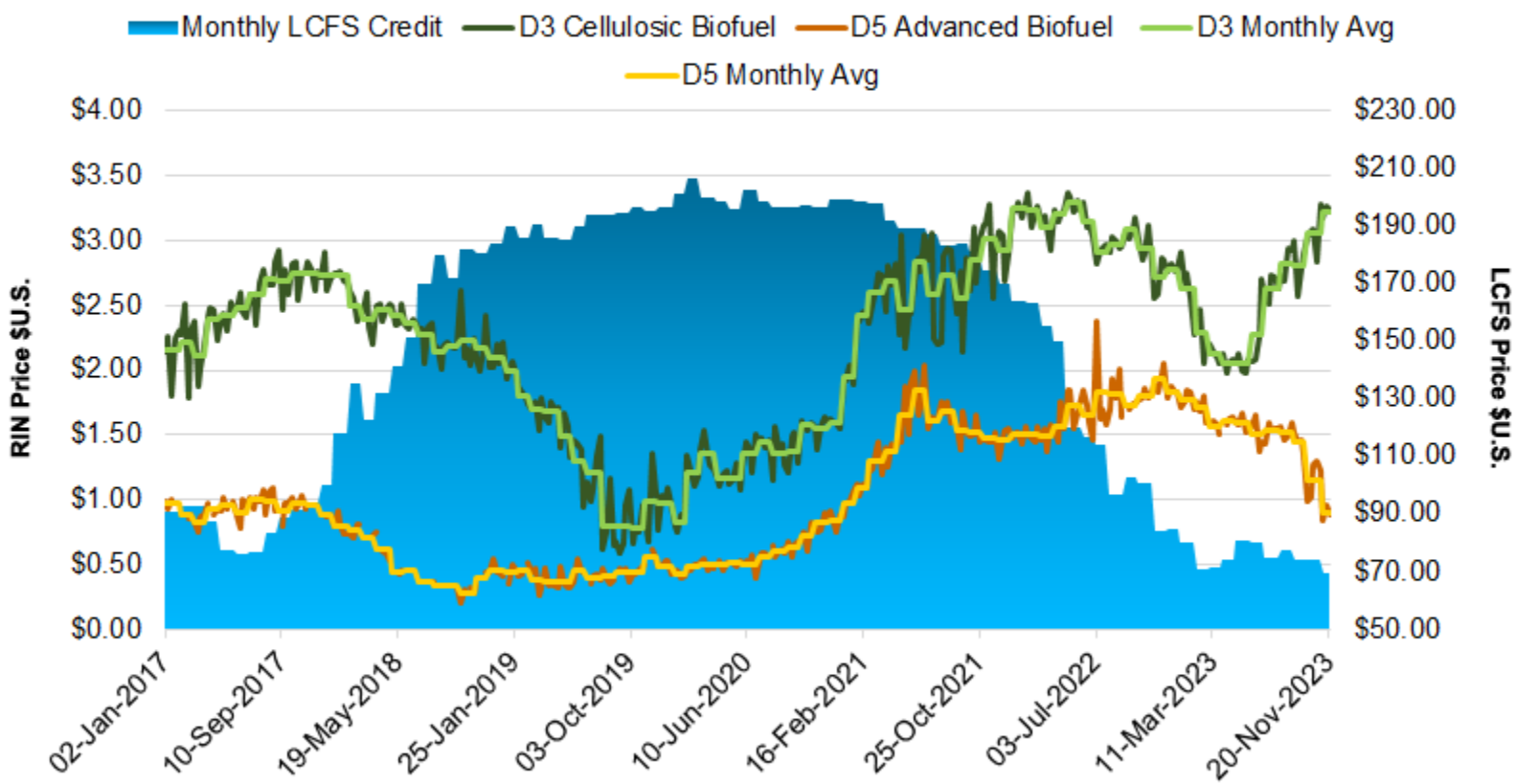
Daily Full RIN Update

D-Code	US$ per RIN (Renewable Fuel Standard)		
	2022	2023	2024
D3	$3.420	$3.350	$3.412
D4	$0.815	$0.805	$0.805
D5	$0.805	$0.795	$0.795
D6	$0.805	$0.803	$0.797

TODAY'S ACTIVE MANURE MARKETS

Average RIN and LCFS Prices

NGI



Source: Compiled by NGI from Environmental Protection Agency and California Air Resources Board data, NGI calculations

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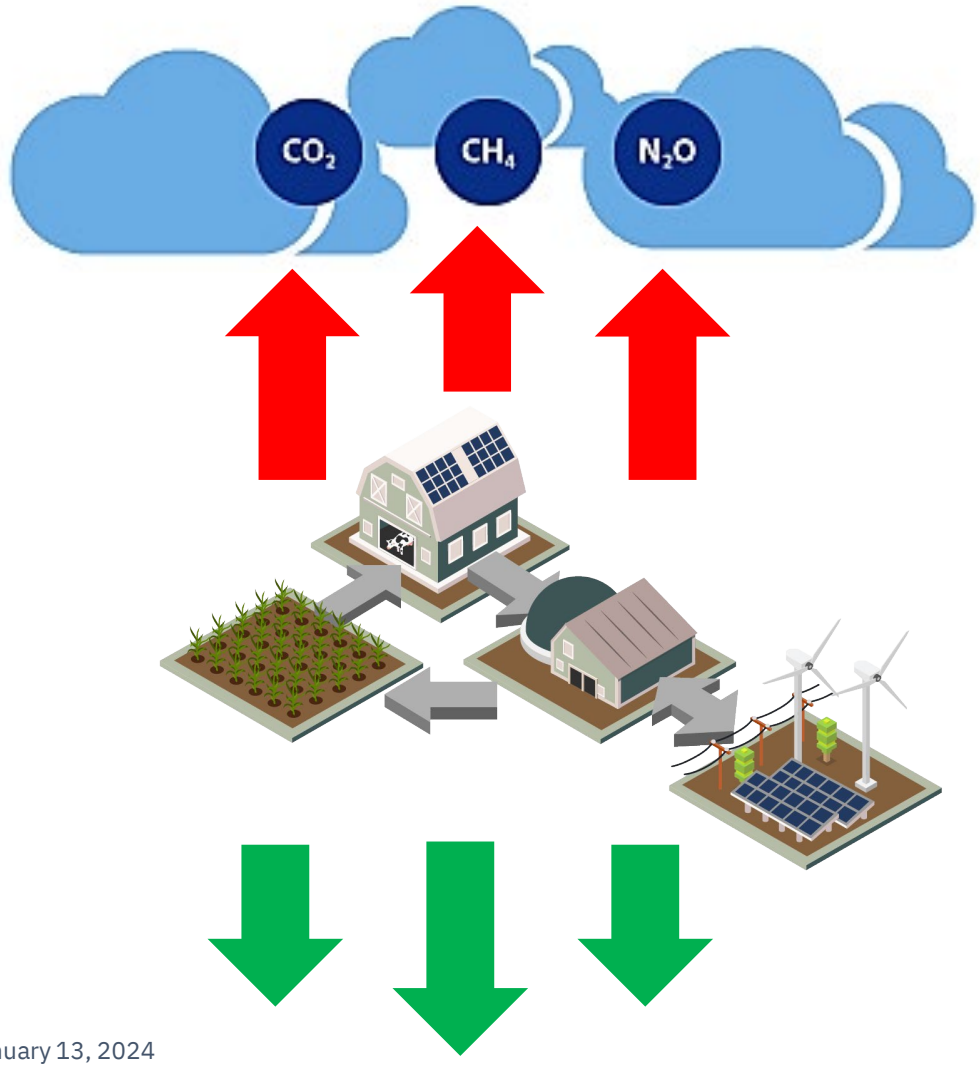
CARBON CREDITS



releasing GHG's

created emissions

=

CO_2e Before

+

CO_2e Project

−

CO_2e After

=

Credited CO_2e

=

capturing carbon

avoided emissions

=

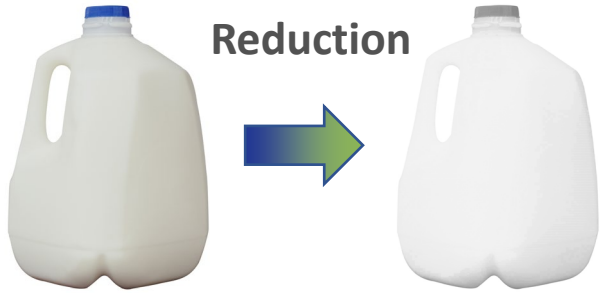
TWO PATHS TO DETERMINE VALUE

1

Carbon INSETS

reducing emissions within the supply chain and offering farmers incentives to reduce emissions

