

Nutrition: Help from the Trenches

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Introduction

- **Nutrient value of feedstuffs**
- **Feeding strategies**



Ingredients available for use in swine diets

- **Traditional**
 - Corn
 - Soybean meal
 - Fat
- **Alternative sources**
 - DDGS
 - Wheat Midds
 - Bakery By-Products
 - Corn By-Products (Corn germ meal, corn gluten meal)



Diet Formulation

- **Two basic requirements**
 - **Nutrient demand or requirements for pig**
 - Determined by genetics, lean gain/day, daily intake
 - **Nutrient Content of feedstuffs**
 - Book values or tested
- **Using those two together we get**
 - **Best cost diet formulation**
 - **Formulation containing right combination of nutrients that meets the demand of the pig at a given weight range**



Diet Formulation

- **Traditional ingredient sources**
 - **Generally more consistent and predictable nutrient content, but can still be variable**
 - **Safe formulation but at what cost?**

- **Alternative ingredient sources**
 - **May be highly variable both between and among sources**
 - **Generally better nutrient value for formulation**
 - **Do you know how to use them in formulation?**



How to Use Alternative Ingredients

- **Basic questions**
 - **What is the nutrient content of the ingredient?**
 - Where do you get the nutrient values from
 - **What inclusion rate can be used?**
 - 5, 10, 15, 30%
 - Is there a maximum level we should be concerned with?
 - **Do certain phases of production have restrictions on certain ingredients?**
 - DDGS in late finishing



How to Use Alternative Ingredients

- **Nutrient Content: How do you know what values to use?**
 - **Use book values**
 - NRC, university bulletins, AFIA booklet
 - **Use conservative values to ensure you do not under formulate**
 - What does this cost your system?
 - **Use of prediction equations (Noblet)**
 - **Do your own research**
 - Run internal studies comparing against corn, sbm, or fat



How to Use Alternative Ingredients

- **Inclusion rate: How is that determined?**
 - **Generally the more precise and confident you are on nutrient content, the more aggressive you can be on inclusion rate**
 - Understanding what you are truly using is key
 - How do we correctly manage those nutrients
- **Need understanding of what other nutrients that may limit or can be exploited for animal performance**
 - **Limiting factors may include**
 - Dietary Fiber
 - Anti-nutritional factors
 - Poor palatability
 - **Nutrients that may have a benefit**
 - Digestible NDF in gestation
 - Digestible phosphorus in DDGS



Cargill's Nutrient Approach

- **Two major tools used**
 - **AutoCalc[®]**
 - **Optimal Value Supplier Database[™]**



Cargill's Nutrient Approach – AutoCalc®

- **Cargill analyzes all raw materials for 6 major nutrients**
 - **Moisture**
 - **Ash**
 - **Protein**
 - **Fat**
 - **NDF**
 - **ADF**
- **Through a series of coefficients and prediction equations, complete nutrient profile is calculated**
 - **NIRs and wet chemistry allows us to verify these coefficients**



Cargill's Nutrient Approach - AutoCalc®

- **Minerals can be predicted from ash**
 - Swine digestible phosphorus
- **Digestible amino acids can be predicted from protein and using digestibility coefficients**
 - Swine ileal lysine, threonine, tryptophan, etc
- **Net Energy (NE) can be predicted by calculating various energy components of raw materials (e.g. fat, starch, protein, other carbohydrates) and using a series of coefficients**
 - **NE limits the variation in animal performance often experienced when using alternative ingredients and formulating on ME which does not account for heat loss from fermentation or other metabolic processes**



Cargill's Nutrient Approach - AutoCalc®

- **These equations allow a very dynamic system to be put in place to understand the nutrient content at all times**
 - **Versus just a snapshot in time**
 - **Versus the use of generic book values**
- **These allow for much quicker and precise estimations of nutrient content of new raw ingredients**
 - **Allows for the understanding and use of a new nutrient stream that others do not know how to use as effectively**
 - **This can result in obtaining an inexpensive raw material with a high nutrient availability for your system**



Cargill's Nutrient Approach – OVSdb

- **Database where all nutrient analyses are stored**
- **All information is separated by sources and suppliers of raw materials**
- **Nutrient values are predicted using data from the previous 60 days of nutrient measures**
- **Gives both confidence score and variability score to each supplier based on number of samples collected and variability of that supplier over time**



Last OVSdb Summary: 24-Feb-2011 Template:

Ingredient: ... SubCode: Save Blend

Export Code: ... Ingredient Risk:

Suppliers To Blend

Supplier	Supplier Name	Percent

New Crop Always Take BMP Value

Total Pcnt: 0 %

Blend Result

Nutrient	Value	Regional	AnName

Pct Remain: 100 %

Regional Values

Samples	ASH	CADF	CNDF	CP	FAT	IVAAD	MOI	P	PRERUP	S
2744	3.99	7.25	24.57	26.24	10.15	3.59	9.83	0.76	20.16	

Available Suppliers

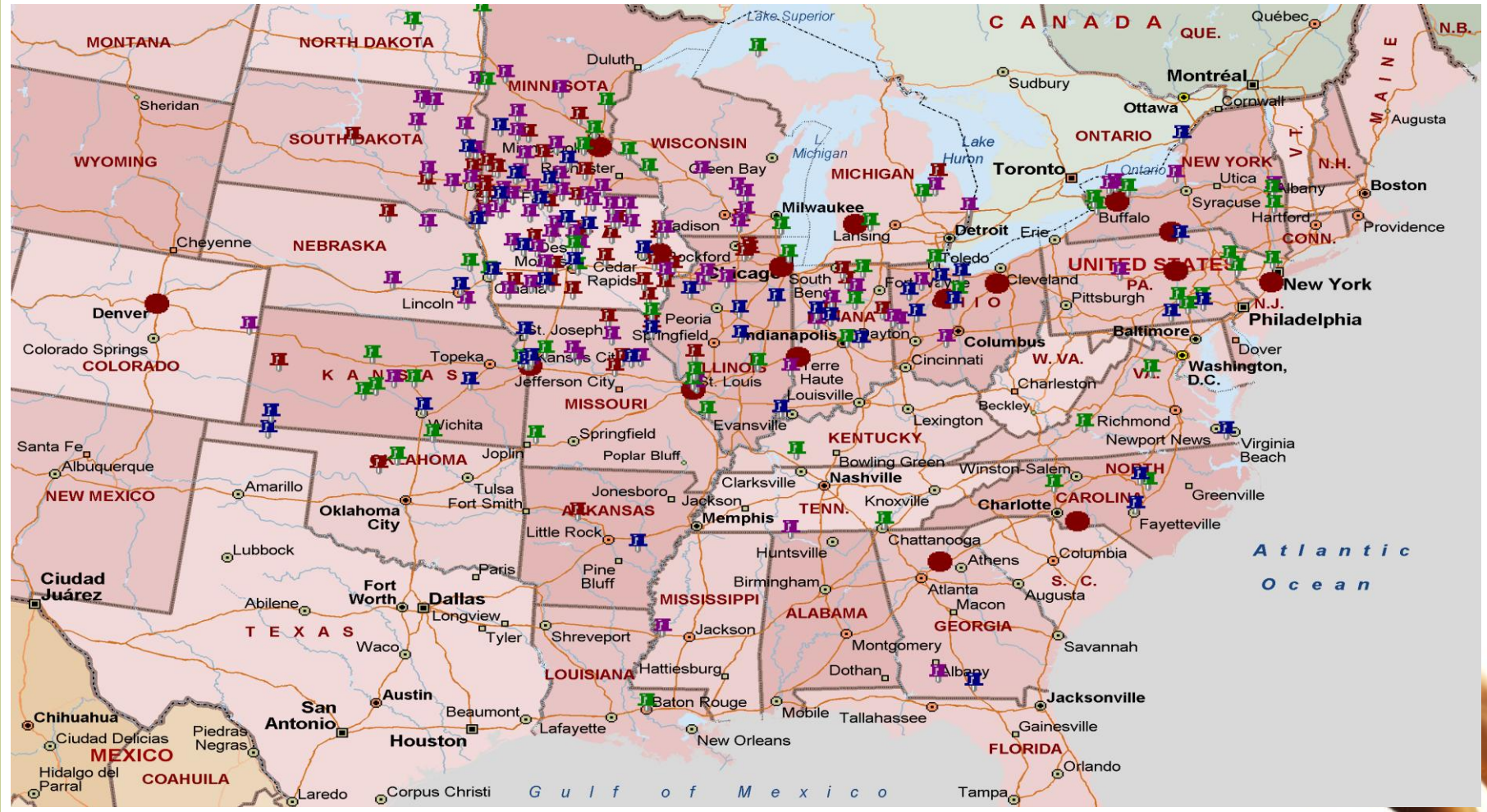
Use	Supplier	Supplier Name	City	State	Dtl	LC	SC	Ris	ASH	CADF	CNDF	CP	FAT	IVAAD	MOI	P	PRERUP	S	ZVAAD	Ca
■	50444-75	Poet Biorefining_(Hanlon)	Hanlontow	IA	...	8	3	M	4.06	6.69	22.55	25.94	10.60	4.31	10.38	0.77	19.75	0.75	0.45	
■	39084	Nova Grain_(St-Jean Sur R	St-Jean S	QC	...	8	4	M	3.93	6.71	25.66	28.31	9.50	3.14	9.05	0.74	21.83	0.42	0.22	
■	50501-	Valero Renewable Fuels_(F	Fort Dodg	IA	...	8	4	M	3.91	7.65	26.30	25.31	11.07	3.23	10.64	0.77	19.90	0.51	0.20	
■	56137	Heron Lake Bio Energy_(He	Heron Lak	MN	...	8	5	M	3.79	7.53	24.19	25.48	9.31	3.90	10.29	0.73	20.50	0.59	0.29	
■	58576-	Blue Flint Ethanol_(Under	Underwoo	ND	...	9	0	M	3.98	7.00	26.42	28.54	8.93	3.50	10.46	0.72	21.85	0.51	0.26	
■	K0E1T0	Greenfield Ethanol_(Presc	Prescott	ON	...	9	2	M	3.69	6.97	24.15	25.90	10.97	3.32	11.01	0.77	20.47	0.53	0.22	
■	50164	Flint Hills Resources_(Me	Menlo	IA	...	9	3	M	4.00	7.04	24.10	24.92	10.46	3.25	10.94	0.78	18.50	0.58	0.24	
■	51601	Green Plains Renewable En	Shenando	IA	...	9	3	M	3.72	7.85	25.96	24.56	9.59	3.18	10.79	0.73	20.02	0.43	0.21	
■	56031-1	Buffalo Lake Energy_(Fair	Fairmont	MN	...	10	2	M	3.90	7.30	23.38	26.23	9.12	3.92	9.98	0.74	20.20	0.52	0.32	
■	57002	Valero Renewable Fuels_(A	Aurora	SD	...	10	5	M	3.69	6.81	24.04	25.61	10.06	3.06	10.59	0.76	20.41	0.46	0.18	
■	62451	Lincolnlnd Agri Energy_(Palestine	IL	...	10	5	M	4.11	8.39	28.06	27.17	8.77	3.88	10.37	0.77	20.86	0.56	0.29	
■	46947-	Andersons Clymers Ethanol	Clymers	IN	...	10	6	M	3.91	7.11	24.42	25.25	10.46	3.37	10.13	0.81	20.49	0.50	0.24	
■	38240-1	Green Plains Renewable En	Obion	TN	...	11	0	M	3.97	7.26	24.19	26.19	9.31	3.50	9.66	0.78	20.14	0.40	0.28	
■	65339-	Mid Missouri Energy_(Mal	Malta Ben	MO	...	11	0	M	4.05	7.83	26.57	25.91	10.06	3.01	10.96	0.71	19.95	0.58	0.32	
■	68110-24	Gavilon_(Omaha)	Omaha	NE	...	11	3	M	4.03	7.03	24.56	25.41	10.34	3.08	10.02	0.78	20.26	0.39	0.25	
■	53916	United Cooperative_(Beave	Beaver D	WI	...	11	4	M	4.11	7.86	24.18	26.13	9.04	3.96	11.75	0.74	18.83	0.66	0.35	
■	N7M5J5	Greenfield Ethanol_(Chath	Chatham	ON	...	12	2	M	3.79	8.06	25.77	27.54	10.44	3.96	8.92	0.76	21.66	0.61	0.28	
■	51503-1	Southwest Iowa Renewable	Council Bl	IA	...	12	5	M	4.12	8.08	25.79	26.64	10.16	3.89	9.37	0.76	20.14	0.56	0.29	
■	52635	Big River Resources_(West	West Burl	IA	...	12	7	M	4.16	7.97	25.00	25.50	9.07	3.58	7.94	0.83	20.25	0.55	0.28	
■	16830	Bionol Ethanol_(Clearfiel	Clearfield	PA	...	12	8	M	4.02	7.52	23.82	25.59	10.09	3.49	11.44	0.83	19.65	0.47	0.27	
■	N5H2R9	Integrated Grain Processo	Aylmer	ON	...	12	8	M	3.97	7.44	26.28	28.07	11.12	3.55	9.06	0.87	21.58	0.54	0.29	
■	68883	BFE_(Wood River)	Wood Riv	NE	...	12	9	M	3.91	7.38	23.87	26.61	9.96	3.80	10.34	0.76	20.86	0.45	0.29	
■	47371	Poet Biorefining_(Portlan	Portland	IN	...	12	10	M	4.07	6.67	22.04	25.76	10.69	4.38	10.54	0.80	19.73	0.76	0.46	
■	48040	Marysville Ethanol_(Marys	Marysville	MI	...	13	2	M	4.00	7.80	26.76	26.97	10.64	3.44	10.88	0.83	21.74	0.45	0.23	
■	48723-	Poet Biorefining_(Caro)	Caro	MI	...	13	3	M	4.22	6.59	22.82	26.16	10.46	4.24	10.00	0.81	19.74	0.77	0.46	
■	52404-43	ADM Corn Processing_(Ceda	Cedar Raj	IA	...	13	8	M	4.11	7.61	24.10	25.35	10.86	3.75	10.44	0.80	20.35	0.50	0.31	
■	57034-1	Poet Biorefining_(Hudson)	Hudson	SD	...	14	3	M	4.24	6.58	23.00	27.21	9.40	4.45	10.20	0.76	19.79	0.80	0.47	
■	50126-	Hawkeye Renewables_(Iowa	Iowa Falls	IA	...	14	7	M	3.95	6.57	23.70	25.51	10.95	3.11	8.79	0.80	19.02	0.63	0.25	
■	54646	Castle Rock Renewable Fue	Necedah	WI	...	15	4	M	3.89	7.46	24.33	26.63	8.80	3.75	9.96	0.77	20.76	0.54	0.26	
■	05401	Acherman Beardsley_(Burl	Burlington	VT	...	15	6	M	4.01	6.94	24.26	25.57	9.84	3.43	10.37	0.79	19.93	0.47	0.29	

