The Use of Animal Proteins in Chicken and Egg Production

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International Rendering Symposium

NARA Atlanta, GA

February, 2024

Agenda

- Global Challenges
- Industry Challenges
- Opportunities

Global Challenges …

- **Climate Change & Global Warming**

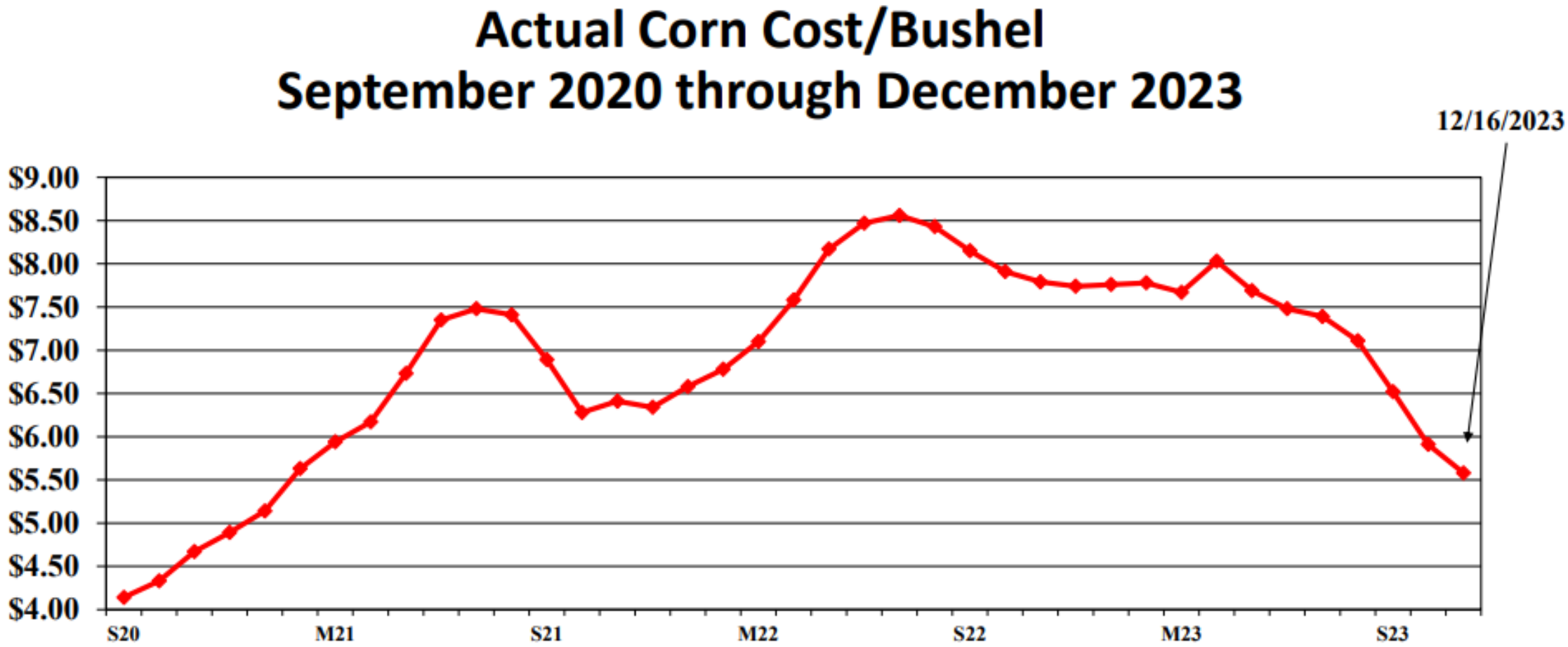
- **Human Population**
  - Now, 7.5 to 8.0 B
  - By 2050, 9.0 to 10 B
  - Need for 50 to 75% more food
  - **10 Billion & Need for 100% more food**
  - **Sustainability ***

- **Diseases**
  - Influenza (Avian & Human), COVID, ASF, **BSE ***, Etc.

Agenda

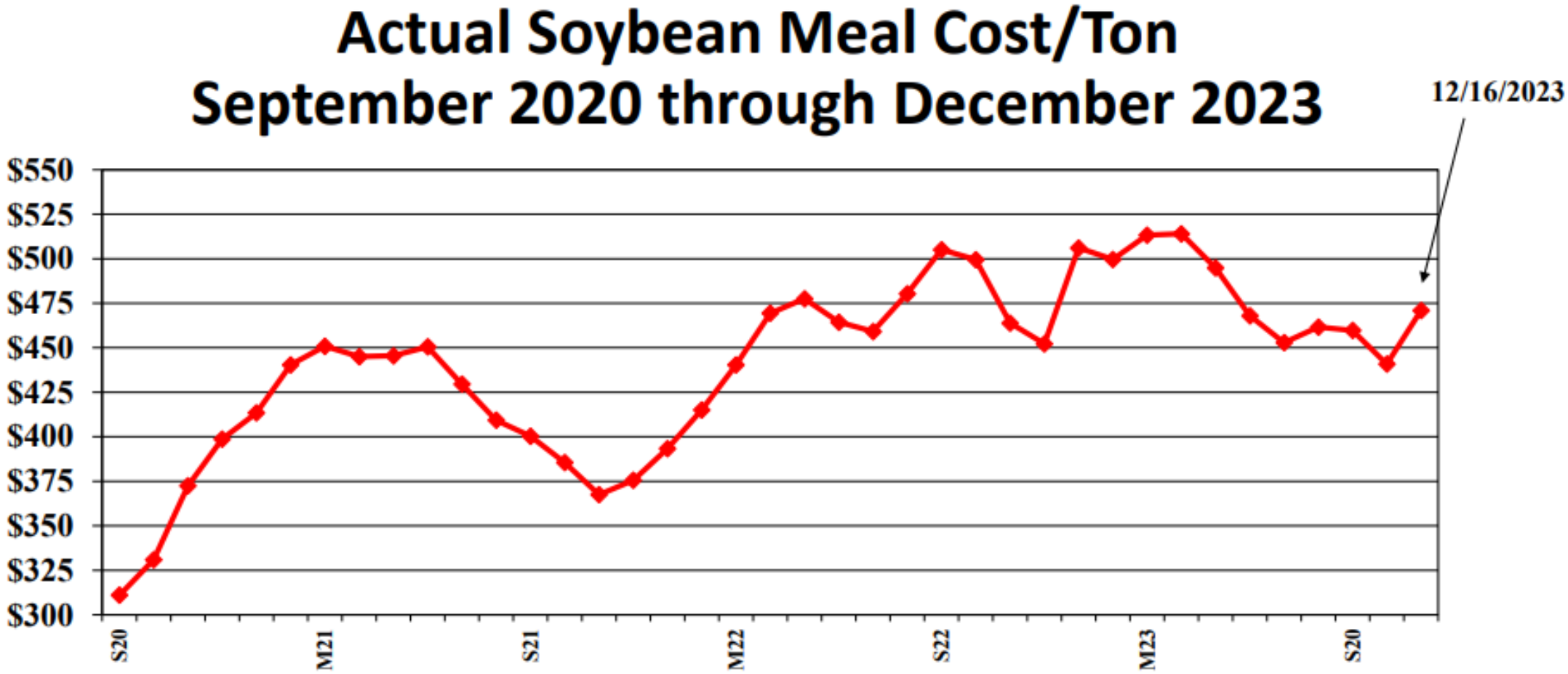
- Global Challenges
- **Industry Challenges**