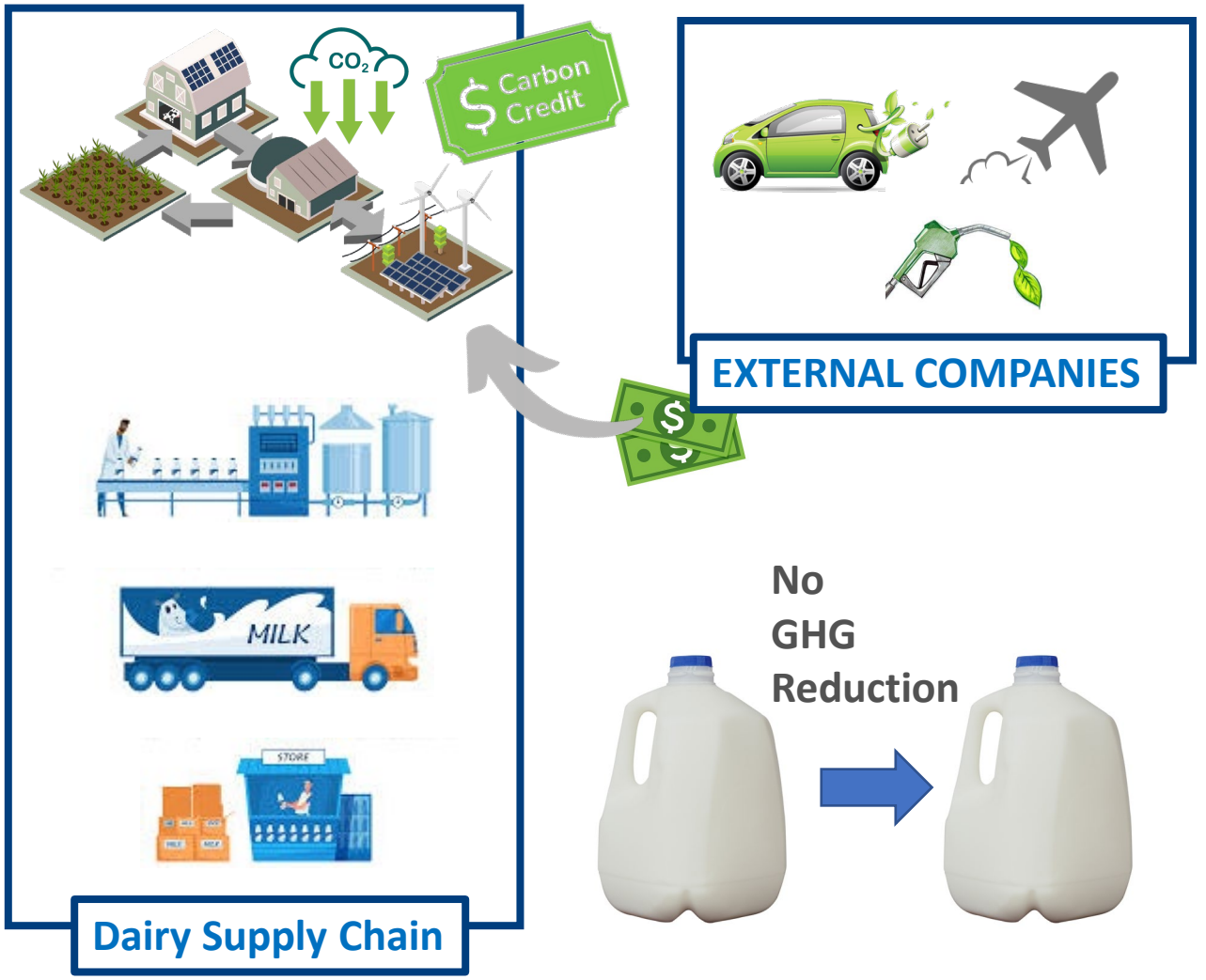
GHG Reduction



TWO PATHS TO DETERMINE VALUE

2 Carbon OFFSETS

selling carbon offsets outside the dairy supply chain



Assessing Dairy's Impact

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OPPORTUNITIES TO REDUCE REDUCTIONS

Estimated GHG contribution of each "print" to the total*:

ENTERIC METHANE 35%

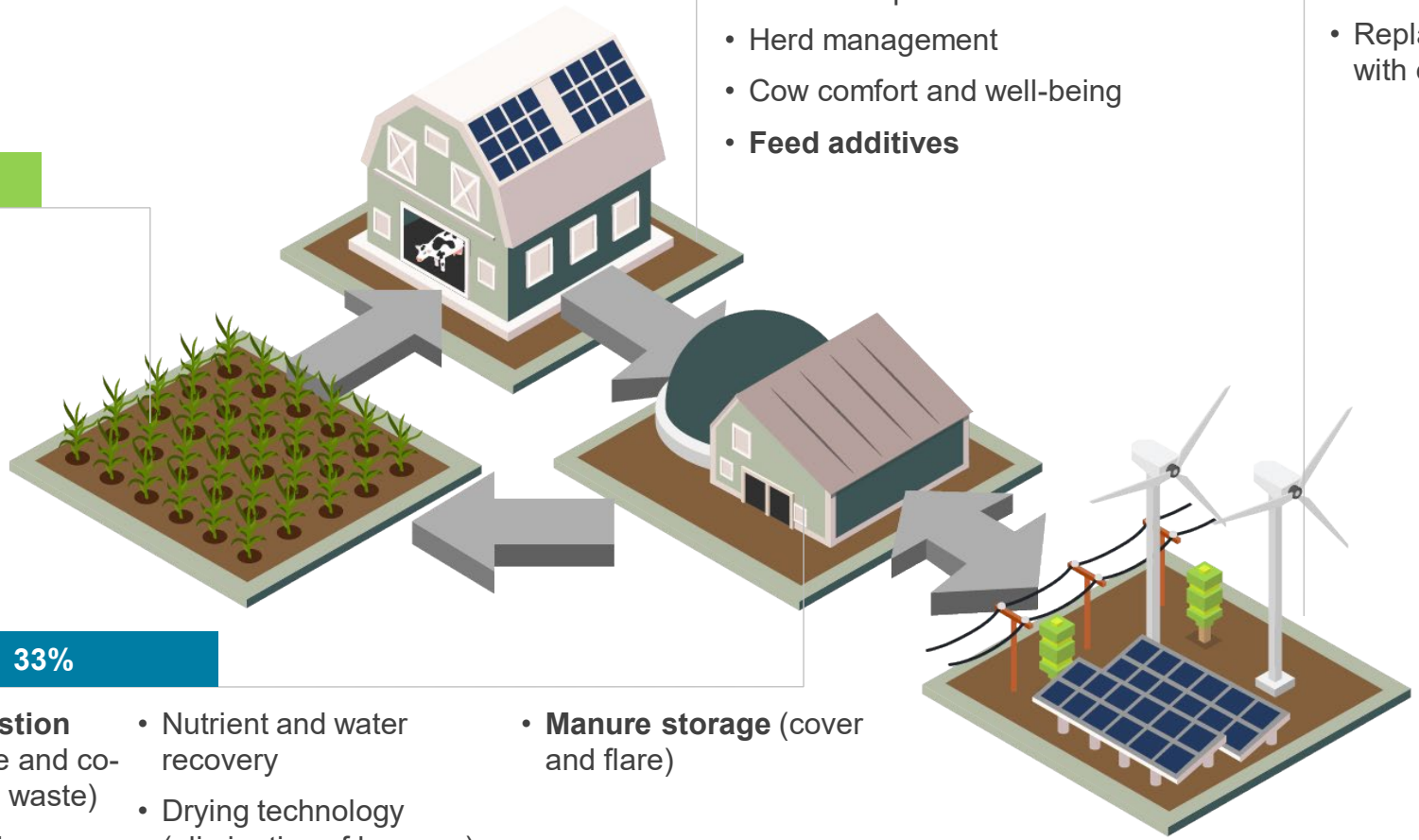
- Diet management
- Genetic improvement
- Herd management
- Cow comfort and well-being
- **Feed additives**