Relative Value of Raw Material Sources

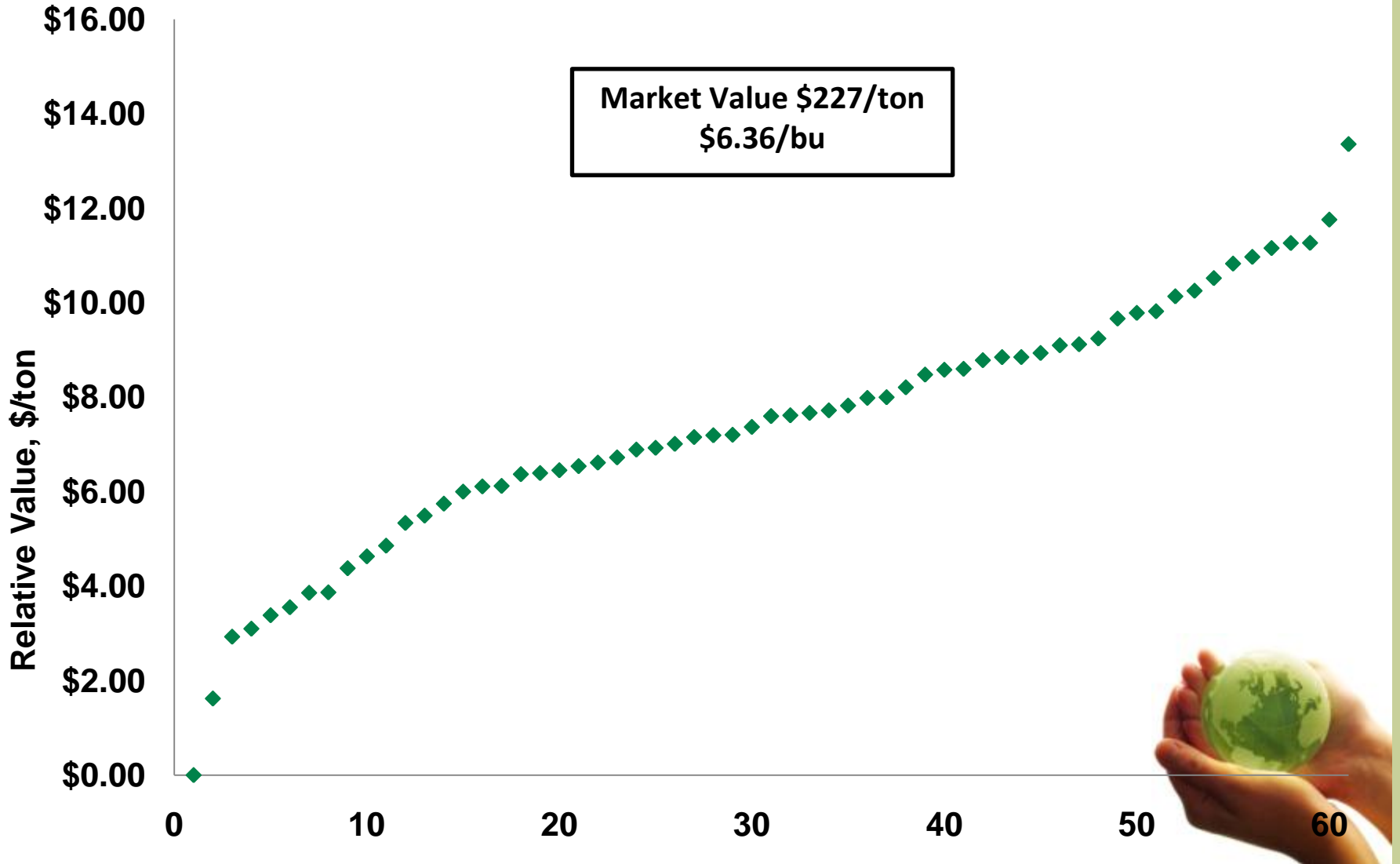
- **Evaluated Relative Value of supplier for the following raw materials in Cargill's OVSdb**
 - **Corn (\$227/ton) - \$6.36/bu**
 - **SBM (\$354/ton)**
 - **DDGS (\$194/ton)**
 - **Wheat Midds (\$152/ton)**
 - **Bakery byproduct (\$225/ton)**
- **Diet designed medium energy diet of a 6 phase feeding program**
- **Used 15% max for Midds and Bakery, and 30% max for DDGS**