Industry Challenges …



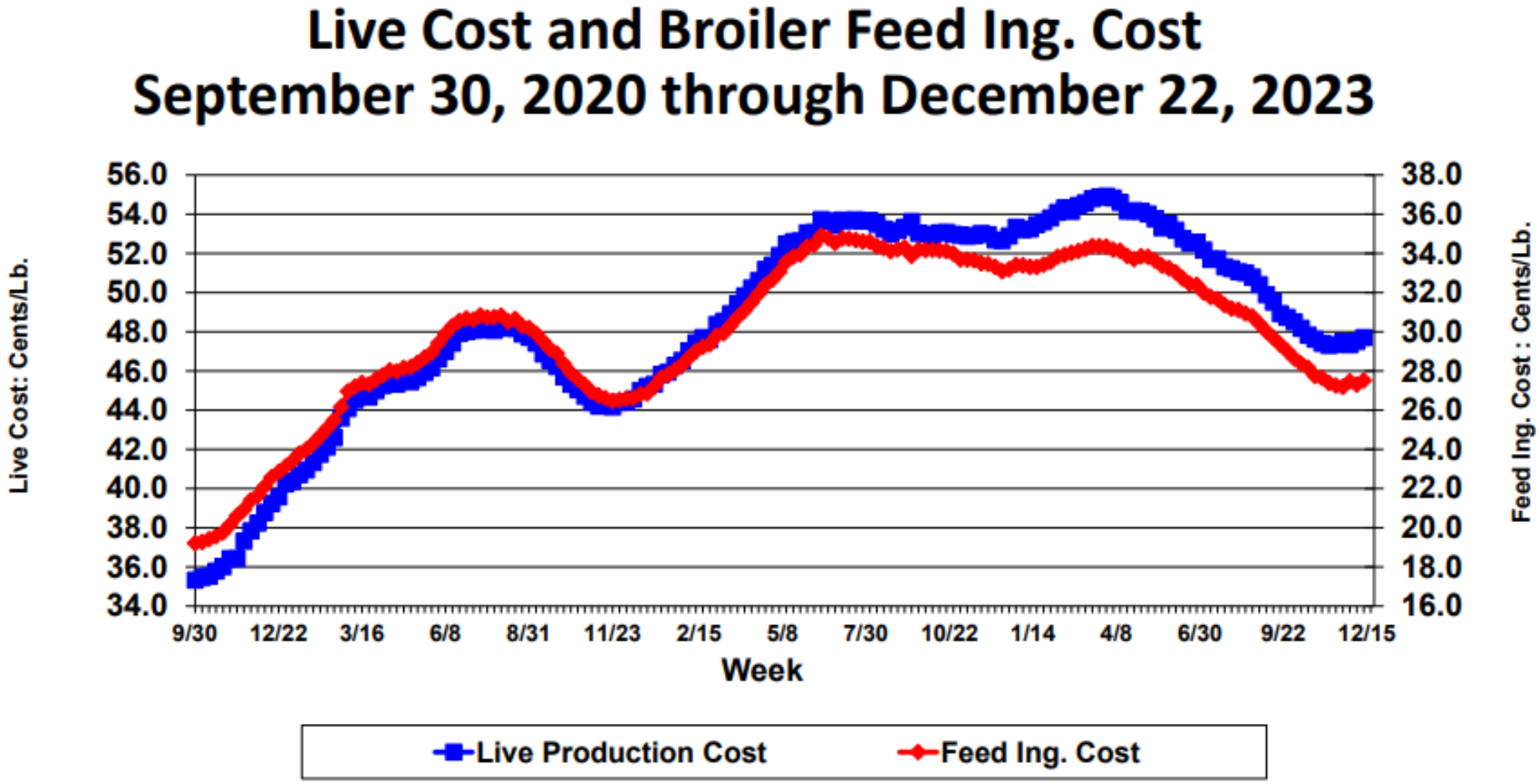
1999 = $1.85

Industry Challenges …



1999 = $132

Industry Challenges …



Industry Challenges …

Live Production Cost: Cents per Kg. 2000 through 2023

	2000	2005	2010	2015	2020	1/2 2023
Chick	8.57	8.42	10.14	10.98	13.18	17.52
Housing	10.38	11.48	12.56	13.82	15.49	17.70
Feed	27.55	30.79	49.46	52.10	45.87	74.47
Catch	2.64	2.91	3.17	3.28	3.64	4.50
Other	3.81	3.99	4.32	4.54	4.96	6.13
Total	52.96	57.59	79.65	84.72	83.13	120.32

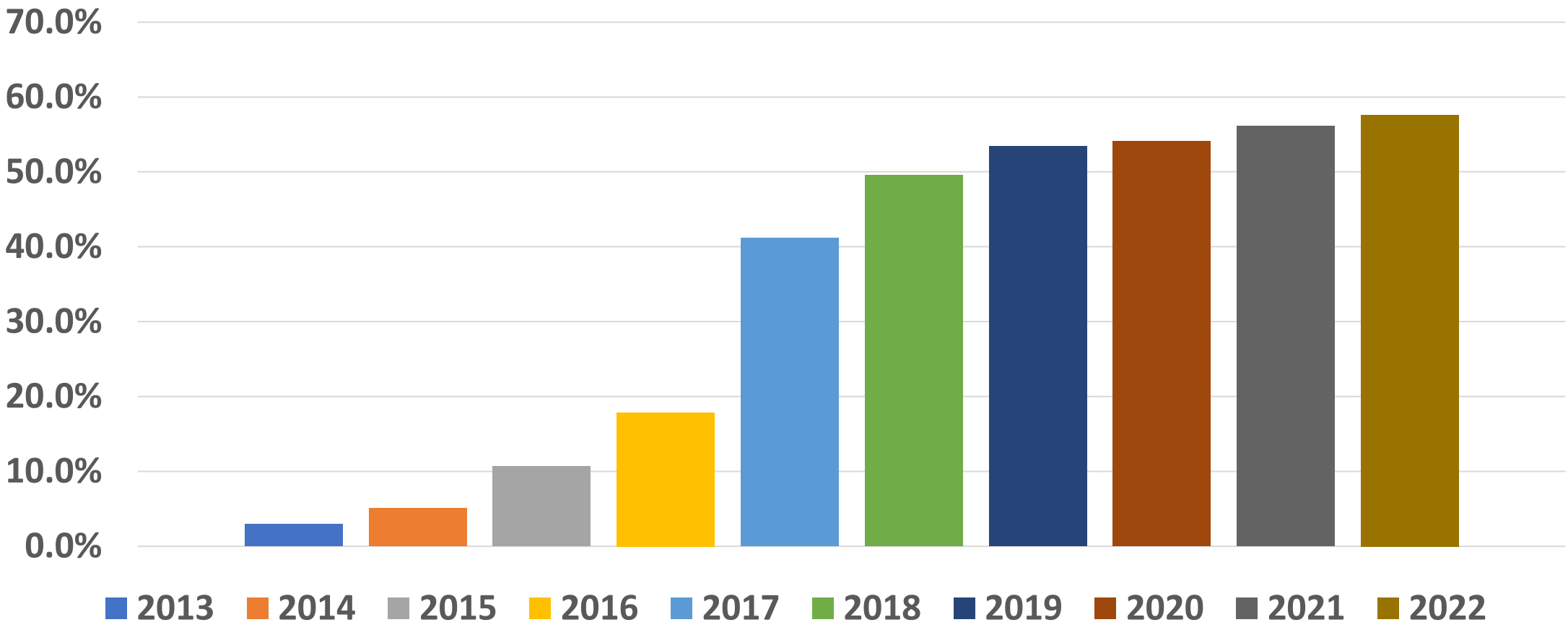
Industry Challenges …

Live Production Cost: Percent of Total Live Costs

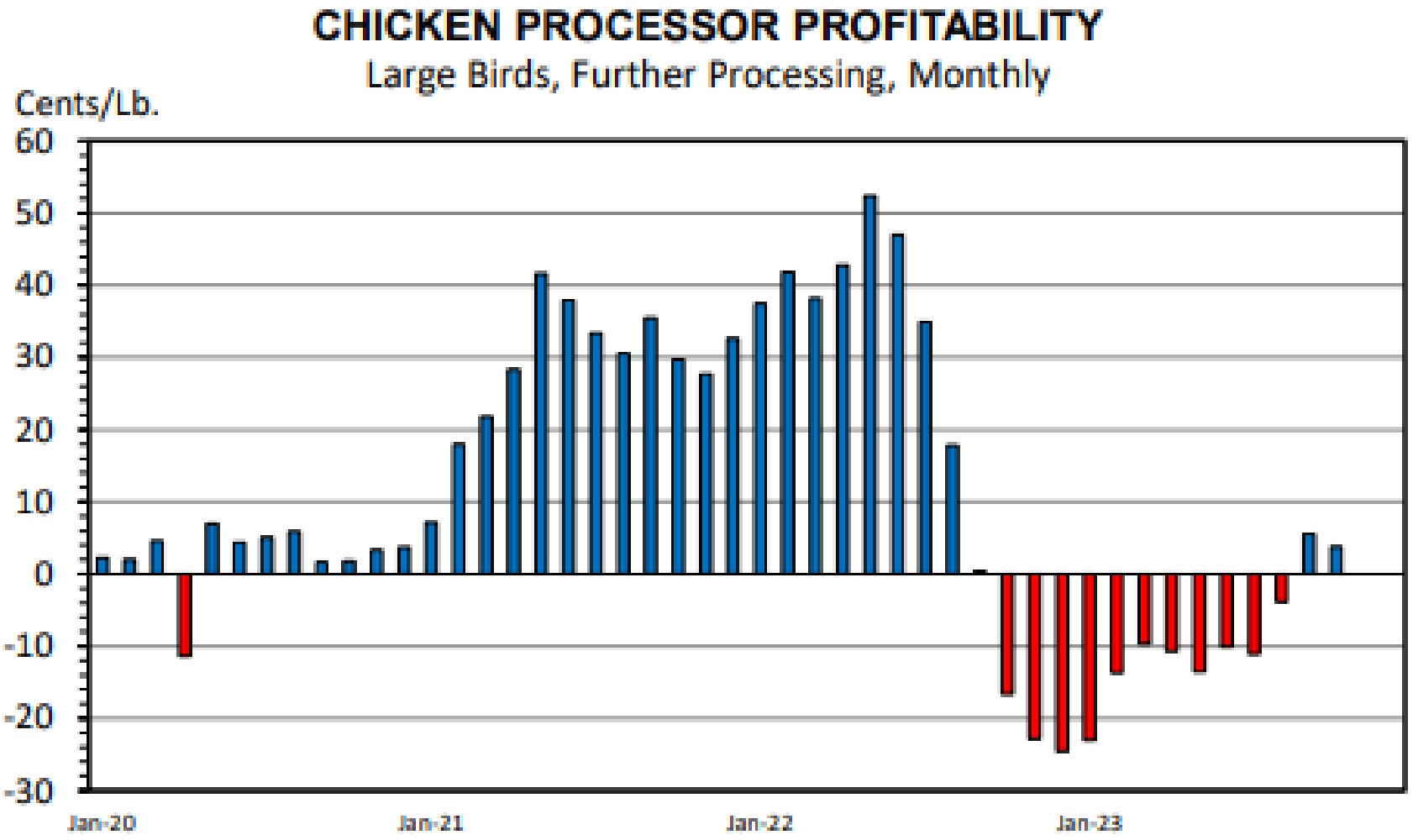
	2000	2005	2010	2015	2020	1/2 2023
Chick	16.2%	14.6%	12.7%	13.0%	15.9%	14.6%
Housing	19.6%	19.9%	15.8%	16.3%	18.6%	14.7%
Feed	52.0%	53.5%	62.1%	61.5%	55.2%	61.9%
Catch	5.0%	5.1%	4.0%	3.9%	4.4%	3.7%
Other	7.2%	6.9%	5.4%	5.4%	6.0%	5.1%
Total	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Industry Challenges …