ENERGY 6%

- **Renewable energy:**
- Energy efficiency:
- Replacement of fossil-fueled engines with electric motors

FEED 26%

- **No/low-till farming**
- **Cover crops**
- Nutrient management
- Precision agriculture
- Water use efficiency



MANURE 33%

- **Anaerobic digestion** (includes manure and co-digestion of food waste)
- Renewable fertilizers
- Nutrient and water recovery
- Drying technology (elimination of lagoons)
- **Manure storage** (cover and flare)

Assessing a Dairy's Impact

Estimated GHG contribution of each "print" to the total*:

Feed (26%) | Enteric (35%) | Manure (33%) | – Energy (6%)

FEED 26%

- No/low-till farming
- Cover crops
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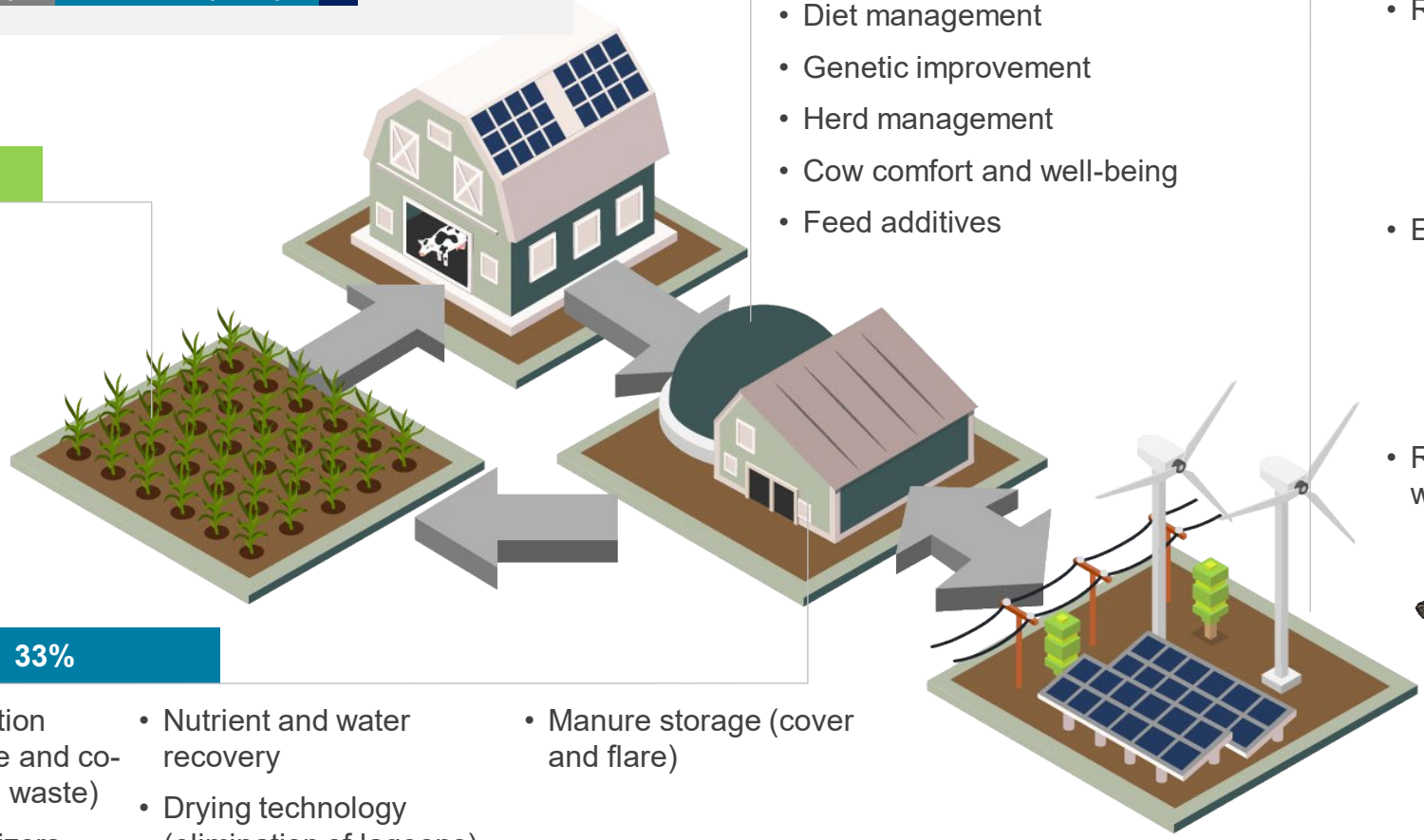

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- Renewable fertilizers
- Nutrient and water recovery
- Drying technology (elimination of lagoons)
- Manure storage (cover and flare)

ENERGY 6%

- Renewable energy:
  - Renewable electricity
  - Renewable natural gas
  - Renewable energy from wind and solar sources
- Energy efficiency:
  - LED lighting
  - Variable speed pumps
  - Milk pre-cooling technology
  - Soft start motors
- Replacement of fossil-fueled engines with electric motors

= 1

Assessing a Dairy's Impact

Estimated GHG contribution of each "print" to the total*:

Feed (26%) | Enteric (35%) | Manure (33%) | – Energy (6%)

FEED 26%

2.9

- No/low-till farming
- Cover crops
- Nutrient management
- Precision agriculture
- Water use efficiency

ENTERIC METHANE 35%

3.9

- Diet management
- Genetic improvement
- Herd management
- Cow comfort and well-being
- Feed additives

ENERGY 6%

.7

- Renewable energy:
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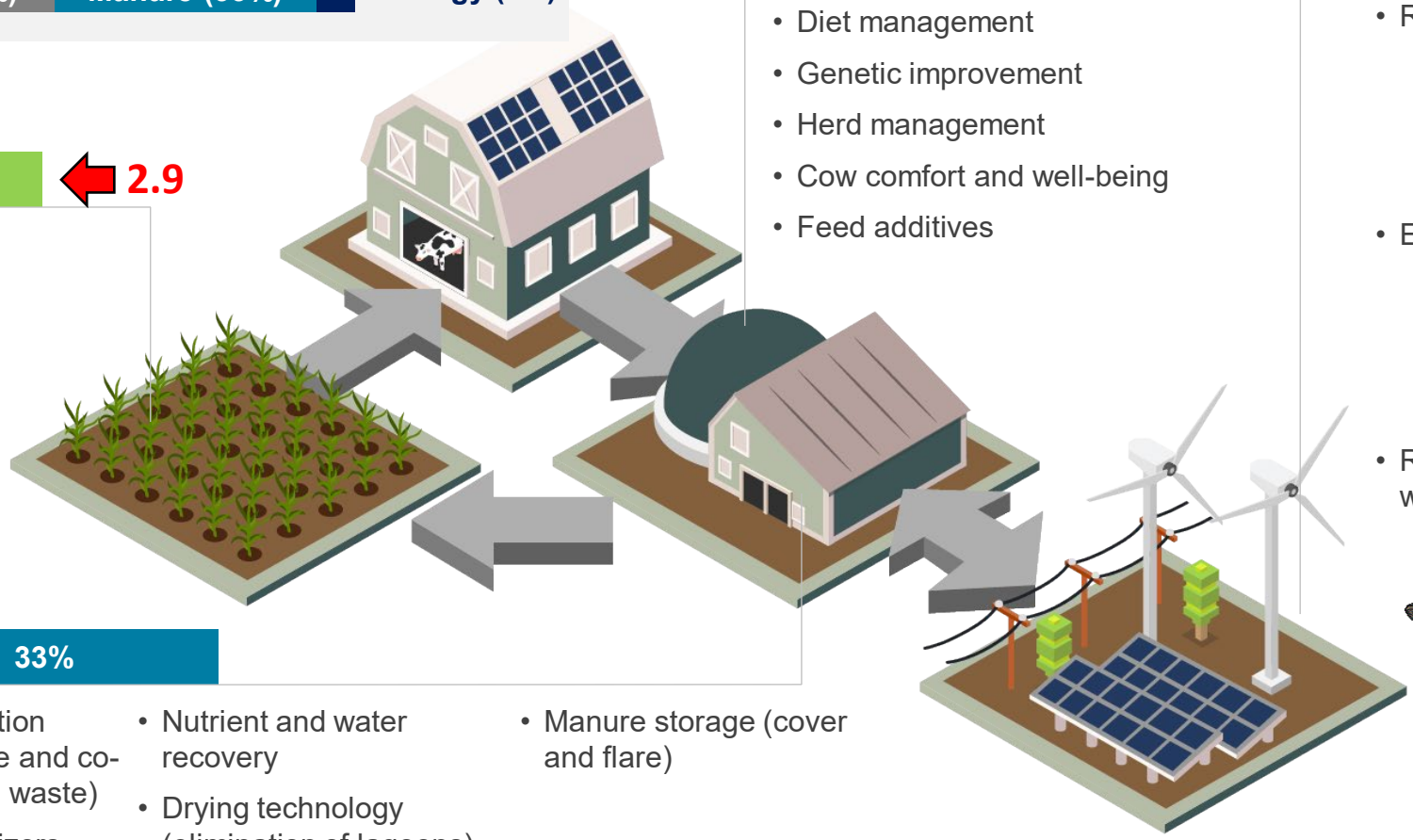