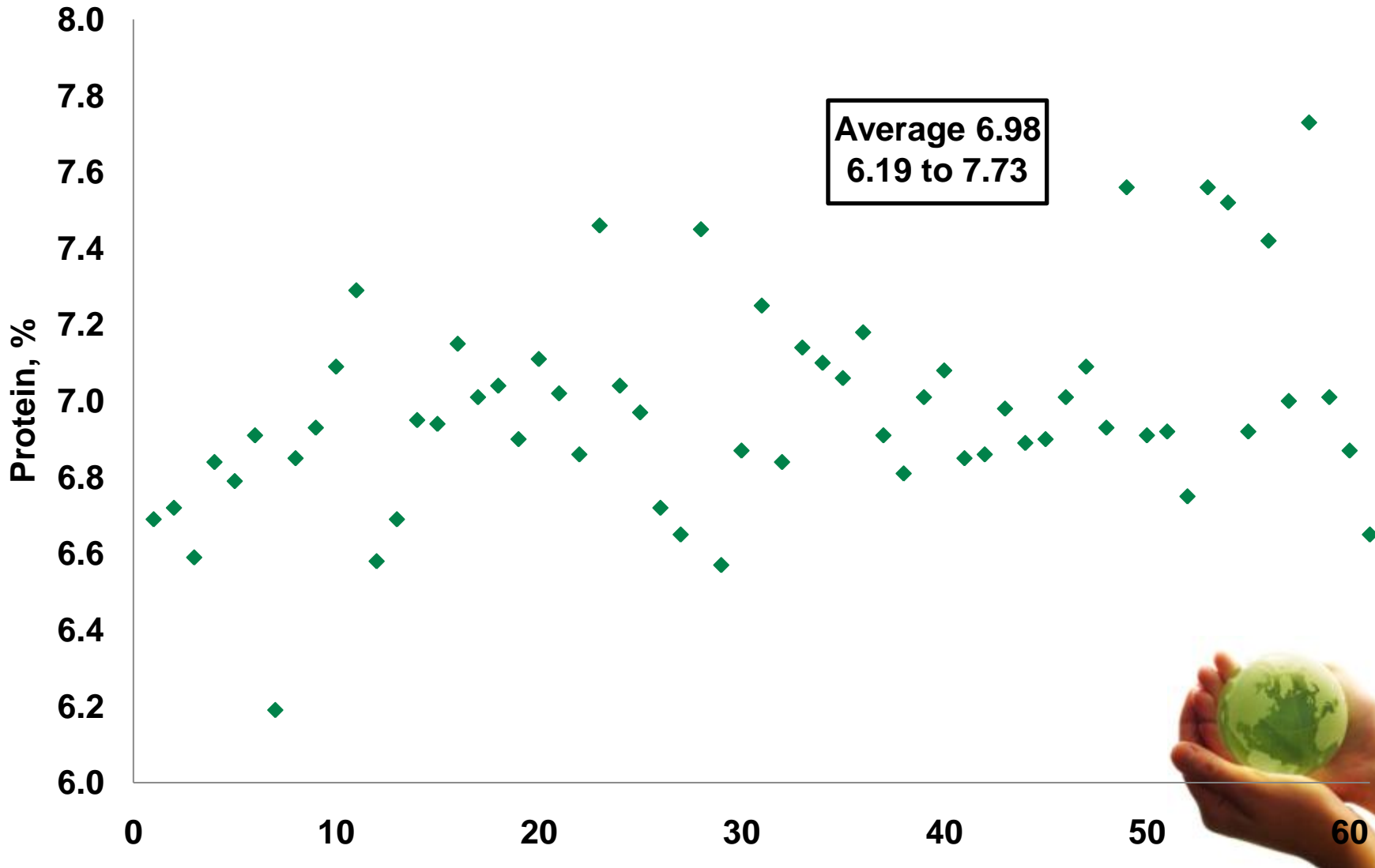
Locations of Raw Material Sources



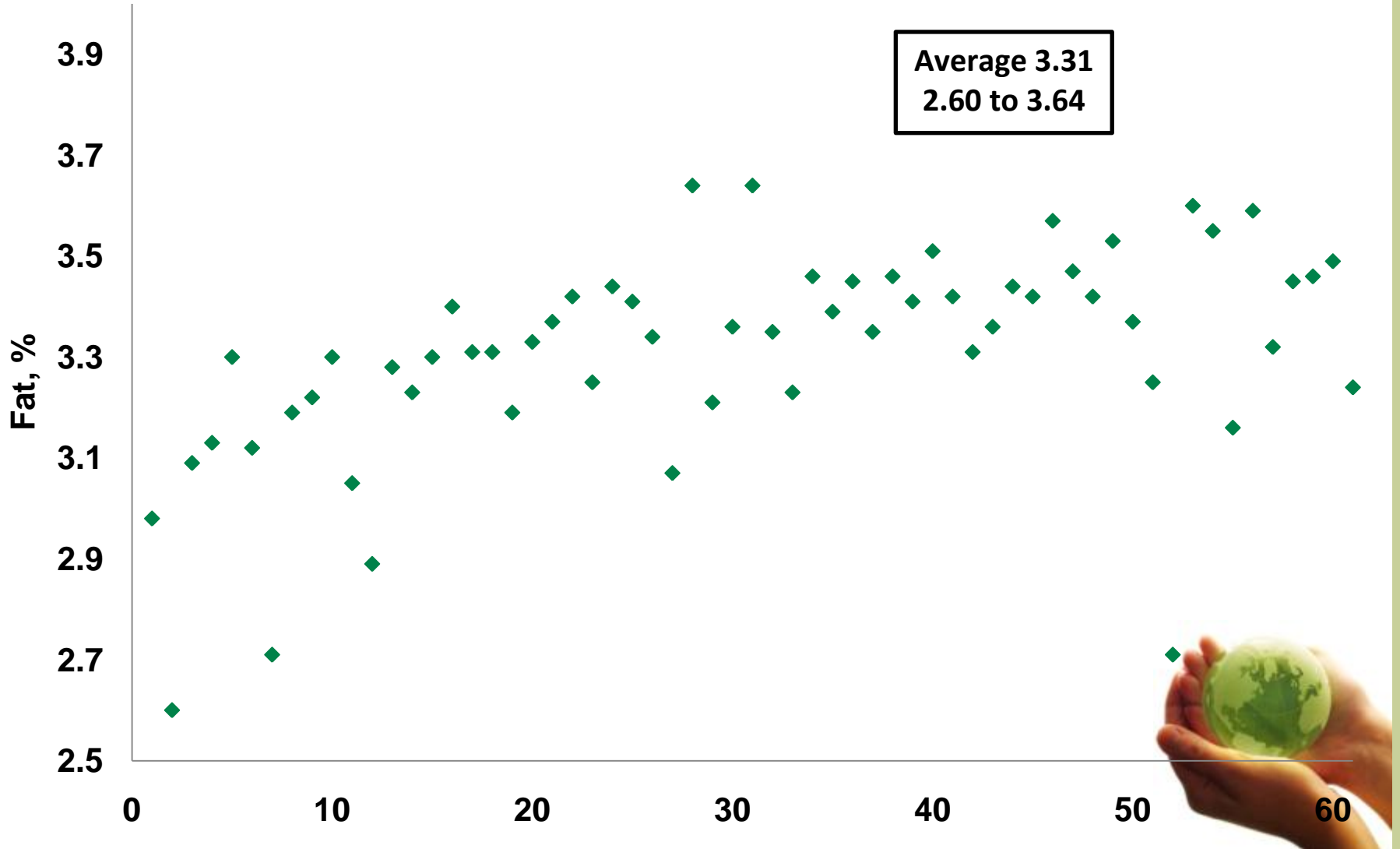
Corn - Relative Value



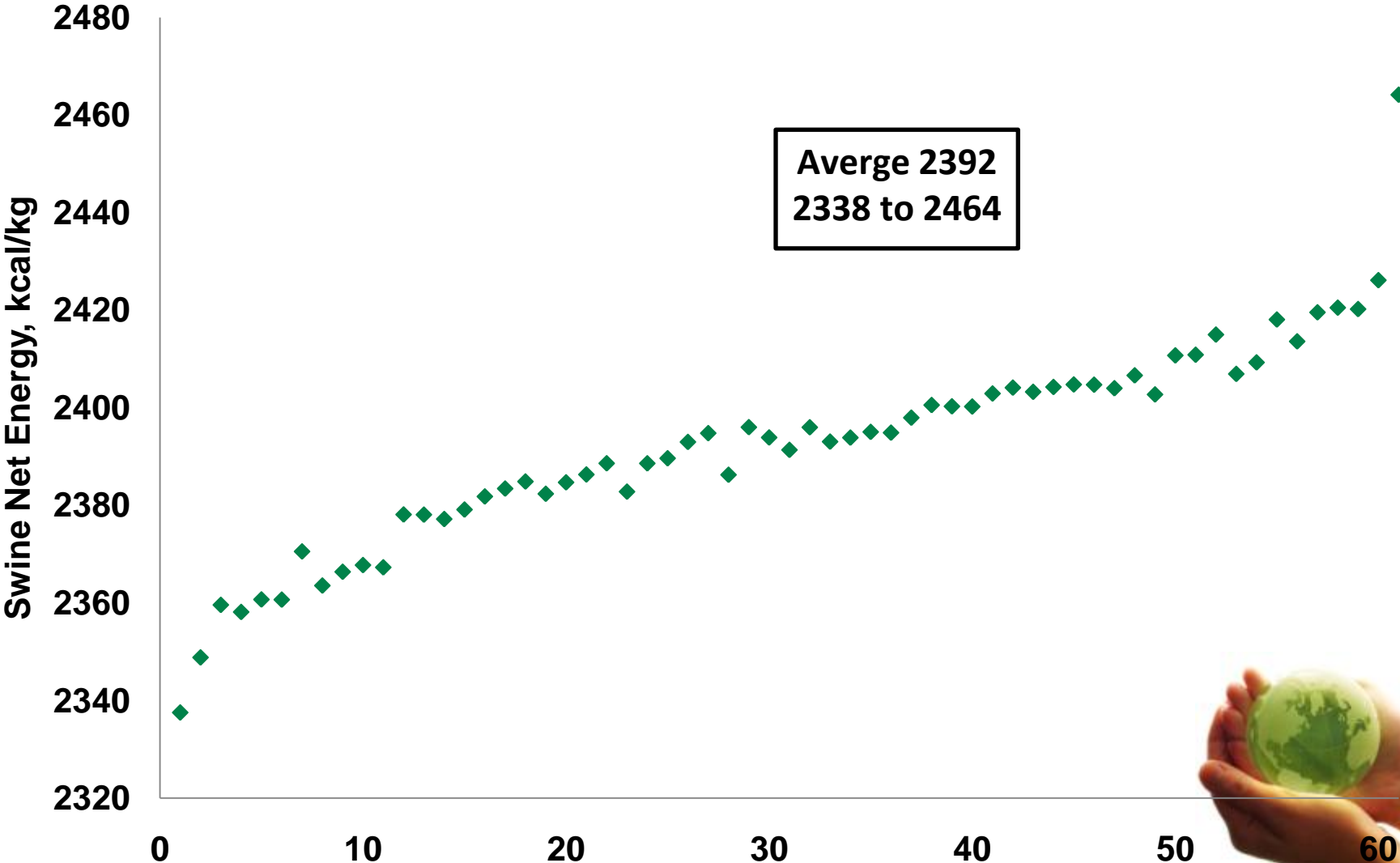
Corn - Protein



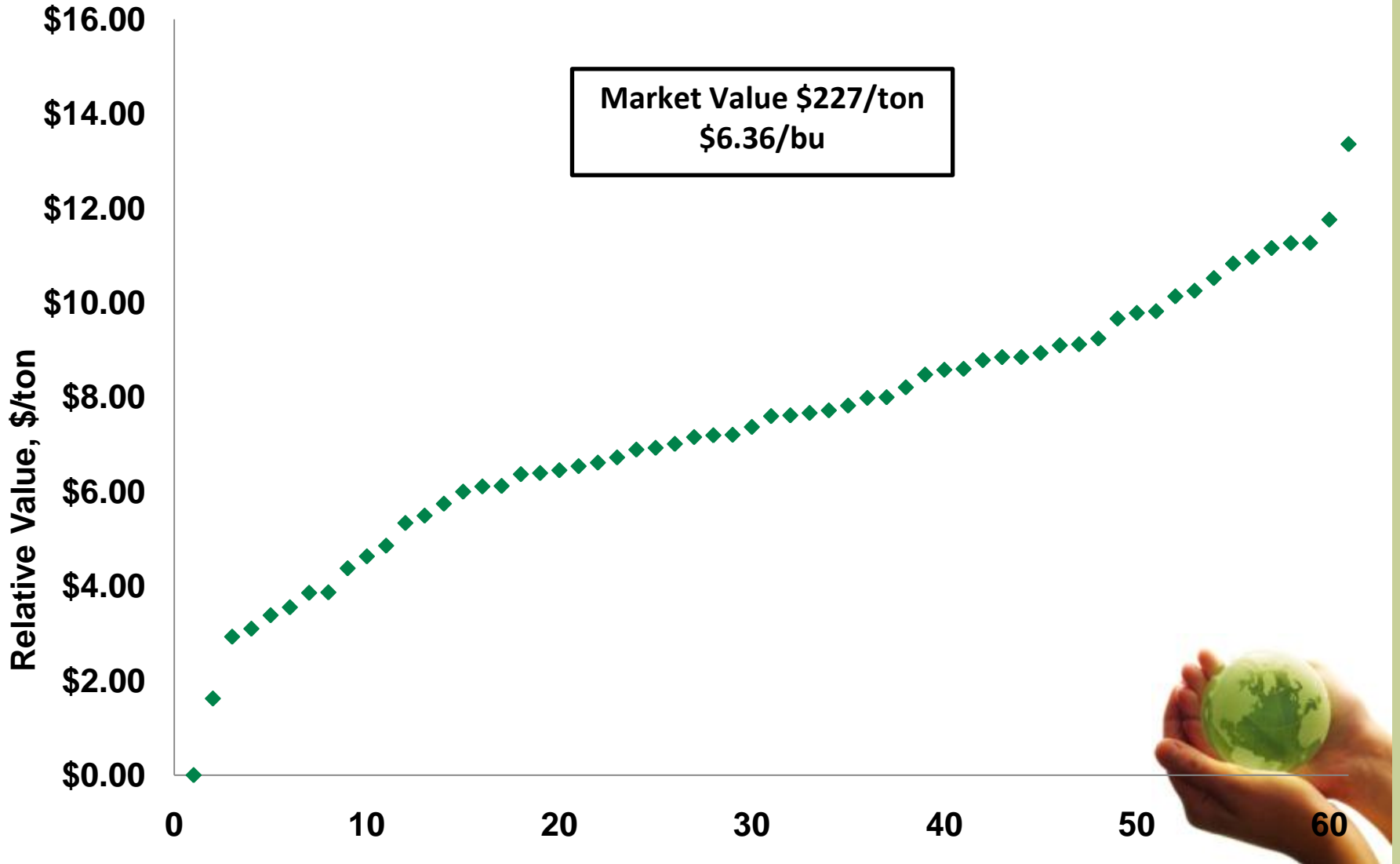
Corn - Fat



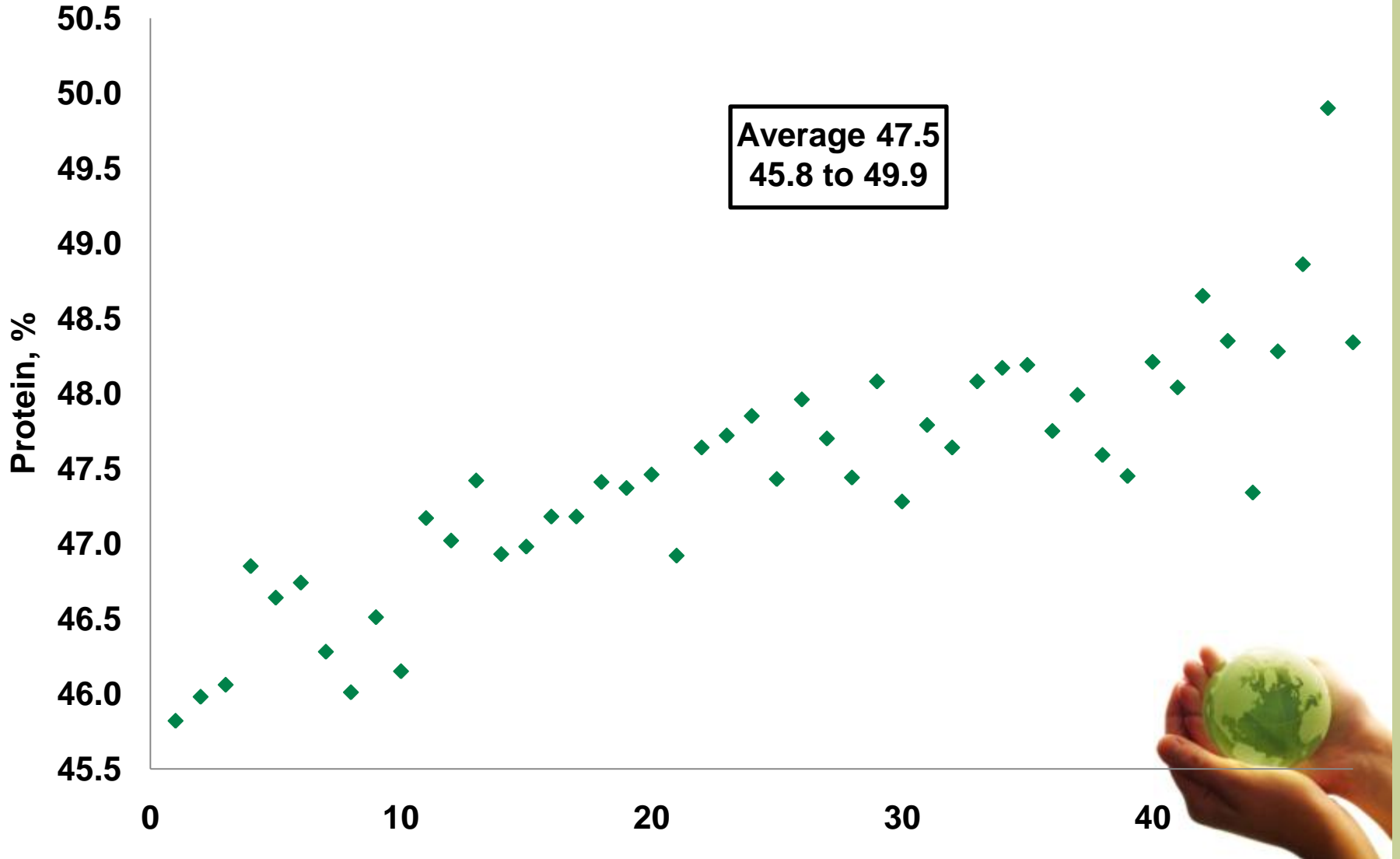
Corn – Net Energy