% of Birds Fed NAE U.S. Broiler Industry: 2013 through 2022



Industry Challenges …



Industry Challenges …

Adjusting the Strategy …

- Tyson to eliminate human antibiotic use in US broilers (April, 2015)
- Tyson examining ways to reduce human antibiotics in cattle, pigs and turkeys (Summer, 2015)
- Tyson moves away from NAE, **best for chickens**, **best for consumers** (September, 2023)

Agenda

- Global Challenges
- Industry Challenges

- **Opportunities**

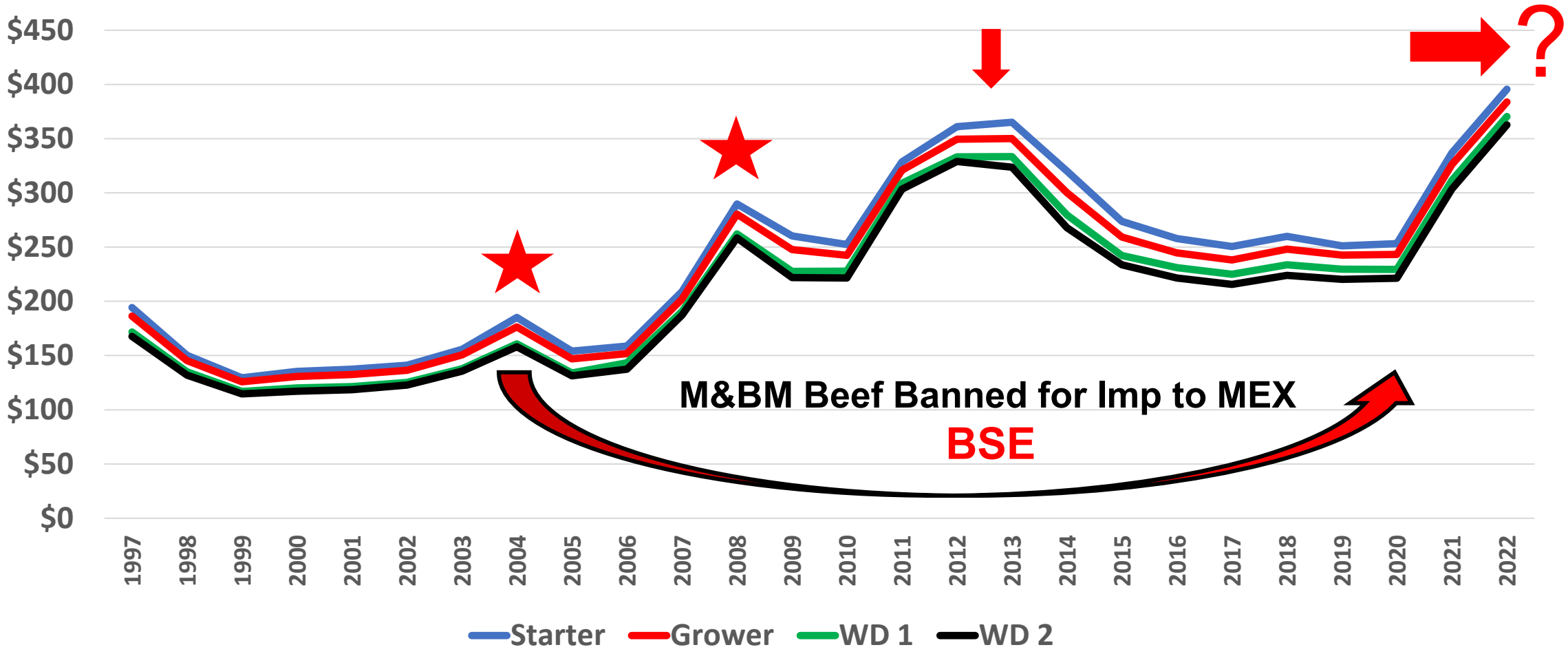
Opportunities … Feed Production …

Top World Feed Companies … 1 MMT / Year

- Top Feed Companies 2018: 102
- Top Feed Companies 2019: 129
- Top Feed Campanies 2020: 140
- Top Feed Companies 2021: 144
- Top Feed Companies 2022: 147
- Top Feed Companies 2023: 152 *