MANURE 33%

3.7

- Anaerobic digestion (includes manure and co-digestion of food waste)
- Renewable fertilizers
- Nutrient and water recovery
- Drying technology (elimination of lagoons)
- Manure storage (cover and flare)

= 11.1

Assessing a Dairy's Impact

Estimated GHG contribution of each "print" to the total*:

Feed (26%) | Enteric (35%) | Manure (33%) | – Energy (6%)

4 ENTERIC METHANE 35%

- Diet management
- Genetic improvement
- Herd management
- Cow comfort and well-being
- Feed additives

1 ENERGY 6%

- Renewable energy:
  - Renewable electricity
  - Renewable natural gas
  - Renewable energy from wind and solar sources
- Energy efficiency:
  - LED lighting
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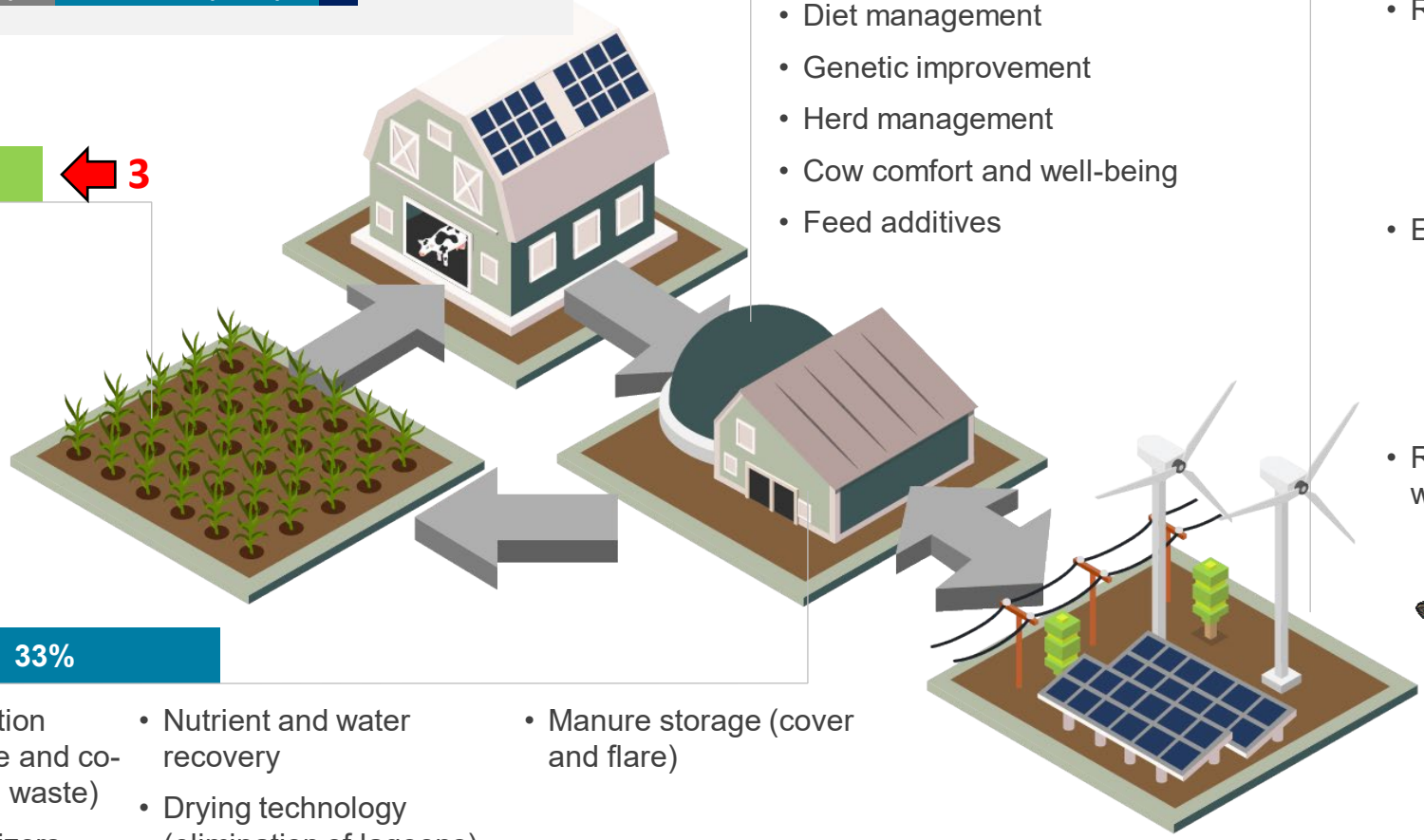
FEED 26% 3

- No/low-till farming
- Cover crops
- Nutrient management
- Precision agriculture
- Water use efficiency