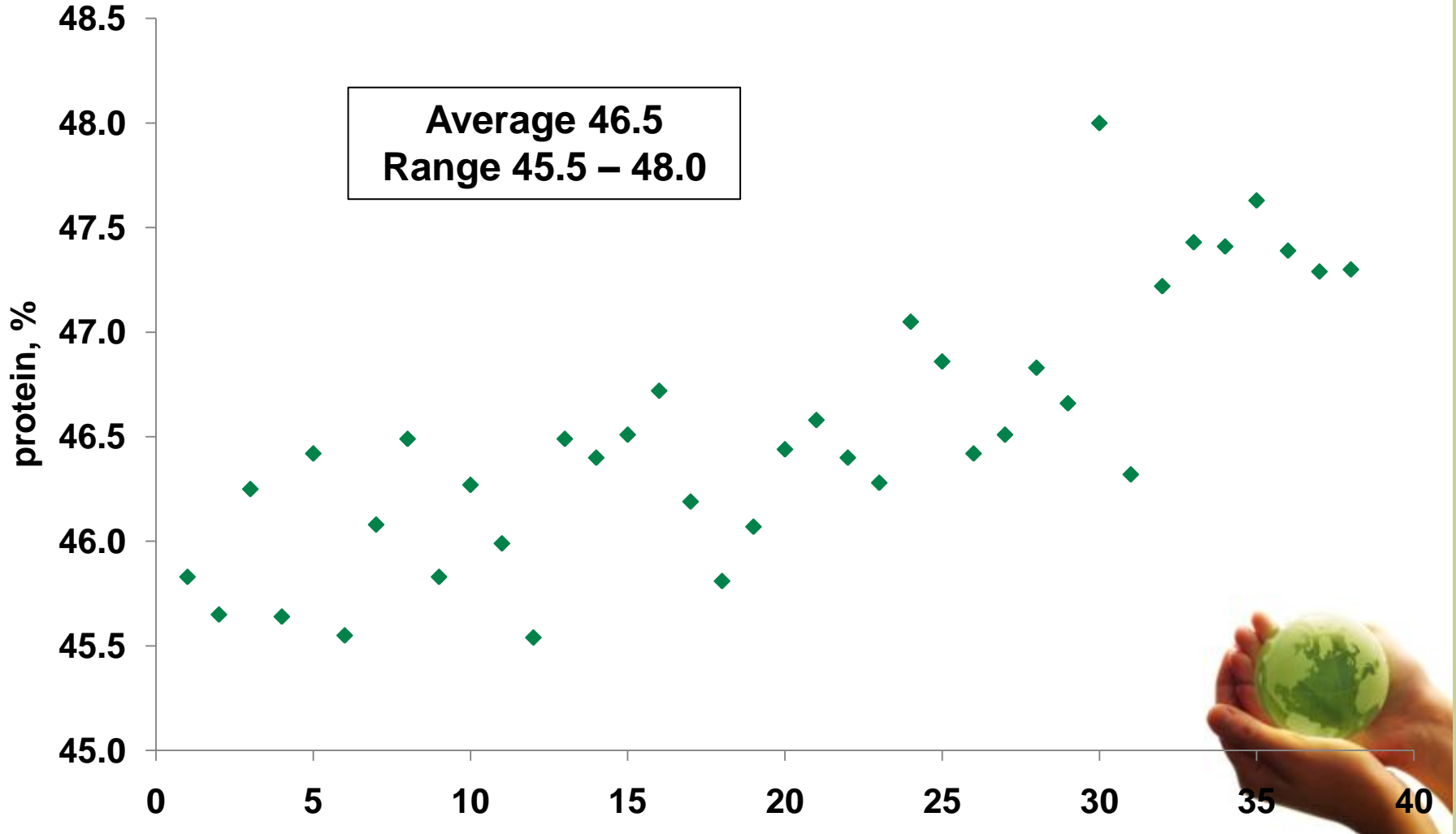
Corn - Relative Value



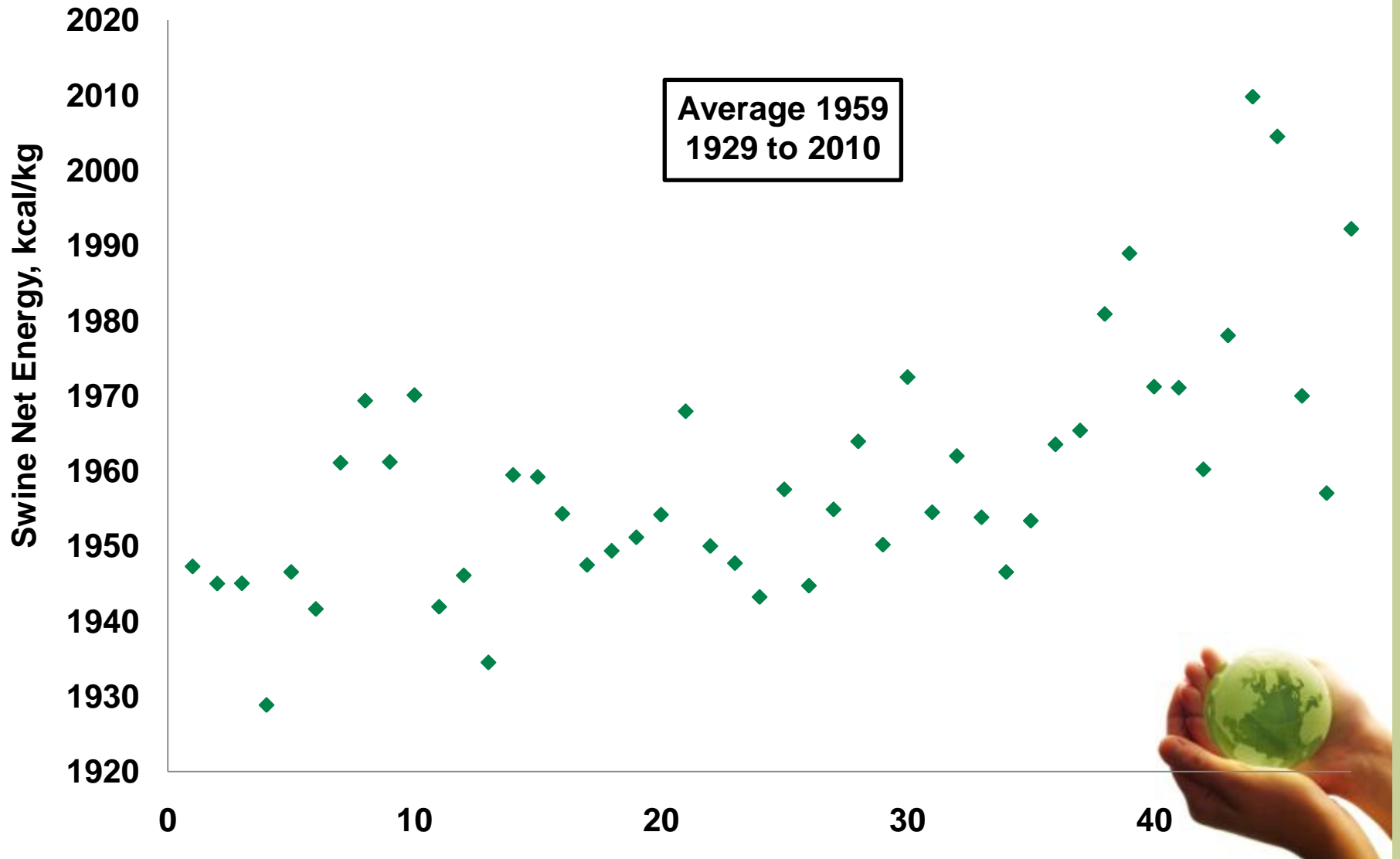
SBM - Protein



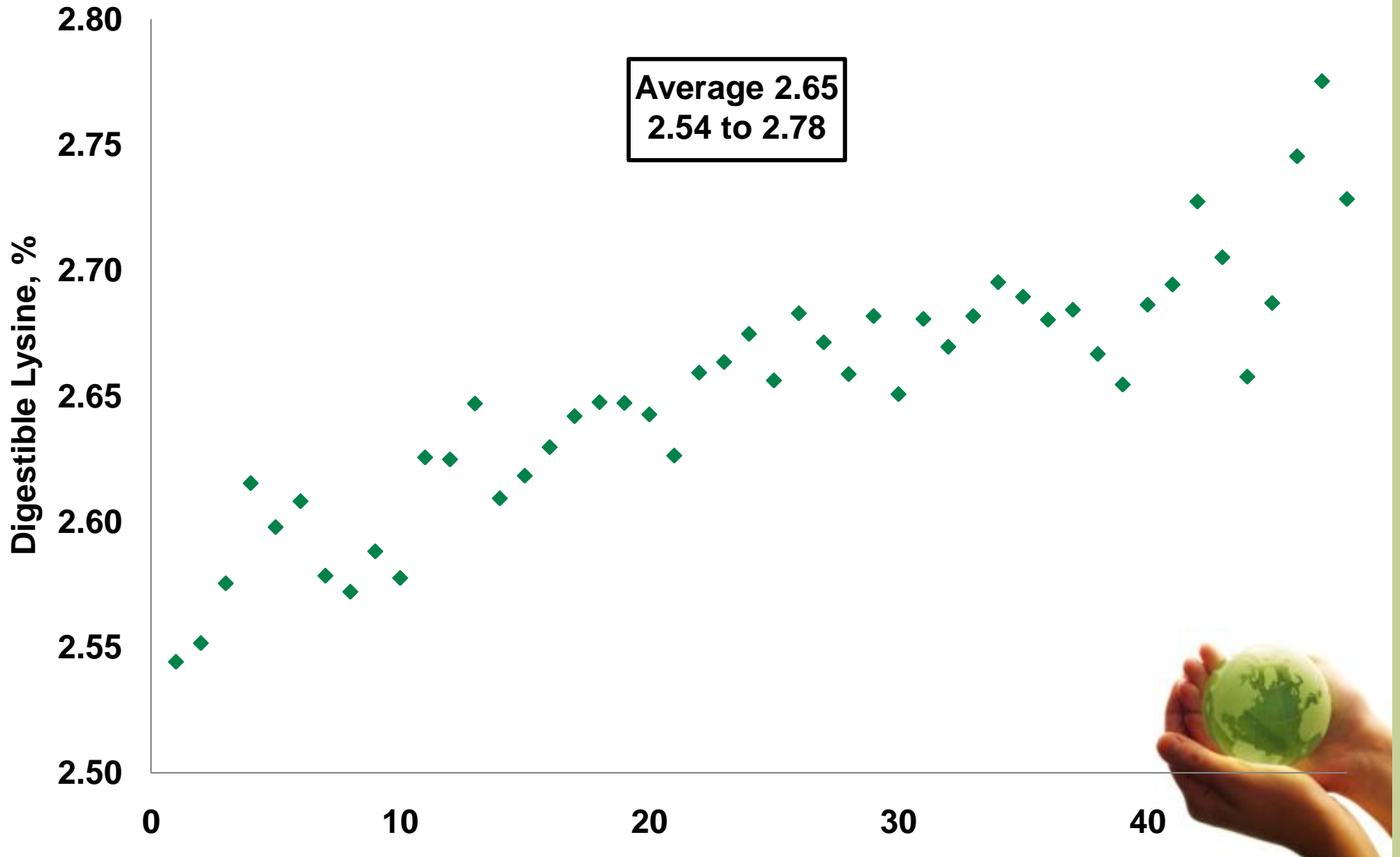
SBM – Protein May 2009



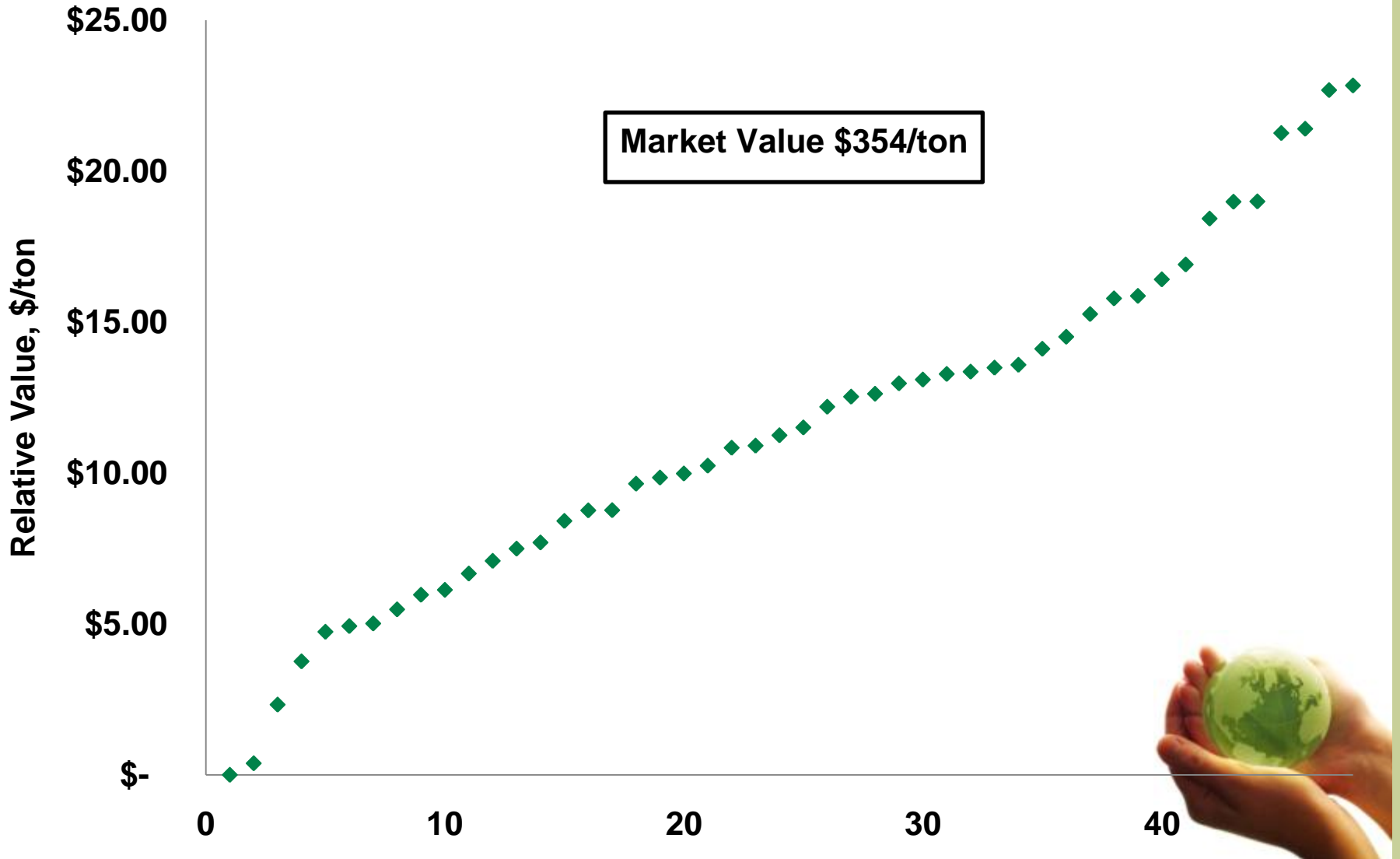
SBM – Net Energy



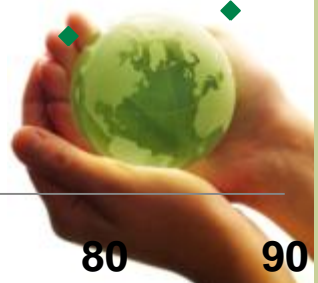
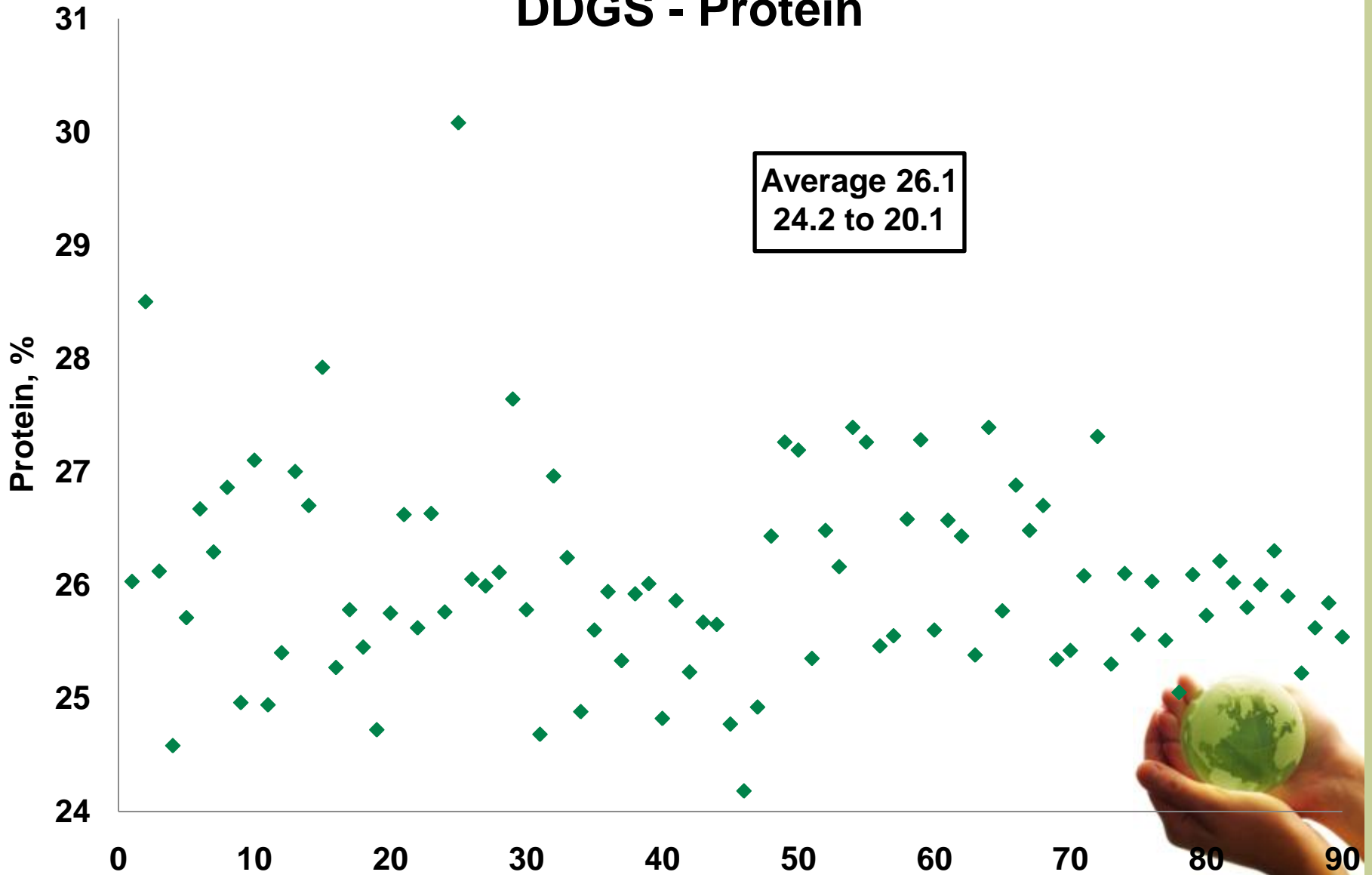
SBM – Digestible Lysine