Industry Challenges …

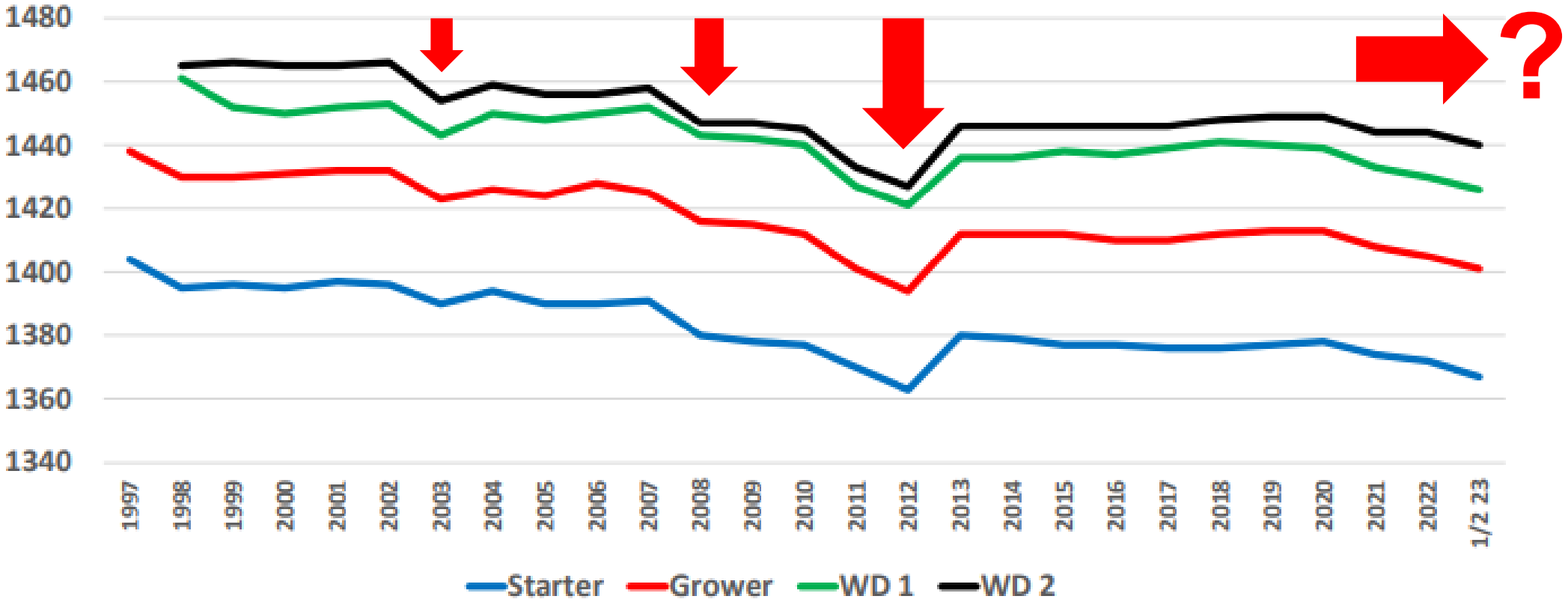
Feed Cost per Ton through 2022



Opportunities … Poultry Meat …

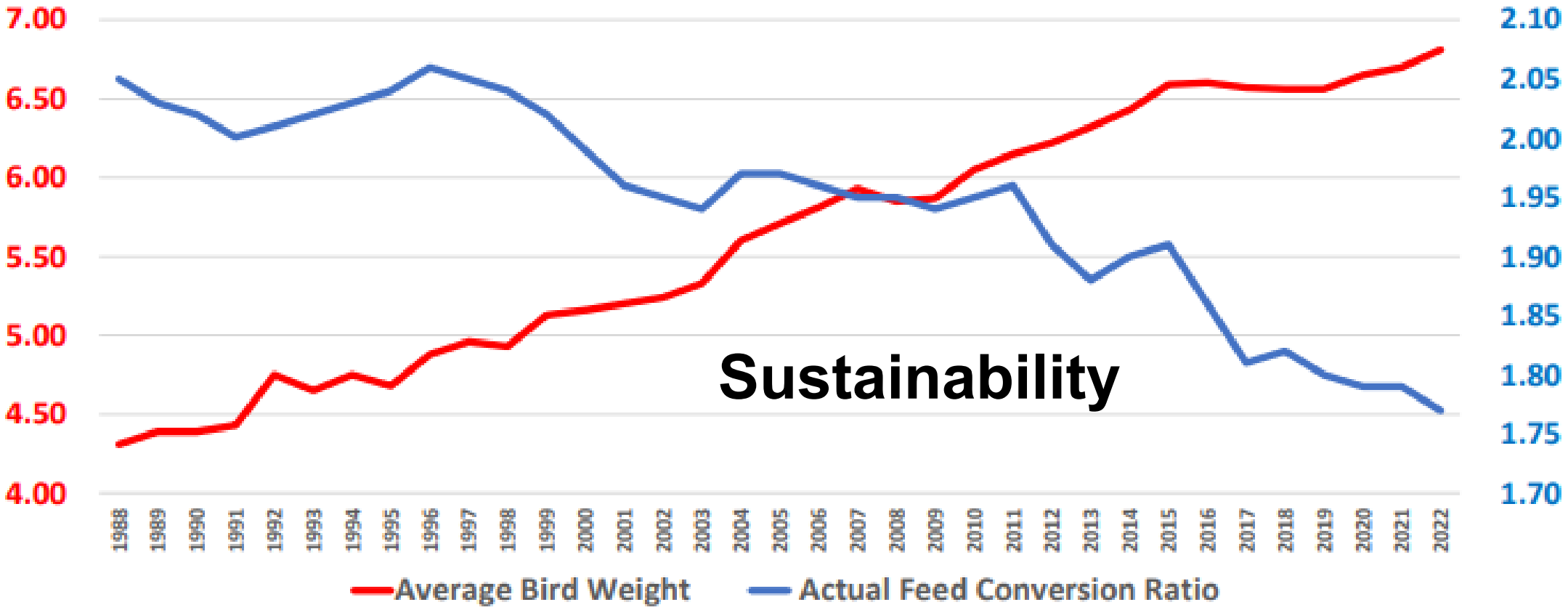
Calories in Broiler Feeds

Build & Review your DATA …



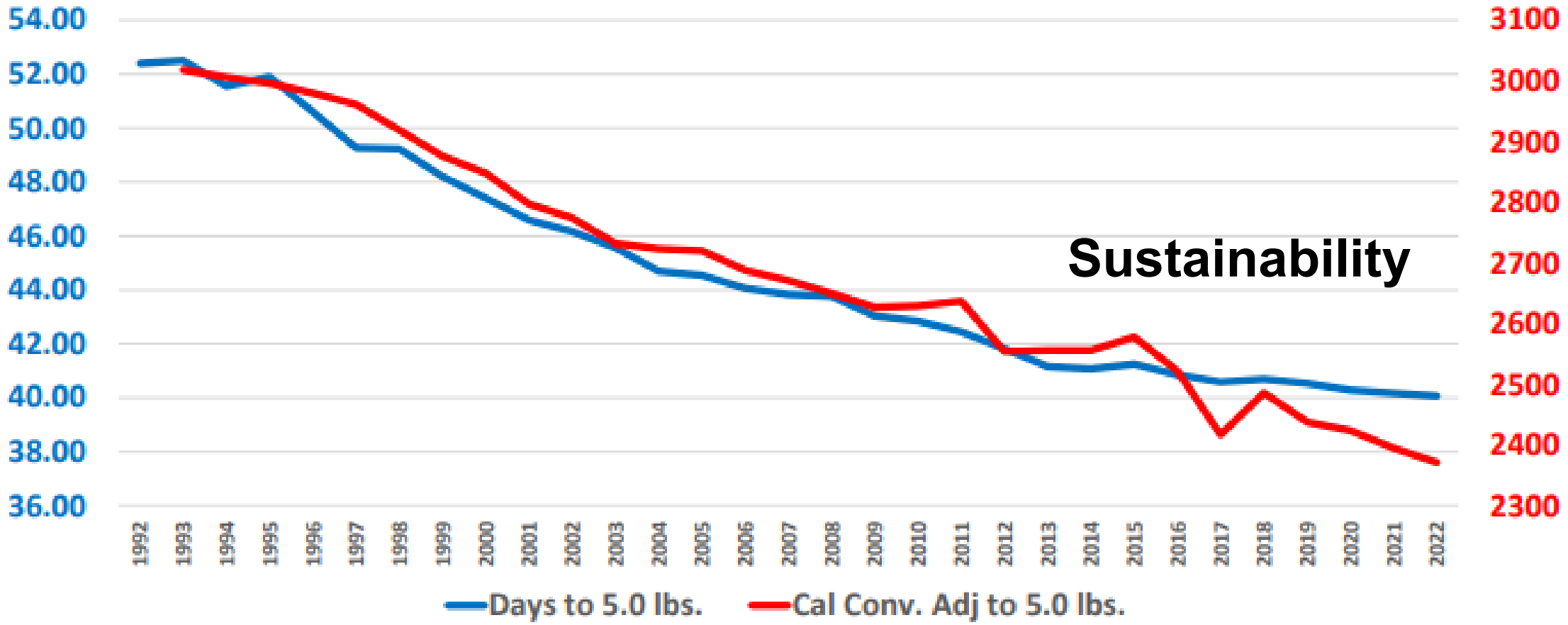
Opportunities … Poultry Meat …

Actual Feed Conversion Ratio and Average Live Wt. (Lbs.)
U.S. Broiler Industry 1988 through 2022



Opportunities … Poultry Meat …

Days to 5.0 Lb. Live Wt. and Adj. Calorie Conversion
U.S. Broiler Industry 1992 through 2022