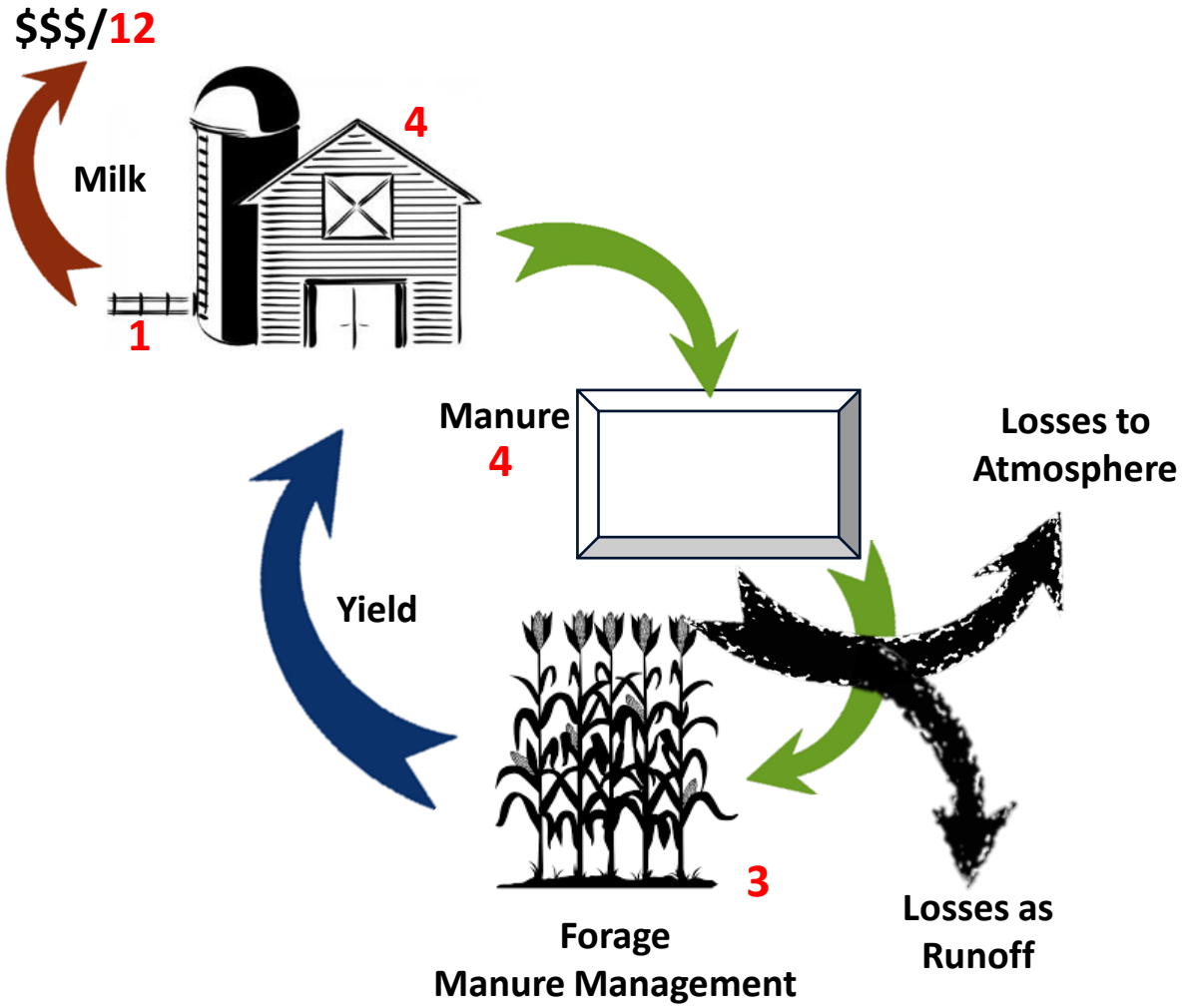


4 MANURE 33%

- Anaerobic digestion (includes manure and co-digestion of food waste)
- Renewable fertilizers
- Nutrient and water recovery
- Drying technology (elimination of lagoons)
- Manure storage (cover and flare)

= 12

Transforming the Use of Manure



Current State

Manure is being generated and reapplied in its raw form in pursuit of nutrient balance and for an expected crop yield.

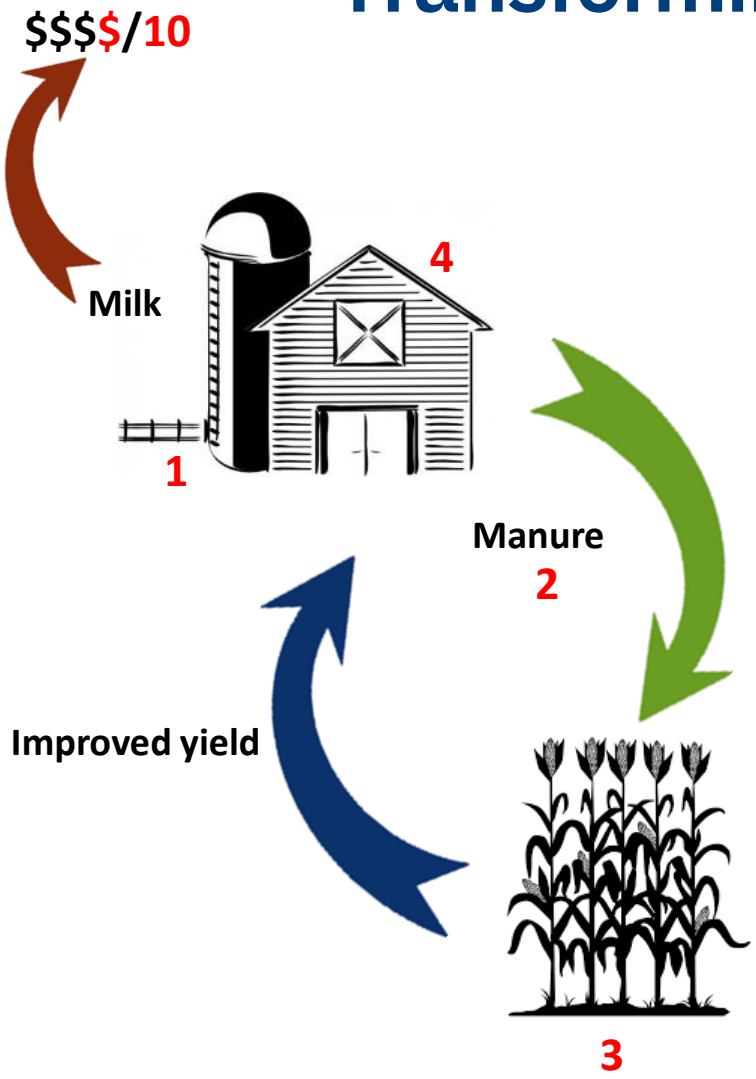
All manure application rates are adjusted for “normal“ fugitive nutrient losses to achieve these yields.

Without proof of that nutrient balance, there is always a tension between nutrient needs and the need to manage the ever-growing supply of manure.

This creates an increased use of commercial fertilizer, an uncertain regulatory environment, it undermines consumer and community trust and places a potential burden on the environment.