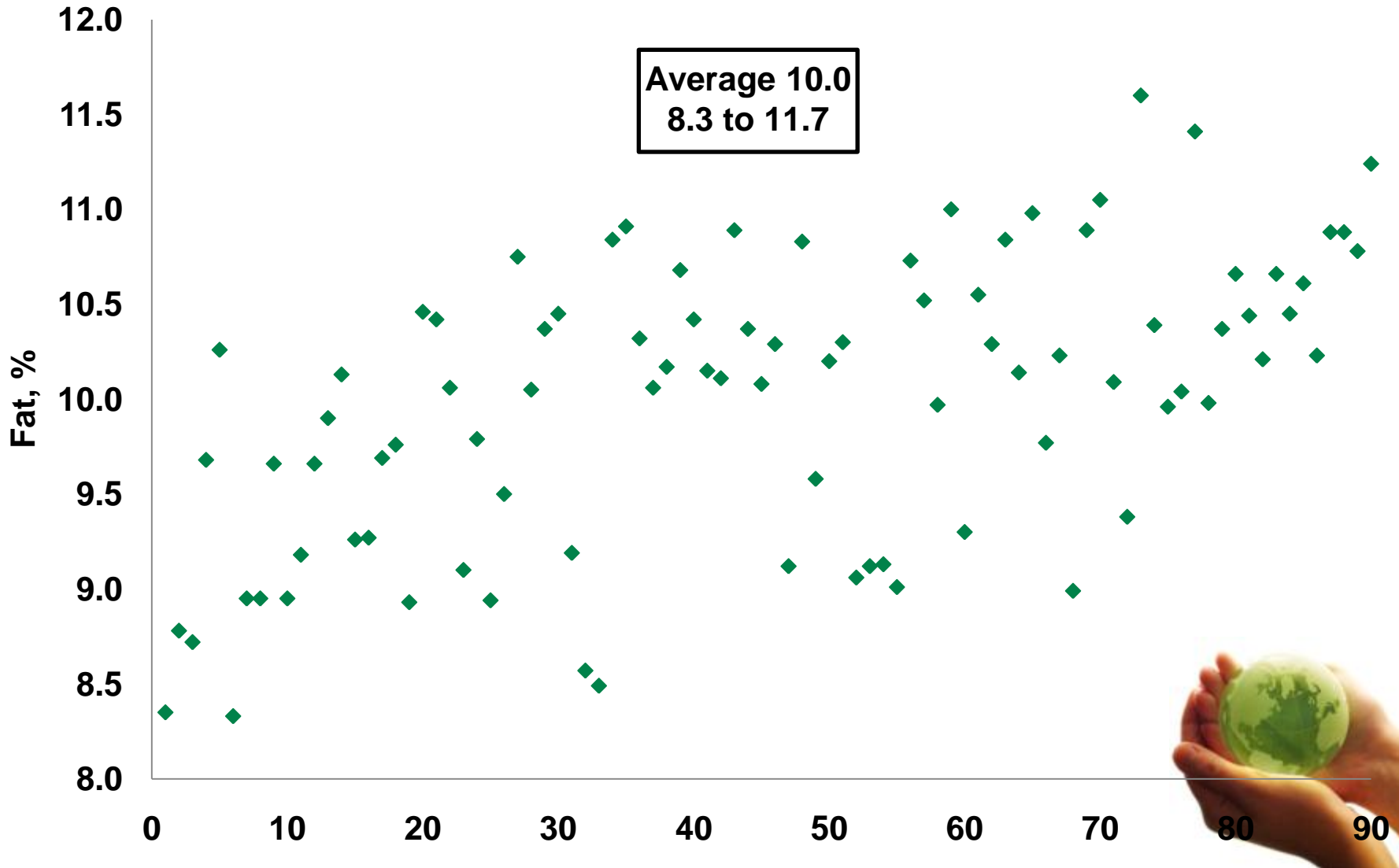
SBM - Relative Value



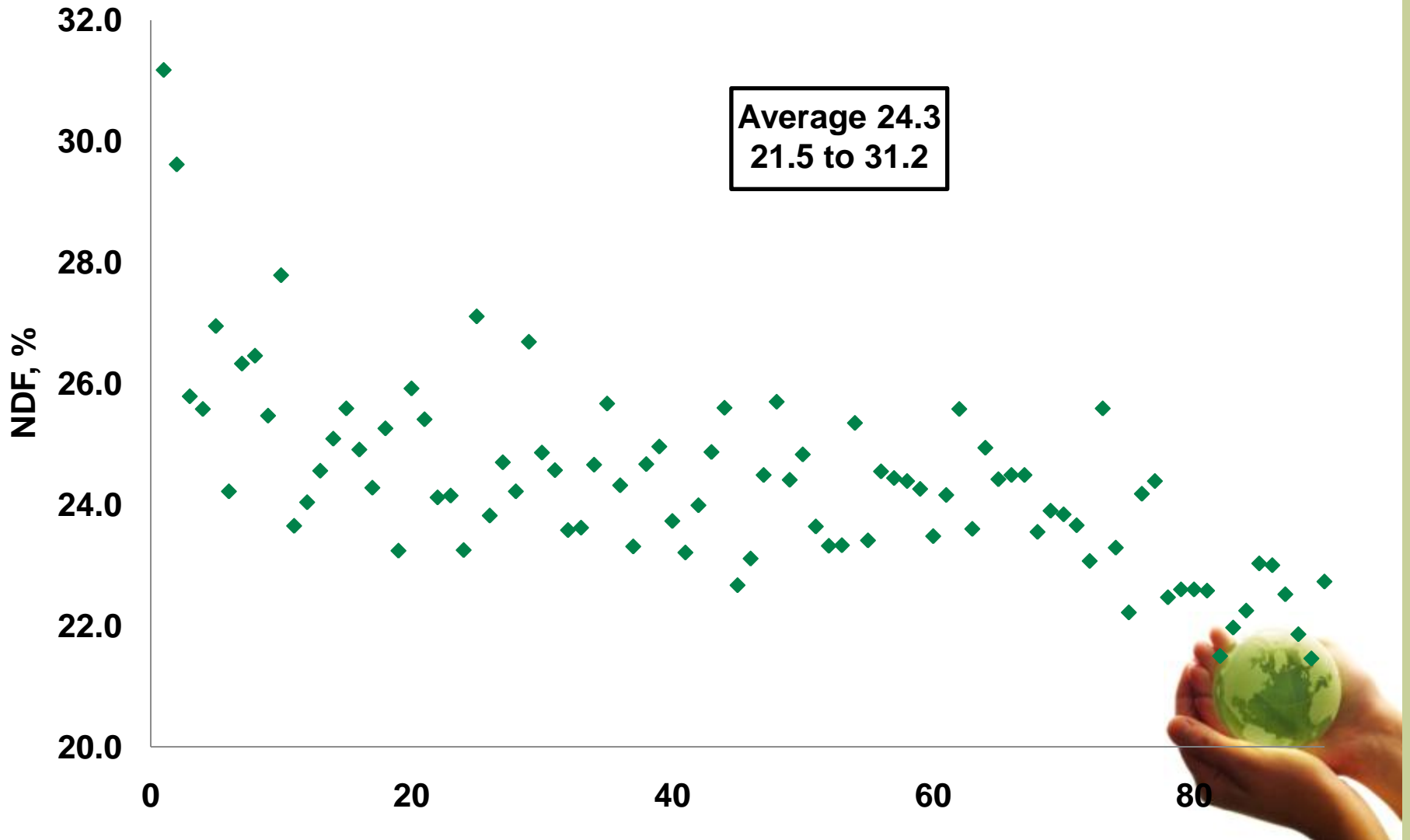
DDGS - Protein



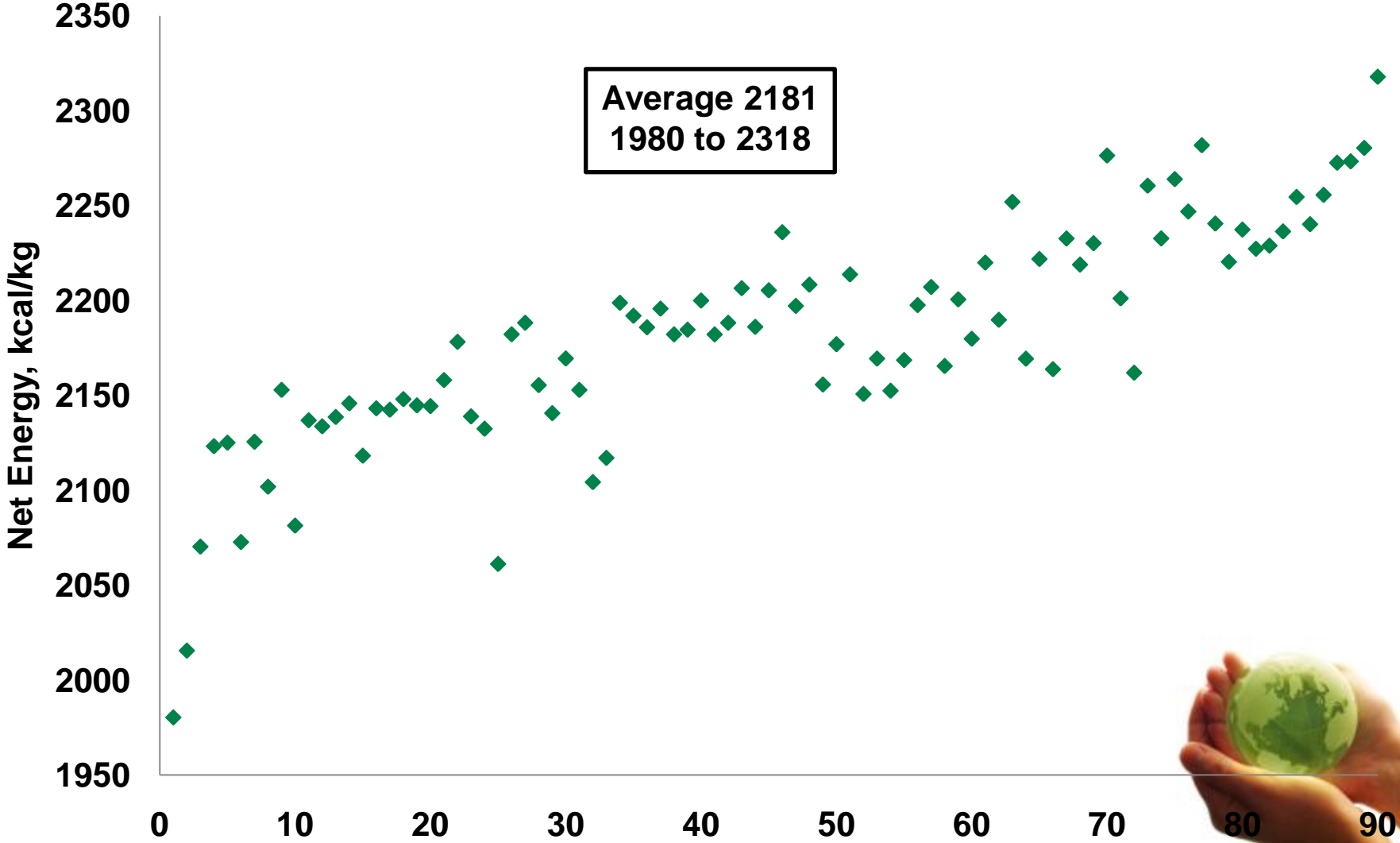
DDGS - Fat



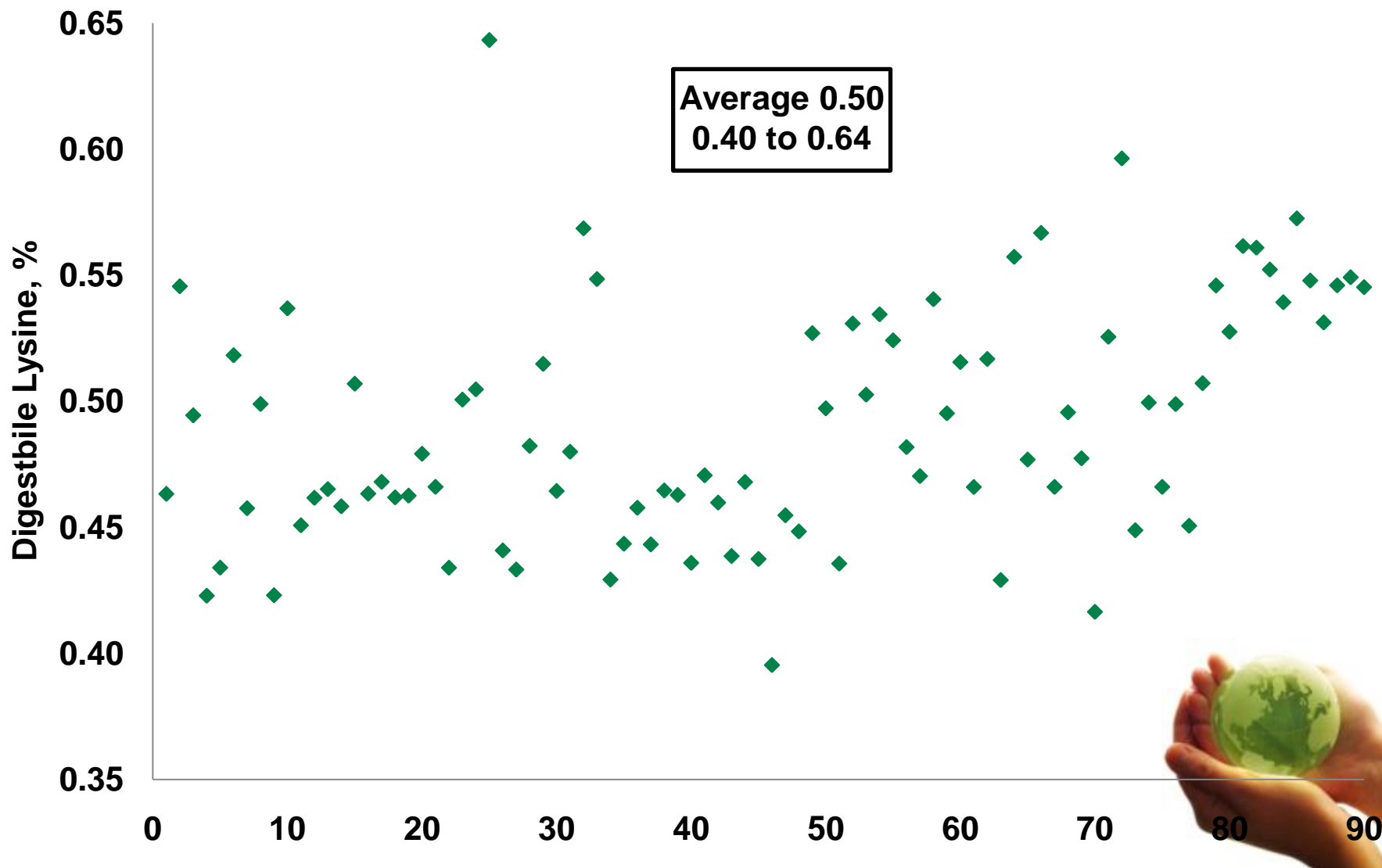
DDGS - NDF



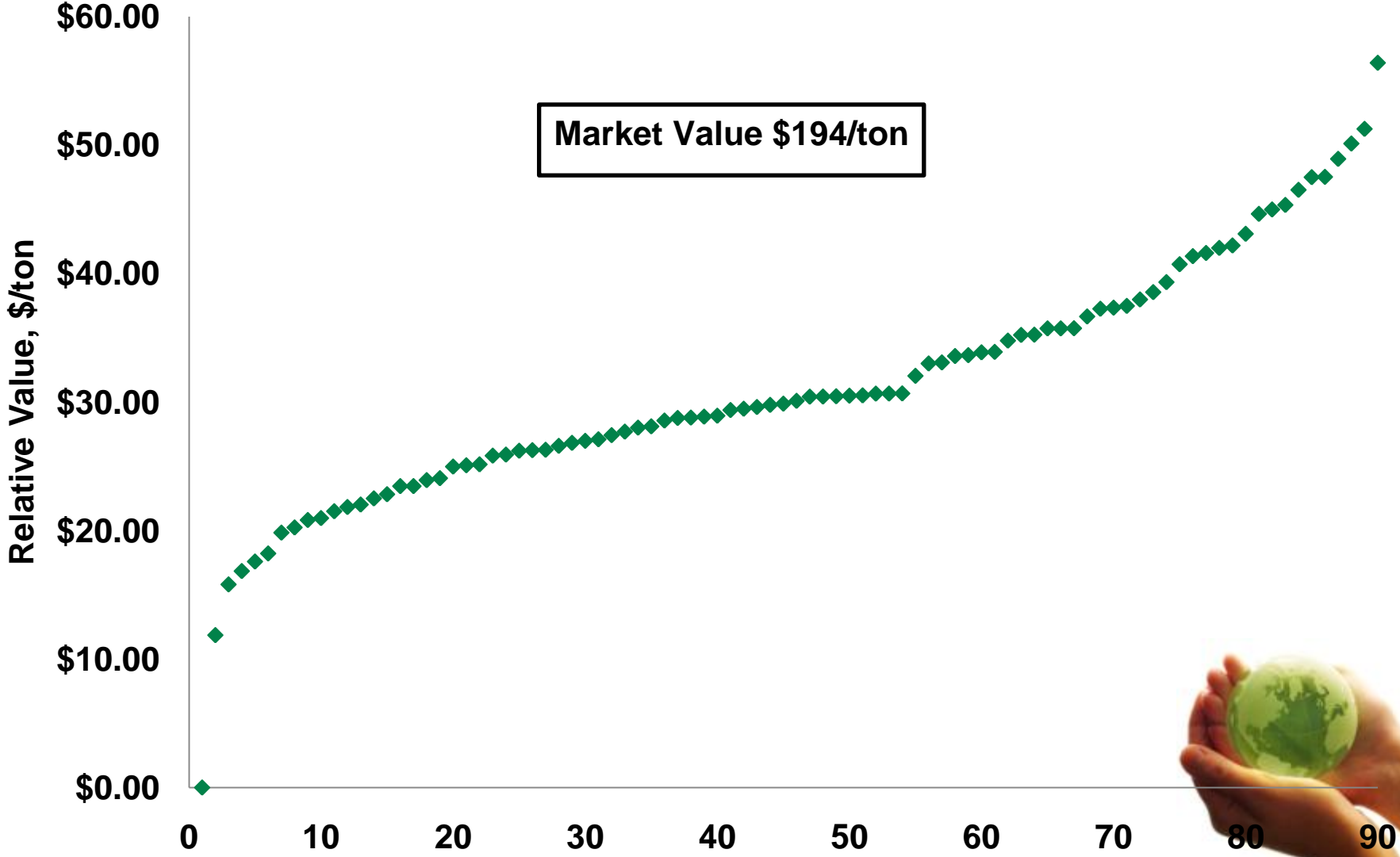
DDGS – Net Energy



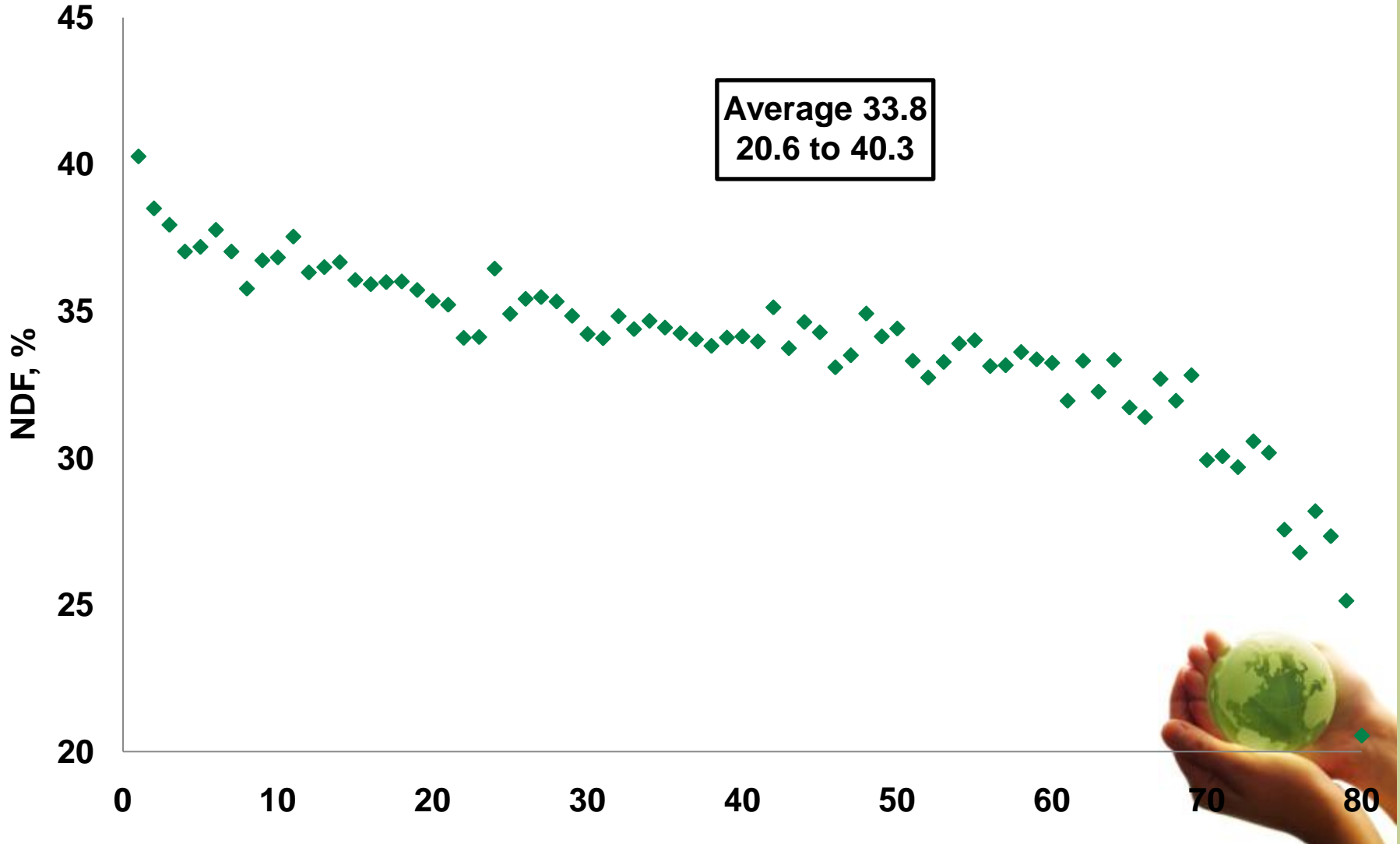
DDGS - Digestible Lysine



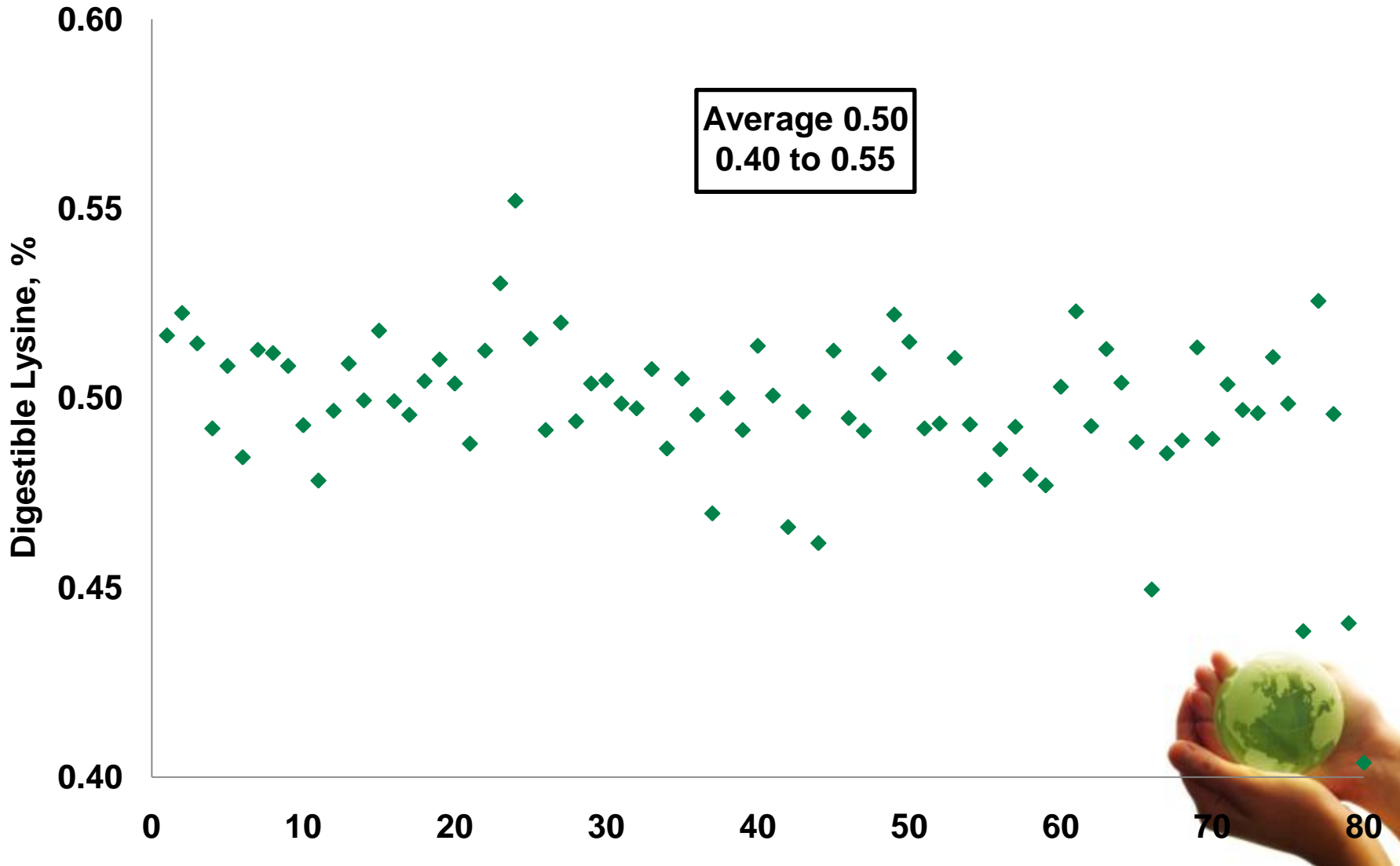
DDGS - Relative Value



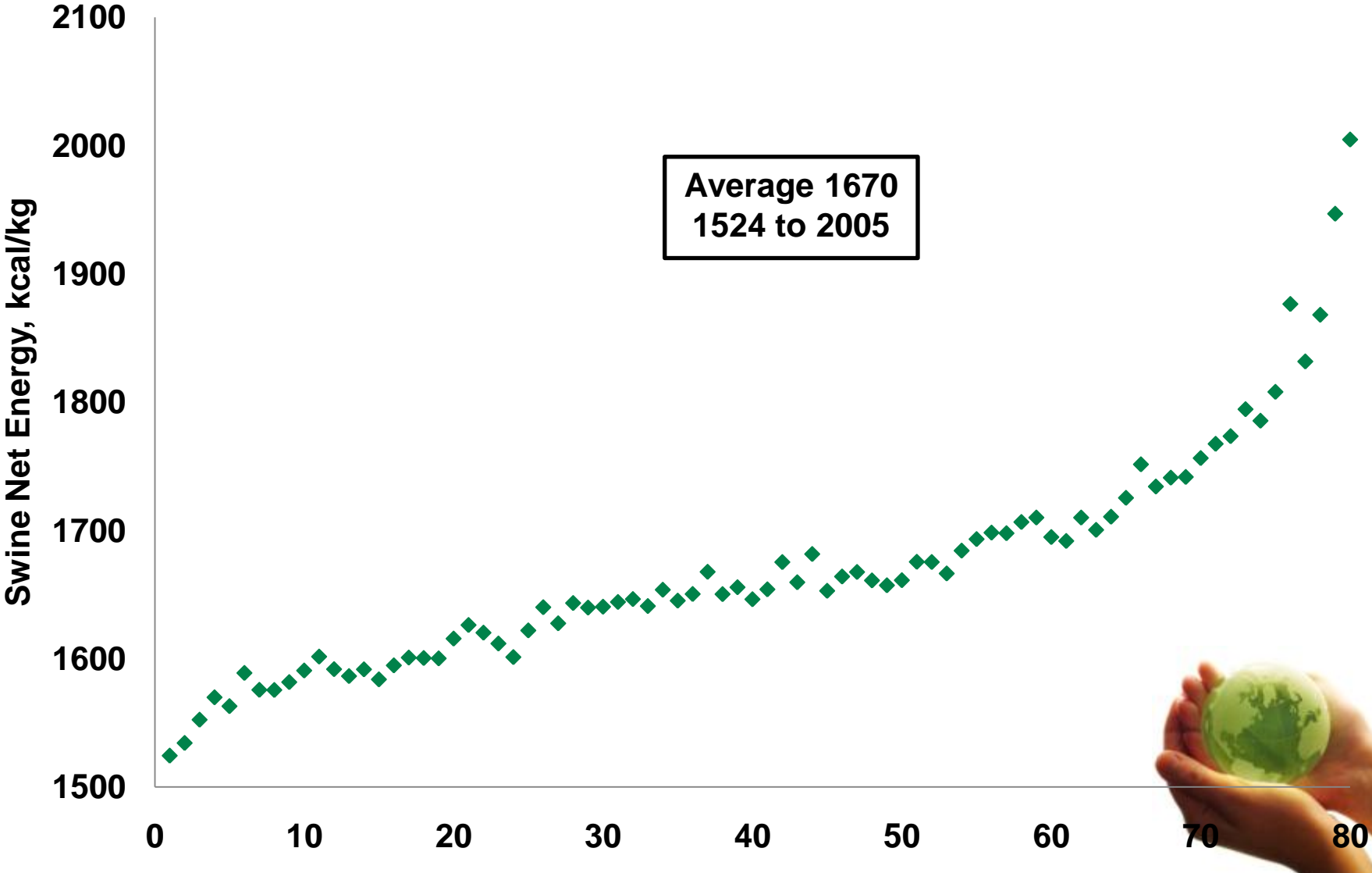
Midds - NDF



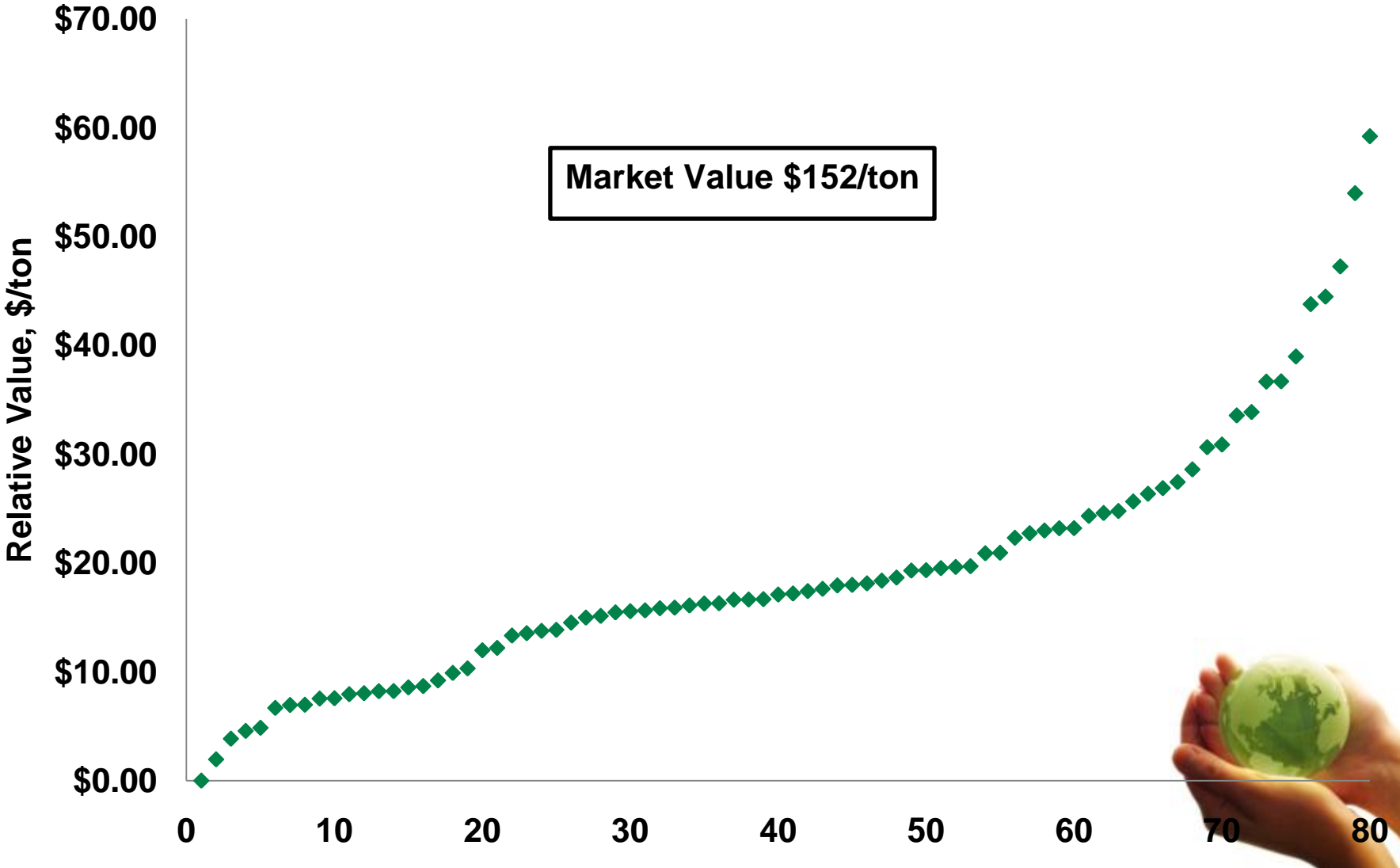
Midds – Digestible Lysine



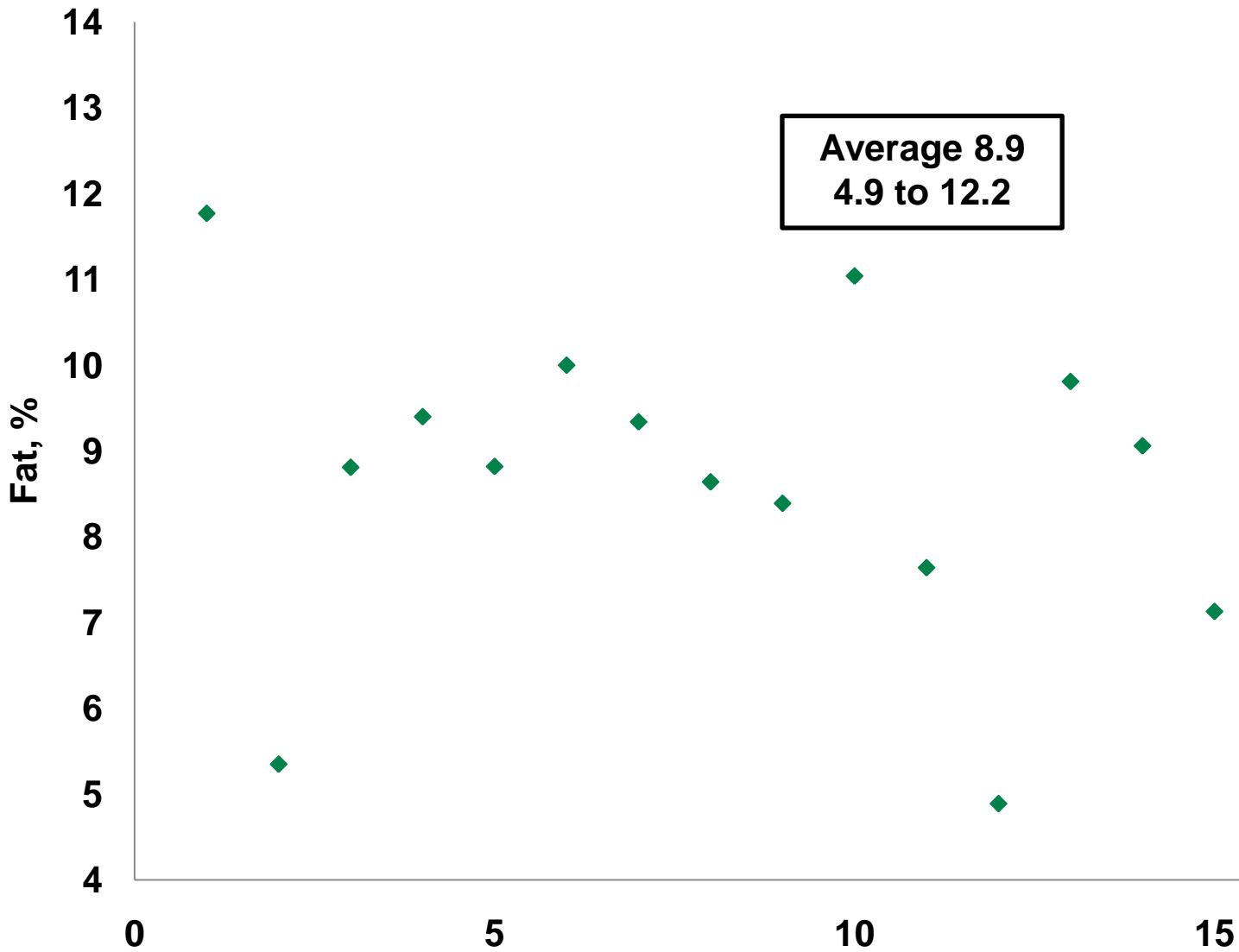
Midds – Net Energy



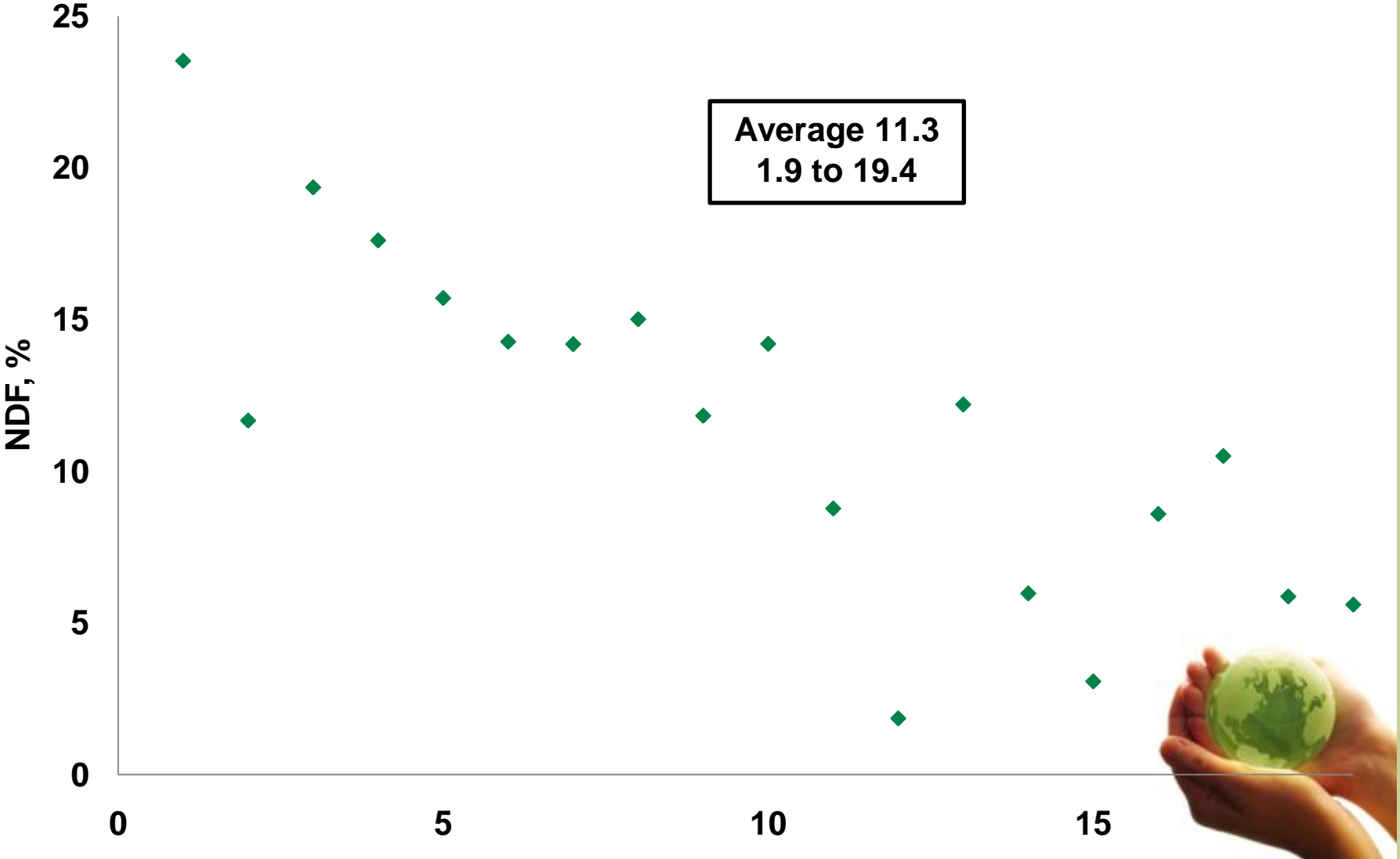
Midds - Relative Value



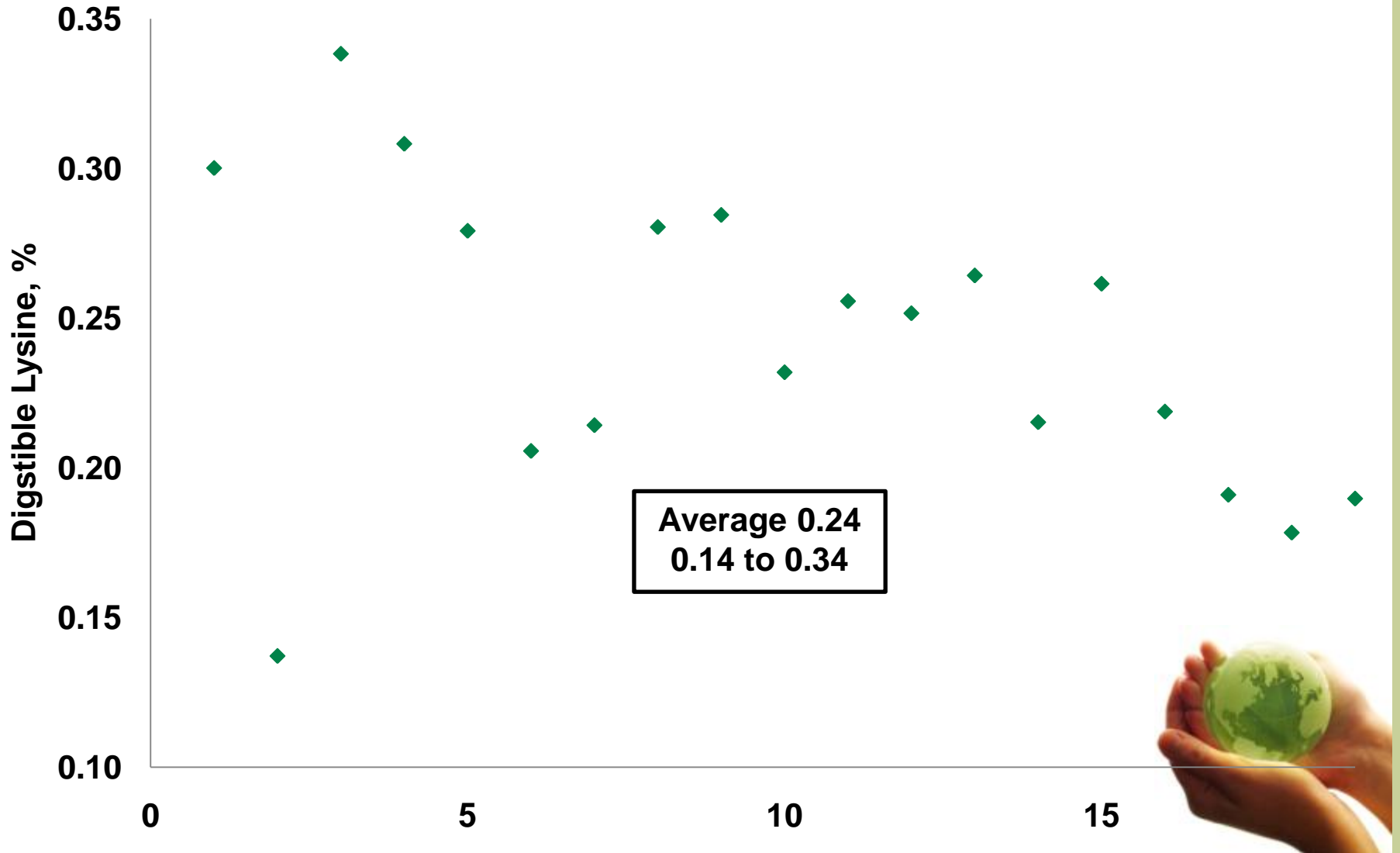
Bakery - Fat



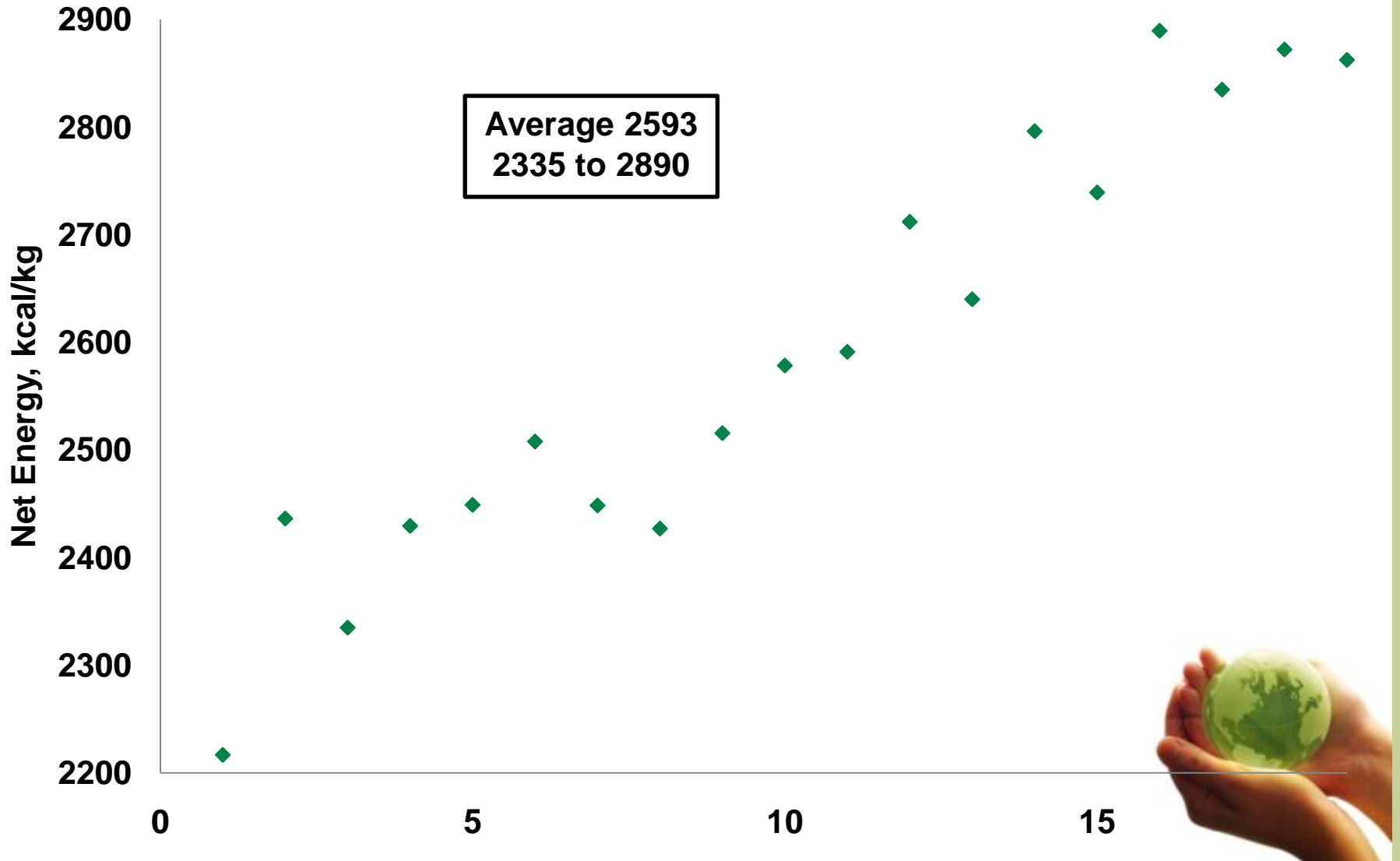
Bakery - NDF



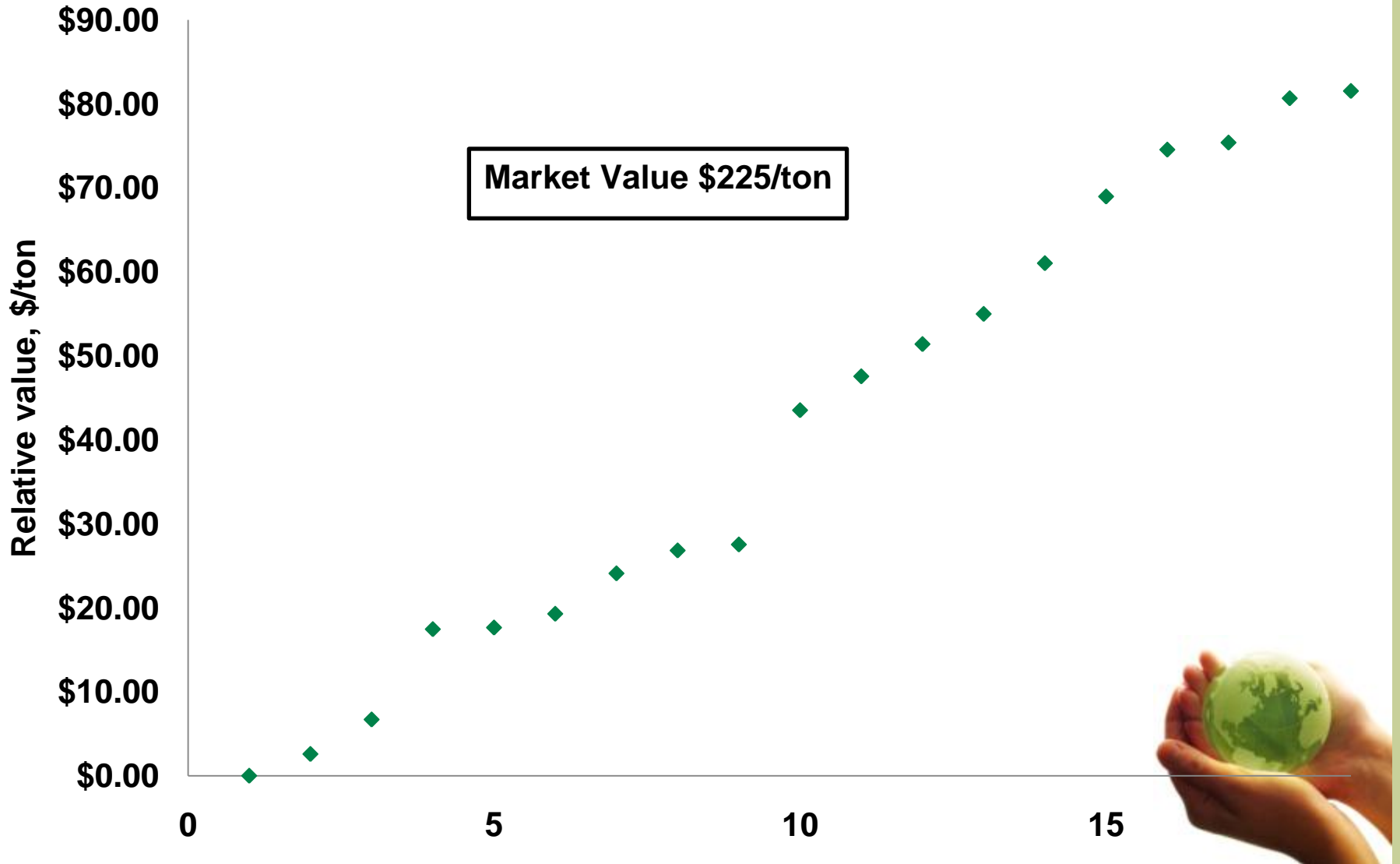
Bakery - Digestible Lysine



Bakery - Net Energy



Bakery - Relative Value



Conclusions

- **Even though ingredients appear to be the same at first glance, finer details demonstrate that there is significant variability within raw materials that need to be accounted for**