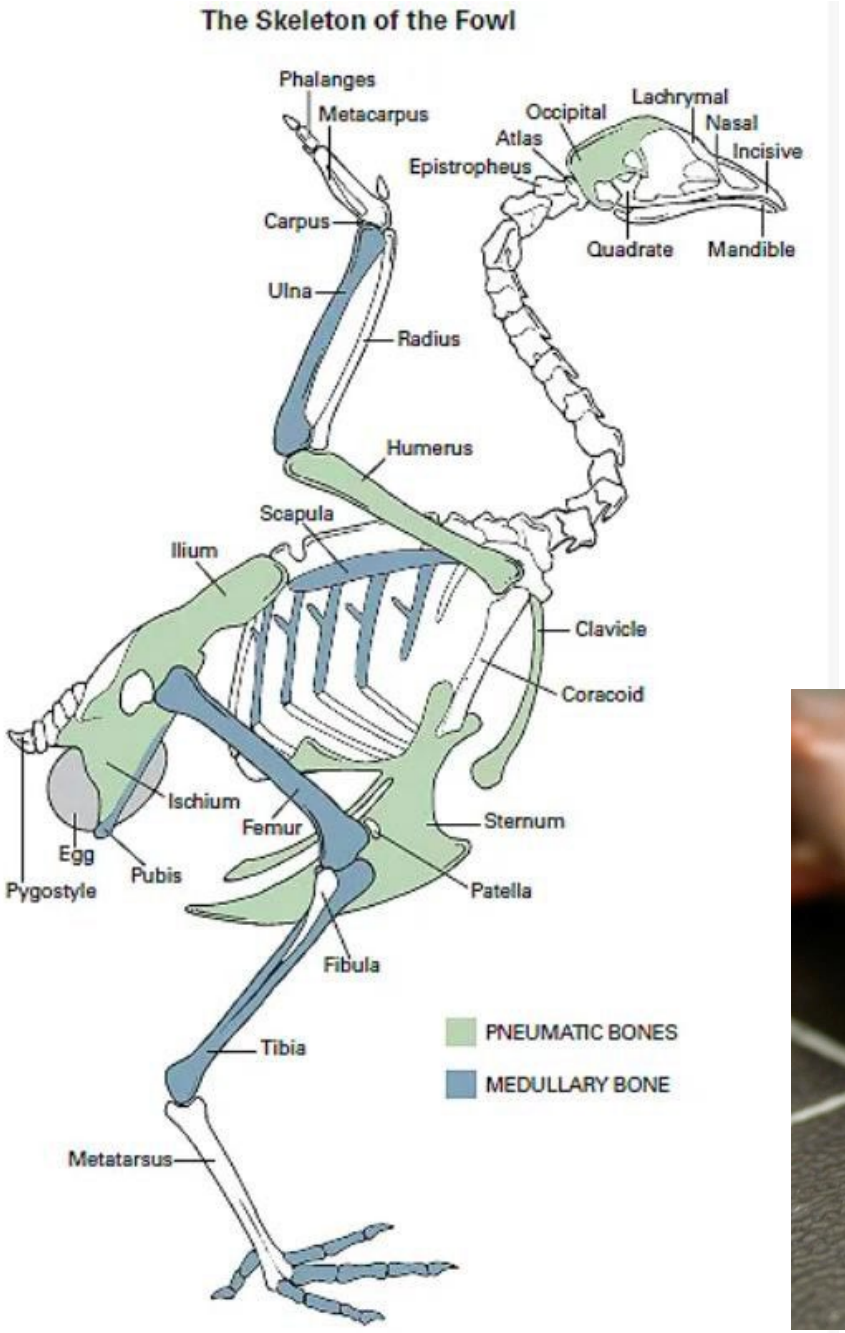
Opportunities … Poultry Meat …

Opportunities … Table Eggs …

Opportunities … Table Eggs …

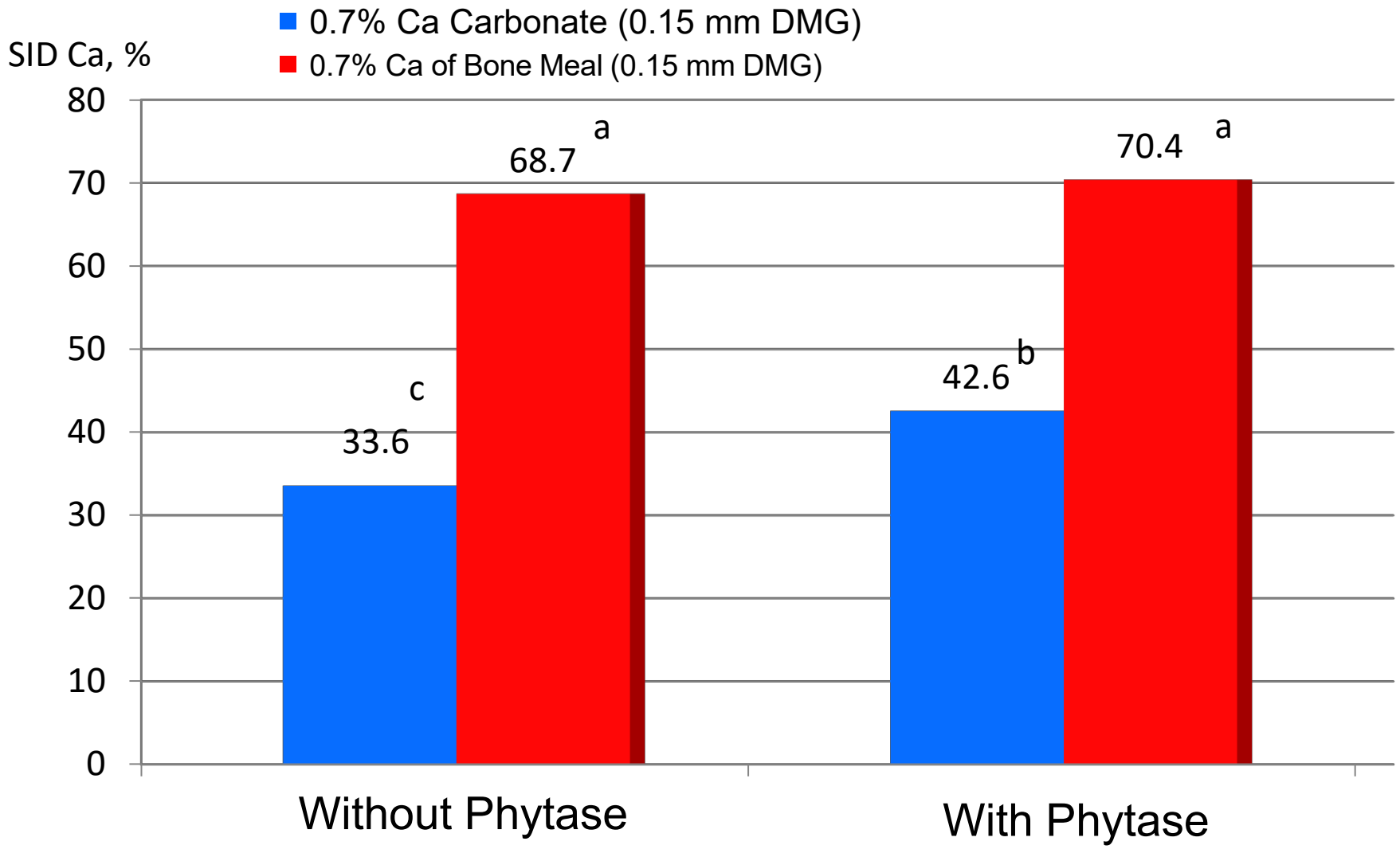
	Year			
Parameter	**1990**	**2000**	**2010**	**2020**
Total Age (Wks)	72	80	90	100
Production Cycle (Wks)	52	60	70	80
Eggs / Hen Housed	280	350	411	500
Productivity (%)	76.71	83.33	83.87	89.28

Sustainability

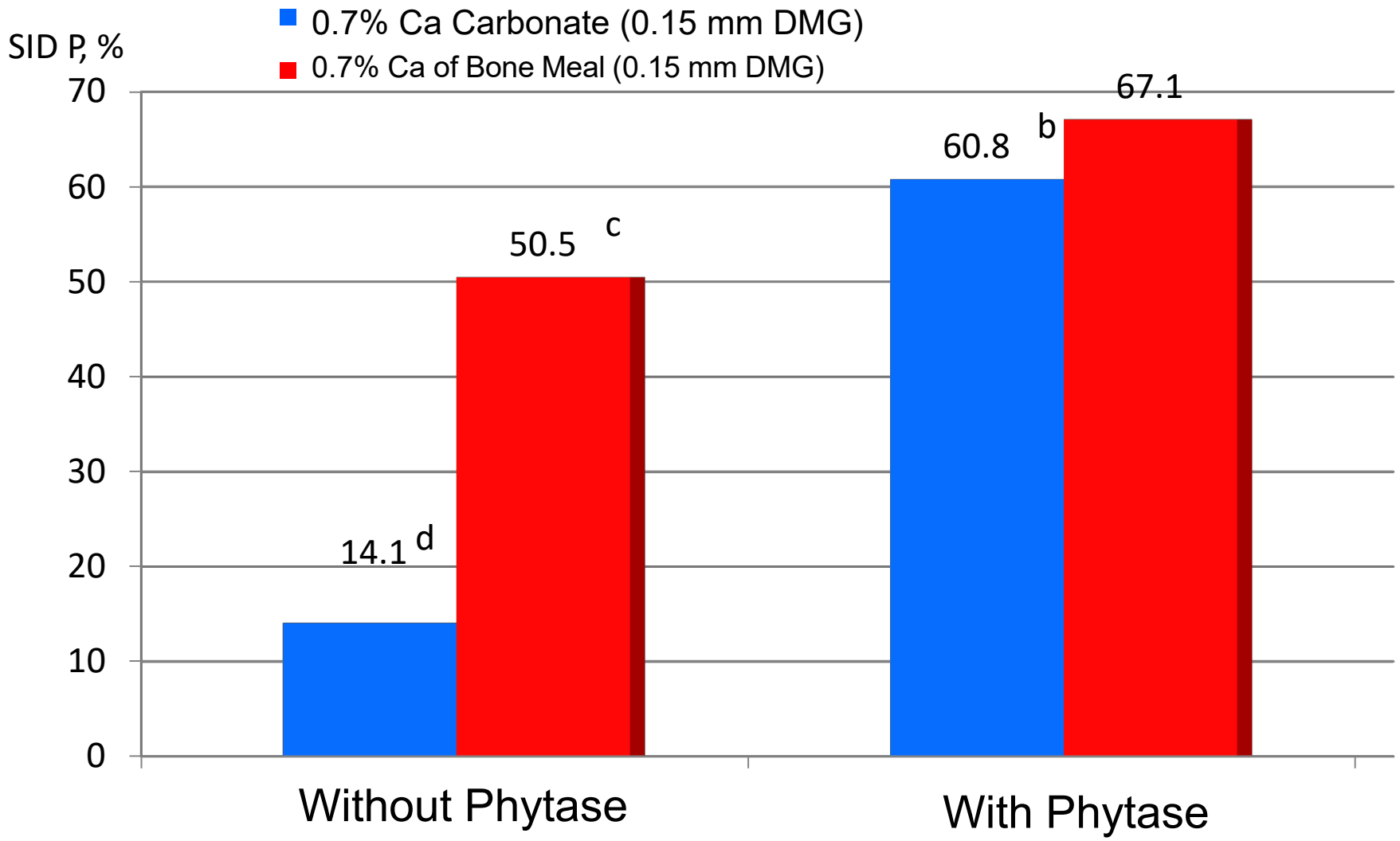

The Skeleton of the Fowl
Phalanges
Metacarpus
Occipital
Lachrymal
Nasal
Atlas
Incisive
Epistropheus
Carpus
Quadrate
Mandible
Ulna
Radius
Humerus
Scapula
Ilium
Clavicle
Coracoid
Ischium
Femur
Sternum
Egg
Pubis
Pygostyle
Patella
Fibula
PNEUMATIC BONES
Tibia
MEDULLARY BONE
Metatarsus


A
B
0
1
2
3
4

Effect of Ca Source Over Standarized Ileal Digestibility of Ca



Effect of Ca Source Over Standarized Ileal Digestibility of P



Animal Proteins …

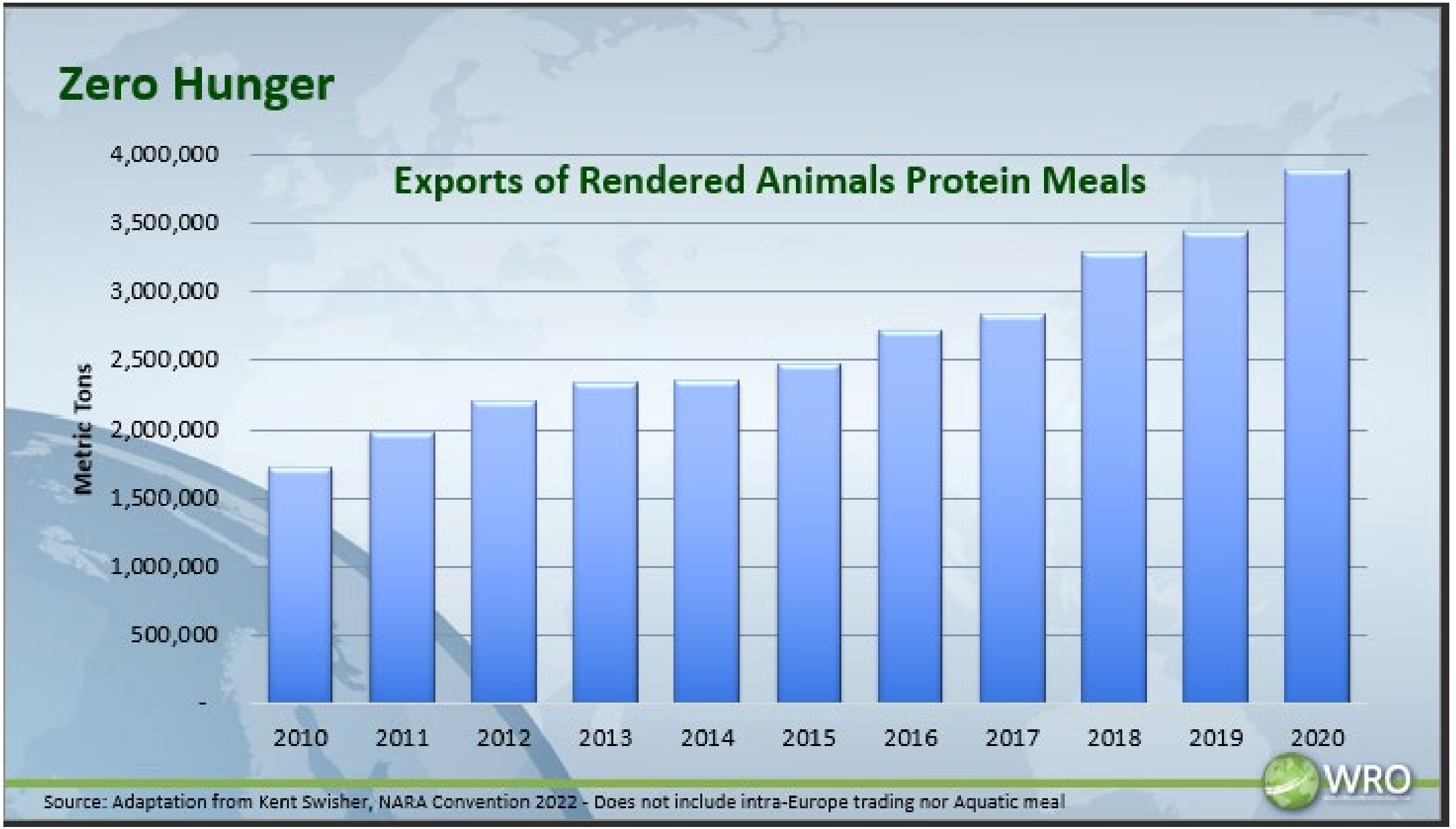
Definition …

- Alternative Raw Materials … ??
- Traditional Feed Ingredients … ??
- By-Products …
- Co-Products …
- Waste Raw Materials …