We have the technology to improve this situation and solve these problems

Transforming the Use of Manure

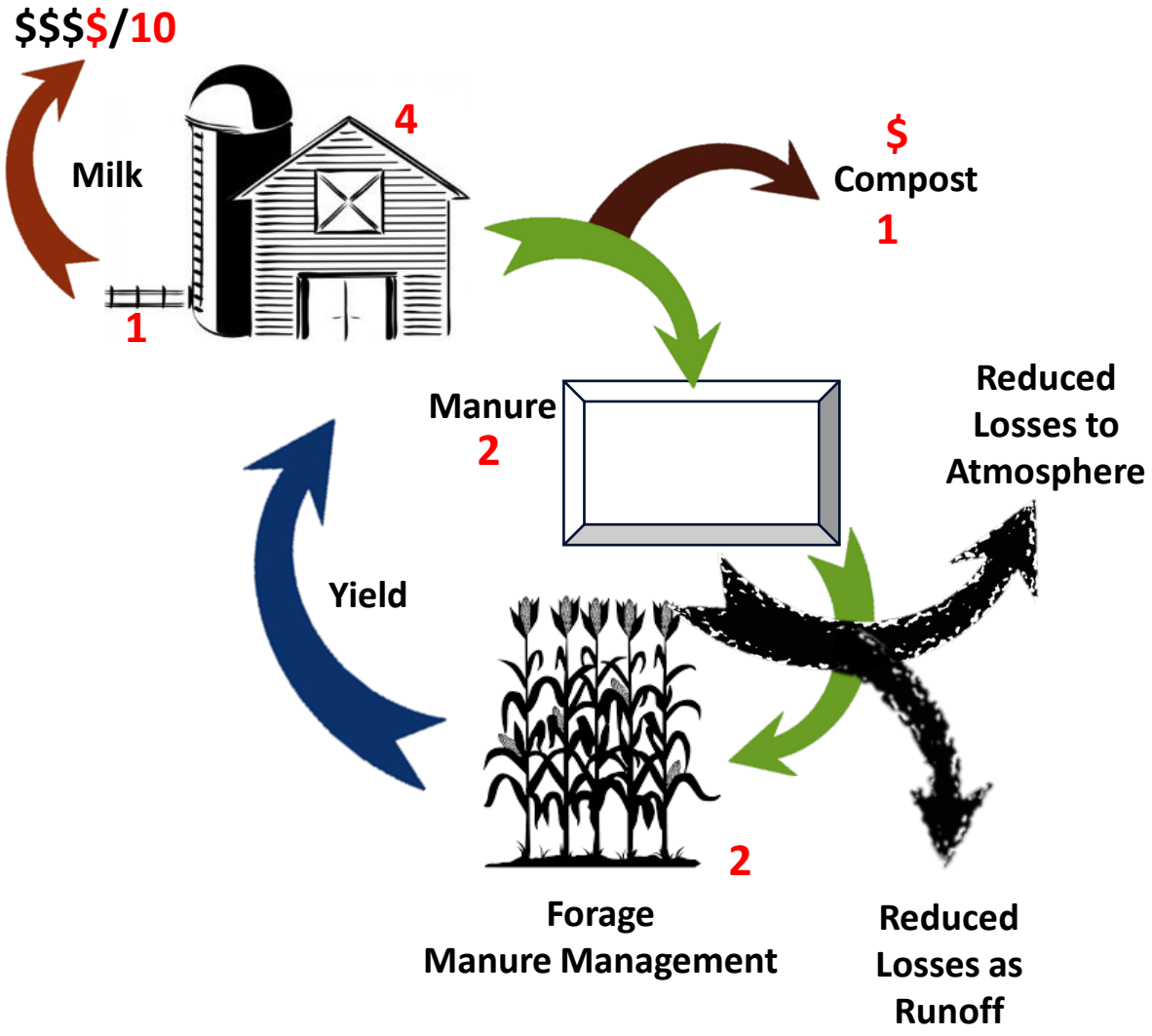


Healthy soils
Water management benefits
Less commercial fertilizer
No external discharge

Simplest Internally Balanced System

- No loss of valuable nutrients
- Regulatory certainty
- Enhance the reputation of dairy and dairy farming
- Grow consumer and community trust
- Enhance the natural environment

Transforming the Use of Manure



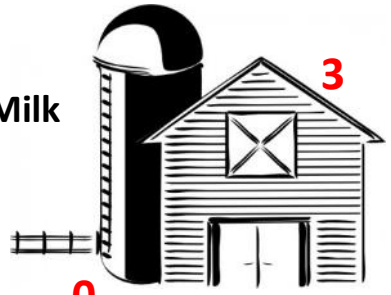
Simple Balanced System with Simple External Product

Healthy soils
Water management benefits
Less commercial fertilizer
No external discharge

Transforming the Use of Manure

$$$$$/0

Milk

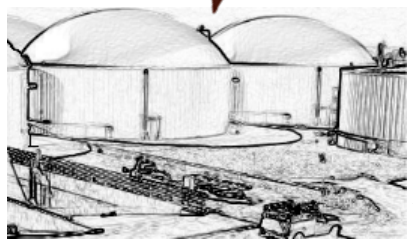


3

0

Manure

0



$$

Electricity
Natural Gas
Heat

-3

Future State

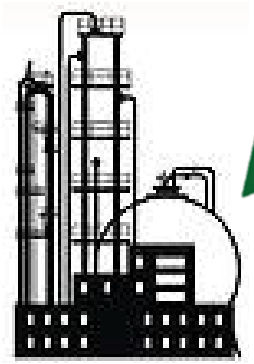
Balanced fields

Leveraged energy value

Leveraged value-added products

Leveraged environmental attributes

1



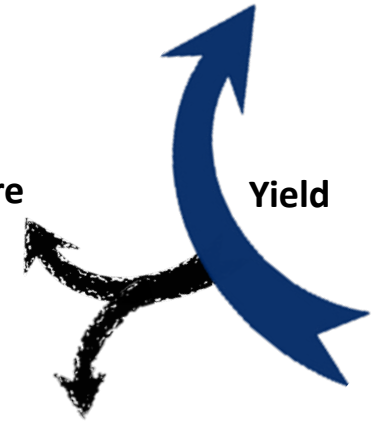
Fertilizer
Products

-1

$$

Products
Credits

0



Yield

Minimal
Losses to
Atmosphere

Minimal
Losses as
Runoff

So, what are the challenges today?

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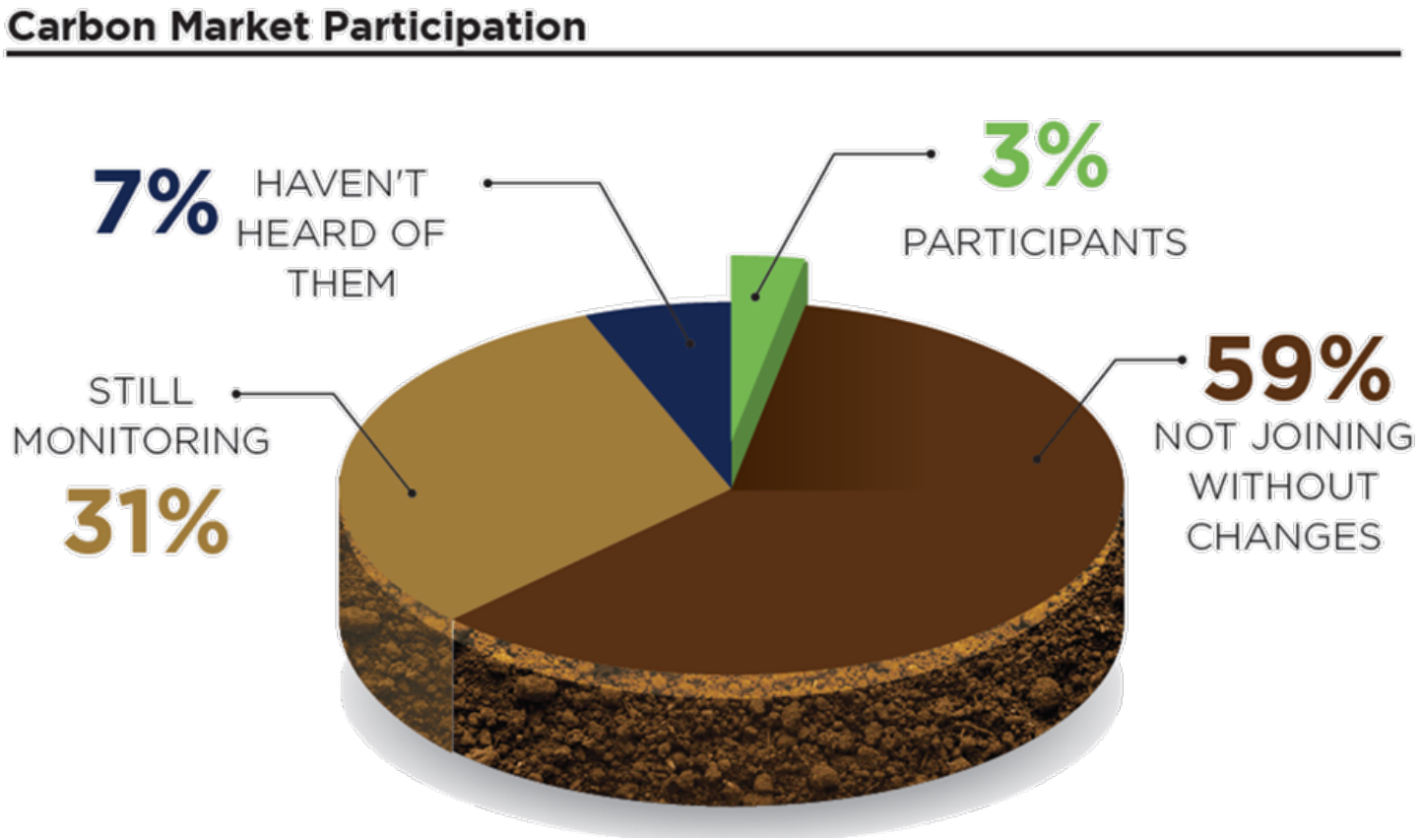
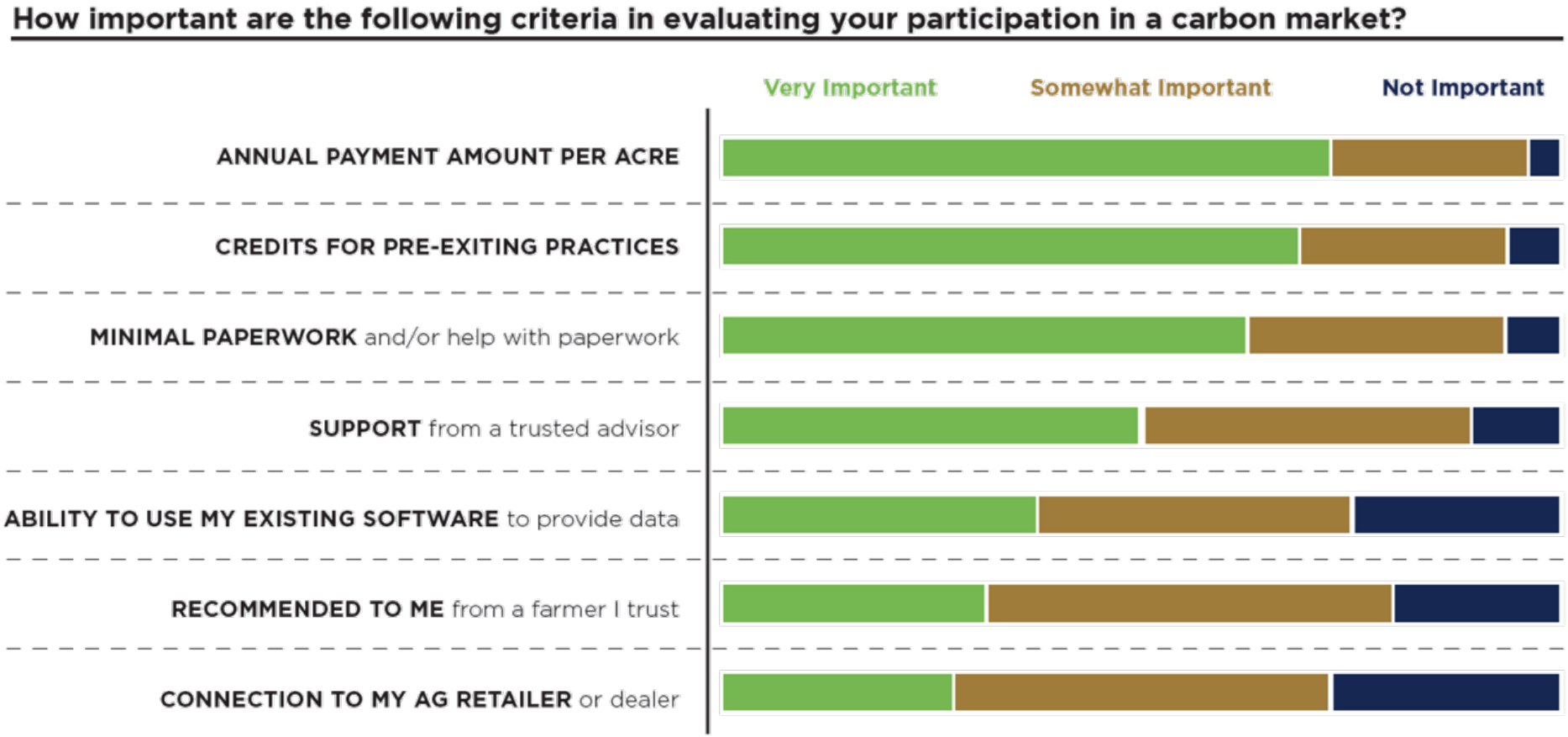
Not all Farmers are Ready to Engage