- **Improved understanding of the variability within raw materials will allow you to use more alternative ingredients and maintain expected pig performance**



Feeding Strategy

- **A lot of discussion around feed efficiency**
 - **Is this the best metric?**



Feeding Strategy

- **A lot of discussion around feed efficiency**
 - Is this the best metric?
 - Agri-Stats (Brian Snyder – Monday)
 - Average Feed:Gain – 2.76
 - Top 25% cost – 2.86
 - Top 25% Profit – 2.80
- **Biggest influencers on feed efficiency**
 - Dietary energy level – fat addition
 - Underfeeding amino acid requirements
 - Production effects
 - Poor feeder management
 - Not applying feed budget correctly
 - Health challenges



Feeding Strategy

- **Is Feeding fat economical?**
 - Historically, fat prices followed corn prices
 - Today (\$/10,000 kcal NE)
 - Corn - \$0.221
 - Fat - \$0.298
- **Does feed efficiency improvement pay for the expensive fat?**

	2300	2350	2400	2450	2500
Revenue/pig	\$257.51	\$264.87	\$270.49	\$280.11	\$287.73
Added fat lbs/ton	0	8.8	30.5	52.2	73.9

Feeding Strategy – Modeling Project

- **MAX[®] Performance Evaluation**
- **Evaluated 5 Net Energy Levels**
 - 2300, 2350, 2400, 2450, 2500 kcal/kg
- **Evaluated 2 feeding strategies**
 - Fixed time – 130 days
 - Fixed end weight – 271 lbs
- **Model assumptions**
 - Market price of \$99.00/cwt
 - Space cost - \$0.10/day
 - Assumed no increase in feed intake with lower energy diets
 - Did not adjust amino acids in lower energy diets



Feeding Strategy – Fixed time (130 days)

	2300	2350	2400	2450	2500
Start Wt	50	50	50	50	50
End Wt	267.1	271.0	274.0	277.0	279.2
Days	130	130	130	130	130
ADG	1.67	1.70	1.72	1.75	1.76
Feed:Gain	2.77	2.73	2.7	2.66	2.64
Total Feed, lbs	604	604	604	604	604
Revenue/pig	\$201.07	\$204.00	\$206.25	\$208.54	\$210.17
Feed cost/pig	\$82.12	\$85.68	\$89.17	\$93.26	\$96.51
Other cost/pig	\$75.37	\$75.37	\$75.37	\$75.37	\$75.37
Profit/pig	\$43.59	\$ 42.96	\$41.71	\$39.91	\$38.29

Feeding Strategy – Fixed weight (271 lbs)