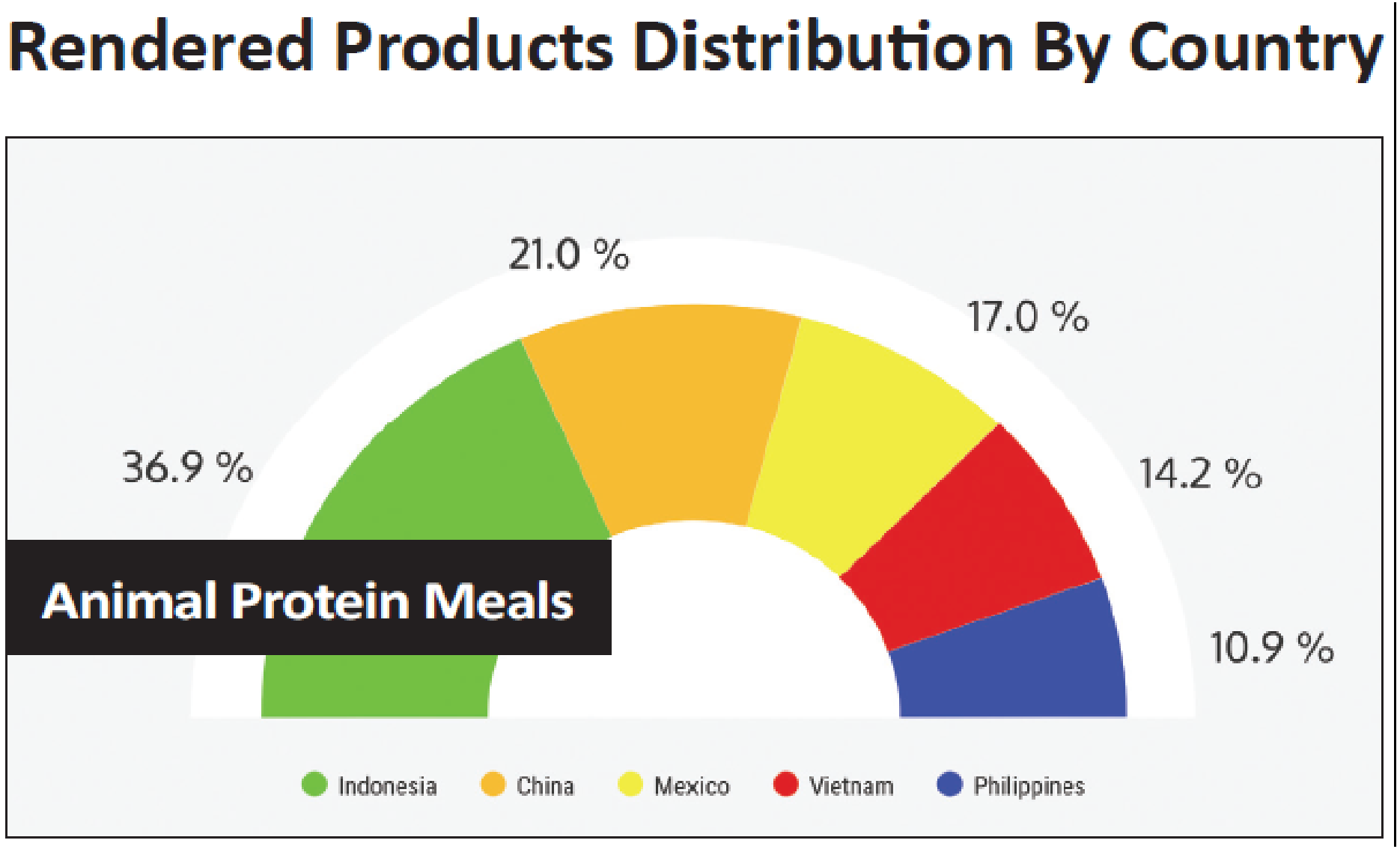
- **Just Feed Ingredients …**
  - Local … Regional … Global Availability …

- **Global …**
  - Vulumes
  - Economic Value

Animal Proteins …



Animal Proteins .....



What is wrong with feeding pigs & poultry animal by-products ??

It all depends who you ask …

- **The animal:** As far as I know, omnivorous animals such as poultry and pigs have no objection consuming animal by-products. It is in their nature to seek out and eat animal proteins and fats.
- **The producer:** For the pig and poultry producer, animal by-products can be an inexpensive source of nutrients that lowers formulation cost. So, they have a clear incentive in using such ingredients.
- **The renderer:** It is true, renderers have a stake in promoting the use of animal by-products, and every move towards banning or restricting such use lowers their business potential.
- **The consumer:** This concerns us who consume animal-derived foods. It is true, **nobody wants to pay more than they have for their food**, but at the same time we want to make sure this food is safe.

- **History has shown this to be always the case:** Every time something is banned, the alternative is never as good, whereas some will find a way to go back to the original item.

Animal Proteins … Europe …

Nutritional value of PAPs in pig and poultry diets and consumer perception of animal source food

EFPRA annual meeting, June 8, Napels, Italy

Paul Bikker, Roger Davin, Jan van Harn, Gemma Tacken, Patricia Jaspers

Animal Proteins … Europe …

Background at the start of the project

- Use of PAPs in farm animal diets was not allowed in the EU since 2001 because of BSE risk
- EU debate, future use in poultry and pigs expected
- Feed table values (e.g. CVB) >30 years old, may not be representative, e.g.:
  - New processing technologies (e.g. drying methods)
  - Species-specific origin vs. mixed/undefined products
- Adequate information on the nutritive value is the basis of animal feed production
- 20 years without experience with PAPs in animal diets

Animal Proteins … Europe …

Nutritional value of PAPs in pig and poultry diets and consumer perception of animal source food

- Background
  - Increasing demand of animal source food
  - EU dependency on imported protein sources
  - Sustainability and nutrient use in animal production
- Aims:
  - Optimal use of by-products and waste products from food production and biobased economy
  - Safe and sustainable (re)utilisation of resources in animal feed
- Partly devoted to Processed Animal Proteins (PAPs)

Animal Proteins … Europe …

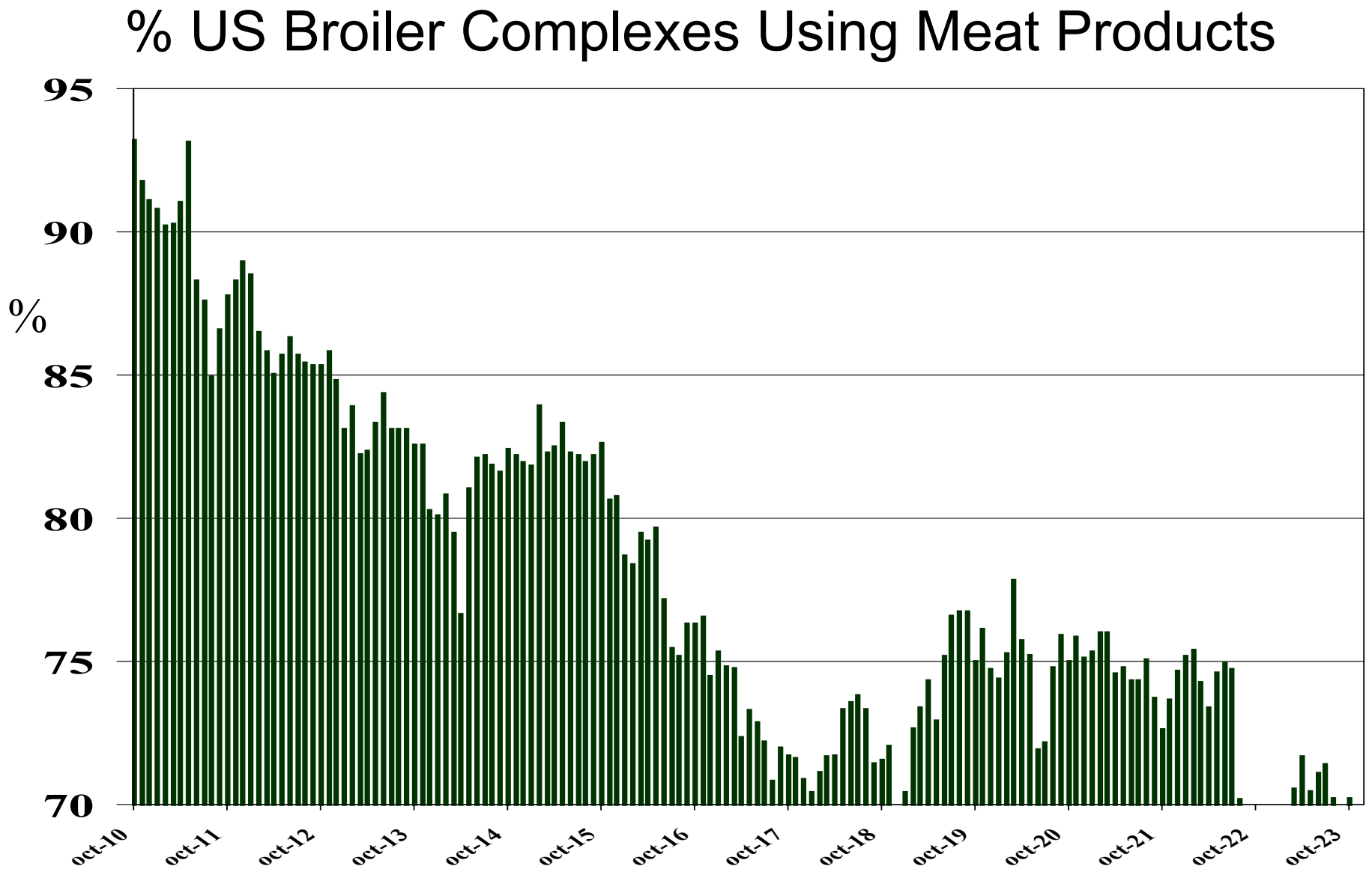
Animal by-products authorized in EU feed in 2021