97% OF FARMERS SURVEYED AREN'T YET READY TO PARTICIPATE IN CARBON MARKETS, ALTHOUGH 93% ARE AWARE THEY EXIST.



What Do Farms Want from Carbon Markets?



Carbon Markets are Promising, but Not a Silver Bullet

- Complex to navigate
- Inconsistent funding
- Need to stack together multiple benefits on the farm
- Growing credibility within programs
- Criticism of environmental benefits within environmental groups

Little Consistency in Approach

- No universal, precise measure of reductions, captures, etc.
- Contract duration
- Acreage minimum
- Lookback period
- Stacking with government programs (e.g., cost-share)
- Targeted buyers
- Product linkages
- Data control and privacy

Overcoming the Challenges

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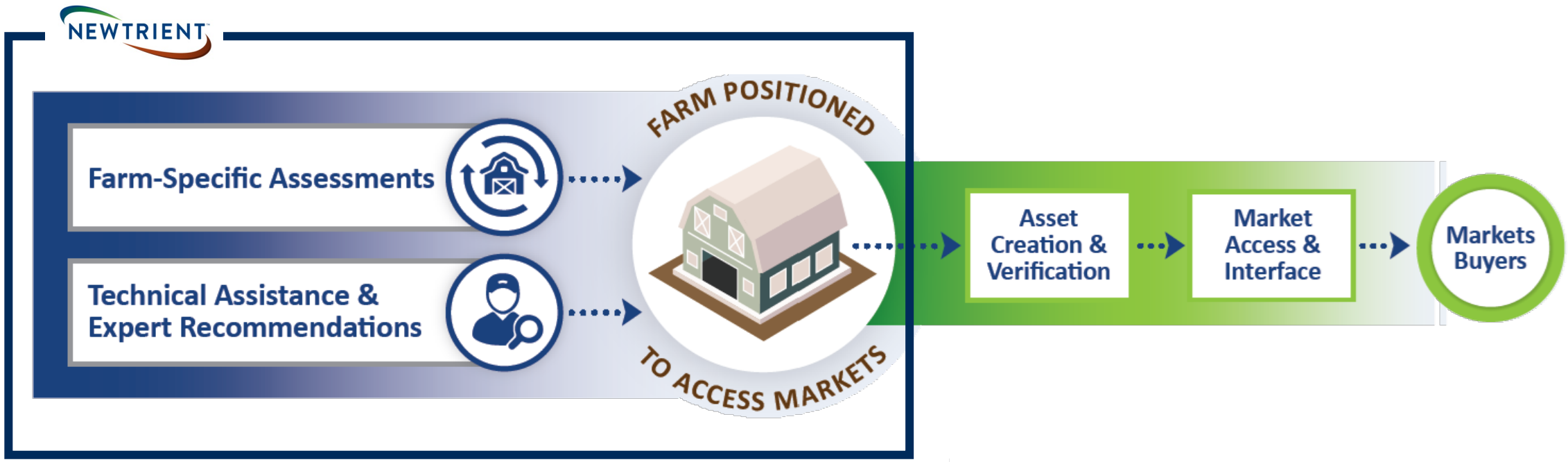
NEWTRIENT'S FOCUS