	2300	2350	2400	2450	2500
Start Wt	50	50	50	50	50
End Wt	271	271	271	271	271
Days	132	130	129	127	126
ADG	1.71	1.74	1.76	1.78	1.80
Feed:Gain	2.77	2.73	2.7	2.66	2.64
Total Feed, lbs	625	618	613	601	599
Revenue/pig	\$204.00	\$204.00	\$204.76	\$204.00	\$204.00
Feed cost/pig	\$87.22	\$87.69	\$89.45	\$90.03	\$91.66
Other cost/pig	\$75.72	\$75.51	\$75.43	\$75.22	\$75.10
Profit/pig	\$41.07	\$40.80	\$39.87	\$38.75	\$37.24

Feeding Strategy – Conclusions

- **Fixed time (130 days)**
 - Feeding 2300 kcal/kg NE improved profit by \$5.30/pig compared to 2500 kcal/kg NE
- **Fixed Market weight (271 lbs)**
 - Feeding 2300 kcal/kg NE improved profit by \$3.82/pig compared to 2500 kcal/kg NE
- **In both scenarios feed:gain increase by .13 units**
- **Feeding to best feed efficiency is not always best profit – especially with very expensive fat**





THE NORTH FACE

W

CELESTON

CELESTON

CELESTON

CELESTON

POLARIS

TRAIL RMK

2011

Nutrition: Help from the Trenches

Kevin Touchette PhD, Cargill

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