Situation as of 7 Sept. 2021	Feed for farmed animals other than fur animals					Feed for pets and fur animals
	Ruminants	Non-ruminants (except fish)			Fish	
		Pigs	Poultry	Others		
• Ruminant PAP, including ruminant blood meal • Blood products from ruminants						
• Gelatine and collagen from ruminants		2021	2021	2021	2021	
• Hydrolysed proteins other than those derived from non-ruminants or from ruminant hides and skins						
• Pig PAP			2021		2013	
• Poultry PAP		2021				
• Other non-ruminant PAP, including non-ruminant blood meal but excluding fishmeal						
• Insect PAP		2021	2021		2017	
• Fishmeal • Blood products from non-ruminants • Di and tricalcium phosphate of animal origin • Animal proteins other than those mentioned elsewhere in the table						
• Hydrolysed proteins from non-ruminants or from ruminant hides and skins • Gelatine and collagen from non-ruminants • Egg, egg products, milk, milk products, colostrum						

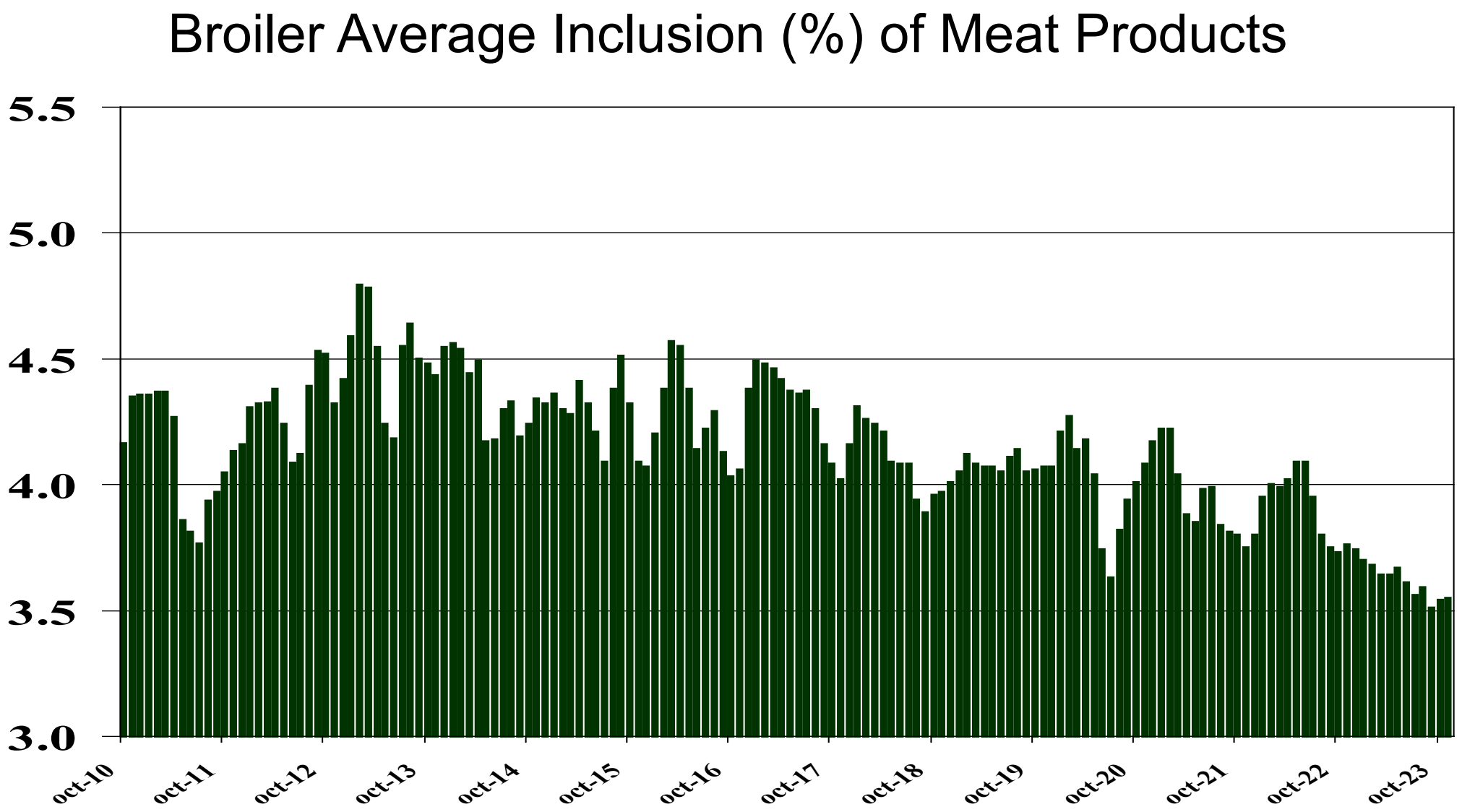
Animal Proteins (Beef) … Mexico …

- Because of BSE, imports of Animal Proteins (Beef) from the US were banned in January of 2004.
- Imports were allowed again not until the end of 2020.

Animal Proteins … US …



Animal Proteins … US …



Sustainable Alternative Protein Sources for Broiler Nutrition

January 22, 2024

- The poultry industry is constantly evolving, with a growing emphasis on sustainability and efficient resource utilization. One crucial aspect of poultry farming is ensuring a balanced and nutritious diet for broilers, as it directly influences their growth, health and overall profitability.
- Traditionally, broilers have been fed diets rich in conventional protein sources like soybean meal and, in older times, some fishmeal **??**.
- However, the rising demand for animal protein, coupled with environmental concerns and fluctuations in feed ingredient prices, has prompted nutritionists and producers to explore alternative protein sources for broiler nutrition, especially with an emphasis on sustainability.

- **In conclusion:**
  - As the poultry industry continues to grow and face challenges related to sustainability, exploring **alternative** protein sources for broilers becomes crucial. **Insects**, **single-cell proteins**, **algal proteins**, **locally produced-plant-based proteins,** and **pulse crops** (lentils and chickpeas) offer promising options to diversify broiler diets and reduce the environmental impact of feed production.

Animal Proteins …

- Very good sources of Crude Protein & AA´s
- Very good sources of Calories
- Excelent sources of **Ca & P**
- **Replace limestone in the diets**
- Sustainability & circulatory economy

- Biosecurity issues (BSE, ASF, AI)
- Regulatory & **marketing issues**

- **Work very close with your suppliers …**

Animal Proteins …

Tabla de especificaciones

Especificaciones	Mínimo	Máximo
Proteína	*50 %	56 %
Humedad	3 %	*10%
Grasa	10 %	14 %
Ceniza	23 %	30 %
Calcio	7.0 %	10 %
Fósforo	3.0 %	4.6 %
Digestibilidad en pepsina 0.2%	*90 %	95.0%
Melamina	Negativo	Negativo
Indice de Peróxido	0.05 meq/kg	*10.0 meq/ kg
Impurezas extrañas		*0.01 %
Rancidez y putrefacción	Negativo	Negativo
Nitrógeno amoniacal		200 mg/Kg
Urea o derivados amoniacales		Neg
Densidad	550 g/l	680 g/l
Granulometría % retenido		
Malla No.10 U.S.B.S.		*6 %
Salmonella sp		Negativo
Aminas biogénicas		
Cadaverina		200 mg
Histamina		500 mg
Mollerosina		200 mg
Temp de recepción		5°C > de Temp ambiente
Plaga viva	0	*0

Fuentes: Association of American Feed Control Officials Incorporated 1990(AFIA). Especificaciones National Renderers Association 2009, Tabla Feedstuffs 2014, FEDNA 2012.

Economic Value …

Animal Proteins

Soyben Meal

Animal Proteins … Mexico … Economic Value …

- Most companies buy M&BM´s by CP units vs SBM
- This approach is normally in favor of M&BM´s
- Inclusion levels: Broilers & Layers: 3.0 to 8.0% (Sources, Phytase ?)