Newtrient's Standardized Approach to Farm Assessments



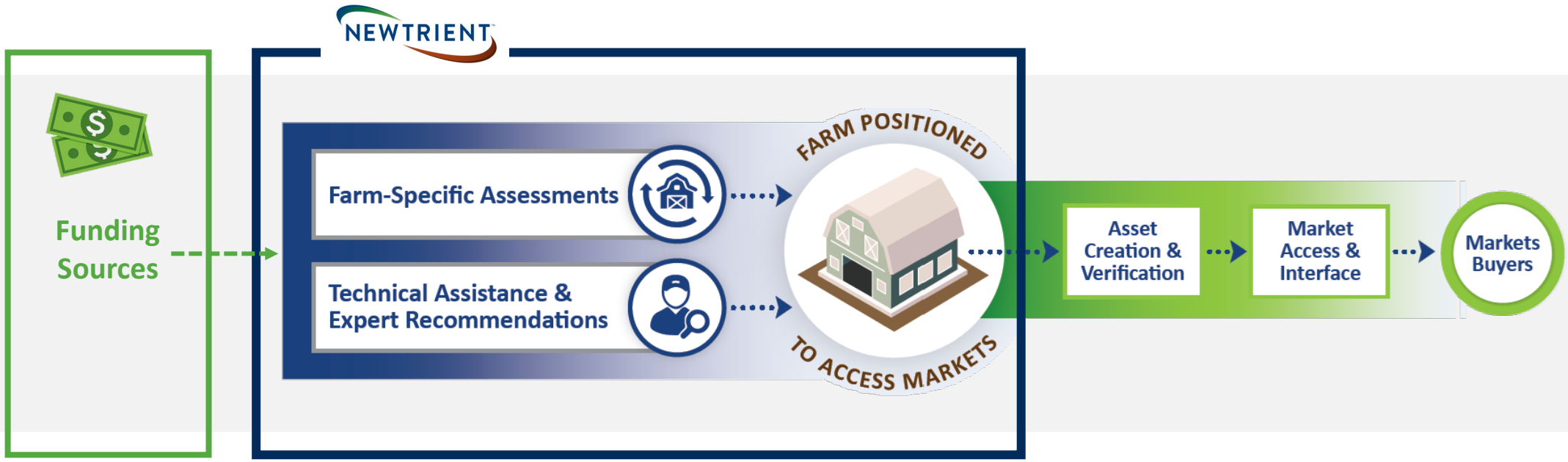
Farm-Specific Assessments

A qualified greenhouse gas (GHG) baseline assessment of the dairy farm's current state, including practices and technologies used on the farm. Assessments will address the total farm GHG footprint, including enteric methane, manure and energy, in addition to practices associated with feed production.

Technical Assistance & Expert Recommendations

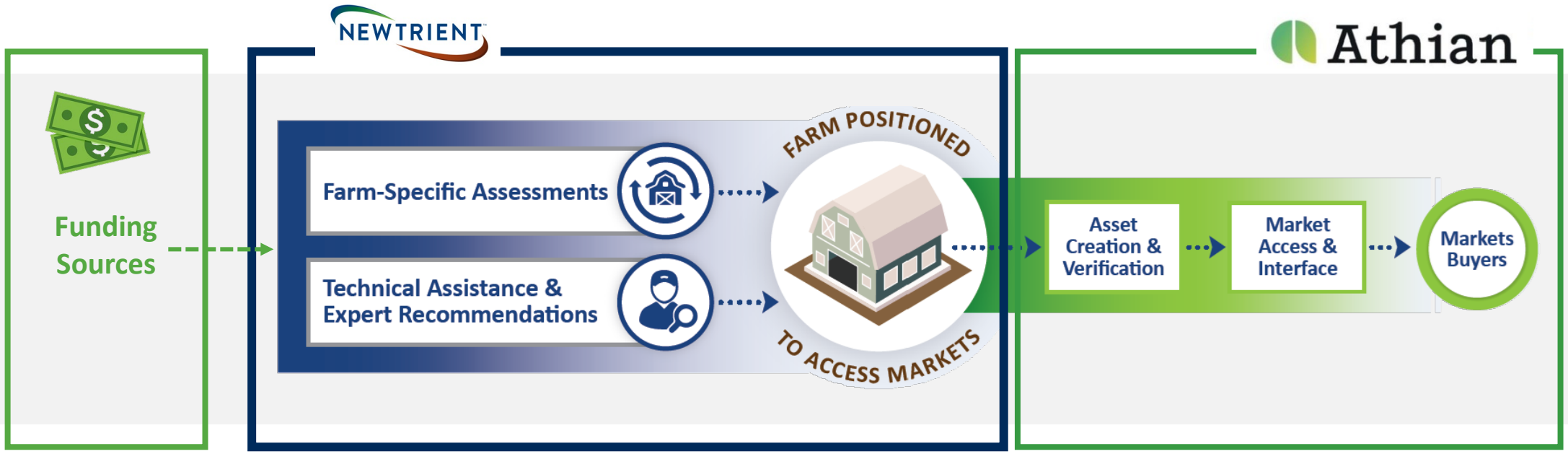
A farm-specific plan with recommendations on climate-smart practices that are economically viable to reduce the GHG footprint.

Scaling Solution Constrained by Funding Sources & Available Markets



Preferred Assessment Tool

Newtrient Overcomes Constrained by Finding Funding Sources & Access to Markets

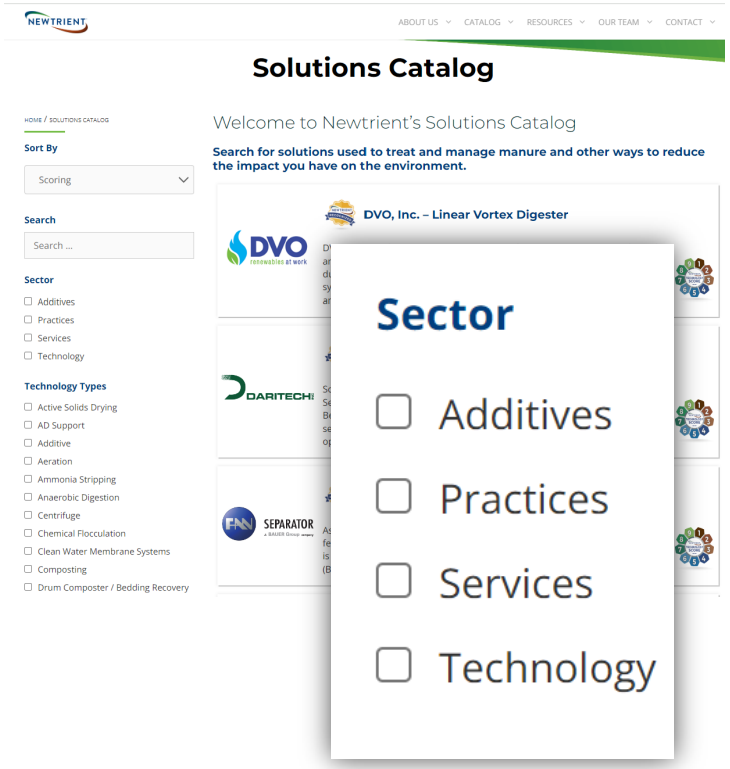


Preferred Assessment Tool

Contact Us

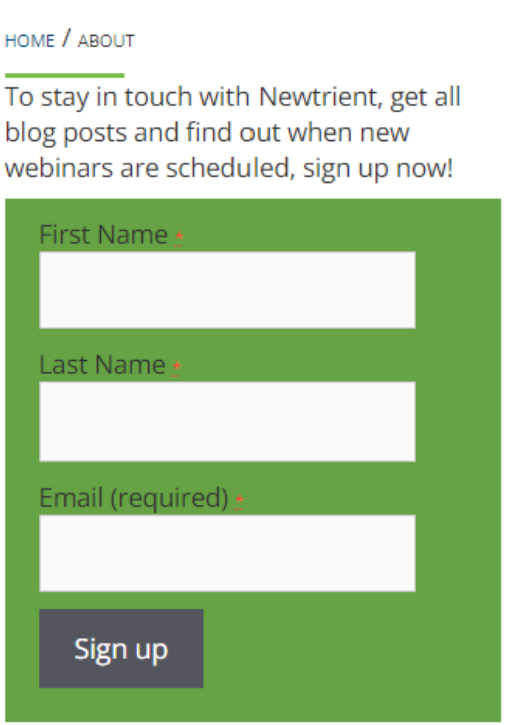
OUR RESOURCES

SOLUTIONS CATALOG



WEBINARS

NEWSLETTER



CONTACT US

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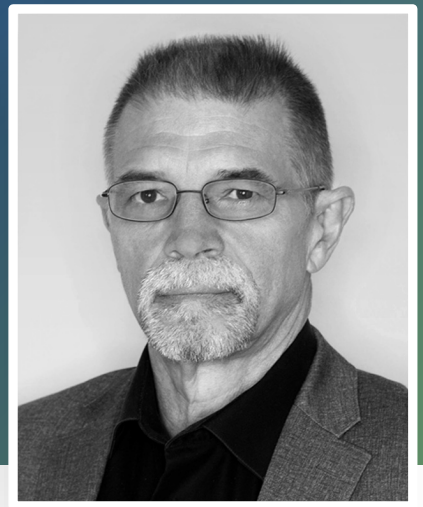

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Questions?