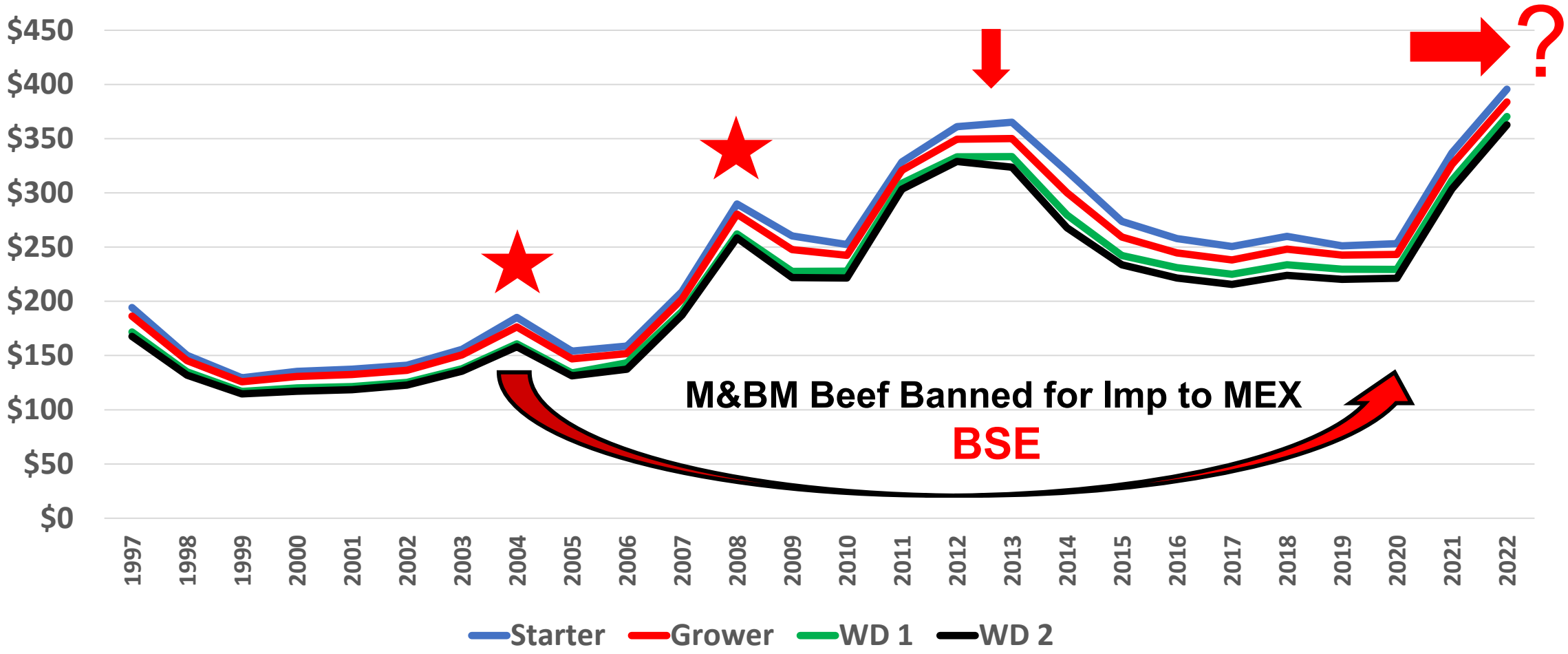
- Broilers & Layers: Saves $2.00 to $3.00 USD per 1.0% inclusion level

- Average Inclusion 5.0% x $2.5 = Saves $12.50 USD per MT of Feed

- Break-even point $ – Replacement of avP

Industry Challenges …

Feed Cost per Ton through 2022



Animal Proteins .....

% Proteina	% CEN	% CA	% FOS	LYS	MET	CYS	THR	VAL	ARG
52.705	33.565	9.500	4.495	2.545	0.750	0.485	1.580	1.945	3.685
48.580	30.540	9.740	4.675	2.325	0.675	0.395	1.485	1.875	3.350
50.585	27.835	9.675	4.640	2.465	0.755	0.350	1.555	1.950	3.495
51.516	30.760	9.640	4.600	2.438	0.704	0.464	1.586	2.016	3.512
51.695	30.320	9.600	4.578	2.423	0.705	0.478	1.593	2.008	3.495
51.135	30.565	9.565	4.543	2.380	0.658	0.535	1.610	2.080	3.563
51.602	32.138	9.554	4.522	2.487	0.689	0.407	1.551	1.847	3.490
51.602	32.138	9.554	4.522	2.572	0.736	0.360	1.556	1.750	3.552
50.467	31.230	9.453	4.500	2.563	0.720	0.347	1.530	1.773	3.503
51.840	31.377	9.730	4.617	2.617	0.757	0.433	1.627	1.917	3.577
49.493	31.003	9.740	4.640	2.580	0.760	0.387	1.540	1.830	3.490
51.146	35.744	10.158	4.856	2.388	0.672	0.358	1.464	1.658	3.432

Beef ...

% Proteina	% CEN	% CA	% FOS	LYS	MET	CYS	THR	VAL	ARG
51.445	33.453	10.103	4.108	2.265	0.538	0.695	1.510	2.213	3.558
52.440	32.640	9.790	4.230	2.240	0.637	0.233	1.213	1.370	3.132
52.782	31.280	10.742	4.663	2.340	0.638	0.285	1.298	1.478	3.238
50.131	33.239	10.075	4.558	2.426	0.668	0.188	1.354	1.714	3.444
50.780	34.435	10.415	4.680	2.385	0.630	0.165	1.330	1.630	3.305
50.275	33.482	11.168	5.225	2.318	0.638	0.213	1.338	1.640	3.403
50.563	29.365	9.488	4.338	2.368	0.643	0.213	1.338	1.725	3.388
51.918	31.055	7.635	4.363	2.392	0.650	0.266	1.420	1.870	3.415
51.103	32.088	11.328	4.983	2.463	0.673	0.163	1.403	1.790	3.518
51.660	32.898	11.148	5.255	2.382	0.680	0.295	1.412	1.778	3.472
51.160	34.920	11.820	6.512	2.312	0.642	0.210	1.318	1.614	3.366
51.942	36.124	10.864	4.810	2.080	0.620	0.220	1.164	1.438	3.118

Animal Proteins … Beef …

Amino Acid Concentrations (%) in MBM Samples, as-is

Amino Acid	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*
ASP	4.01	3.94	3.32	3.87	4.02	4.32	4.51	4.22	4.41	4.52	3.88	3.55
THR	1.94	1.91	1.51	1.82	1.95	2.07	2.12	1.98	1.98	2.01	1.92	1.68
SER	2.63	2.69	2.04	2.24	2.43	2.62	2.48	2.32	2.07	1.99	2.81	2.45
GLU	6.60	6.69	5.59	6.41	6.76	7.19	7.31	6.91	7.36	7.52	6.49	6.13
PRO	4.34	4.24	4.26	4.50	4.00	4.46	4.35	4.23	4.14	3.97	4.62	4.28
GLY	6.14	6.15	6.82	7.09	5.91	6.72	6.49	6.20	6.44	6.25	6.51	6.41
ALA	3.56	3.52	3.49	3.88	3.54	3.96	3.98	3.86	4.10	4.09	3.61	3.56
CYS	0.92	1.08	0.97	0.92	0.92	0.92	1.02	0.92	0.87	0.65	1.08	0.85
VAL	2.93	2.87	2.18	2.58	2.71	2.84	3.04	3.00	2.90	2.87	2.94	2.58
MET	0.74	0.73	0.57	0.71	0.78	0.85	0.86	0.82	0.90	0.93	0.67	0.66
ILE	2.07	2.05	1.51	1.77	1.95	2.02	2.18	2.09	2.15	2.21	2.02	1.76
LEU	3.76	3.78	2.84	3.46	3.68	3.92	4.15	3.91	3.94	3.99	3.66	3.28
TYR	1.29	1.28	0.81	1.07	1.37	1.43	1.33	1.56	1.61	1.60	1.01	1.05
PHE	2.10	2.06	1.60	1.94	2.02	2.16	2.27	2.15	2.15	2.16	2.06	1.84
LYS	2.62	2.52	2.27	2.68	2.82	3.04	3.26	3.03	3.51	3.65	2.43	2.29
HIS	0.97	0.91	0.73	0.98	1.05	1.16	1.29	1.14	1.28	1.35	0.86	0.82
ARG	3.66	3.76	3.37	3.71	3.66	3.94	3.96	3.71	3.76	3.76	3.70	3.41
TRP	0.32	0.31	0.24	0.25	0.33	0.34	0.38	0.31	0.39	0.41	0.30	0.32

Animal Proteins … Beef …

Standardized Amino Acid **Digestibilities** (%) of MBM Samples, as-is

Amino Acid	1	2	3	4	5	6	7	8	9	10	11	12
ASP	62.74	61.67	66.84	68.26	59.30	63.26	65.34	62.85	57.95	58.38	61.40	57.37
THR	76.59	73.61	78.67	78.32	73.75	76.23	76.69	76.74	73.64	72.59	74.35	72.26
SER	75.43	75.25	75.96	77.22	73.13	76.51	74.18	74.28	72.42	68.60	75.34	75.50
GLU	75.00	73.33	76.51	78.00	74.13	76.52	76.41	75.58	75.06	73.96	73.99	73.07
PRO	68.70	69.51	71.38	75.68	71.01	73.56	72.79	69.85	71.86	70.94	74.80	72.20
ALA	74.39	73.37	74.35	79.71	75.08	77.45	77.10	77.07	77.04	76.25	77.48	76.15
CYS	47.14	52.41	71.84	60.81	58.11	50.23	57.85	63.03	57.30	40.93	50.01	45.50
VAL	81.57	78.15	81.97	81.98	77.64	79.41	79.95	82.32	78.57	76.43	80.88	78.69
MET	83.63	79.39	81.59	84.25	81.41	85.06	84.31	83.91	82.00	80.88	80.47	78.18
ILE	84.23	80.53	84.56	83.97	80.79	82.61	83.14	84.55	80.81	80.02	83.44	79.95
LEU	82.41	79.43	82.73	83.76	80.21	81.84	82.24	83.43	80.12	78.79	81.27	78.85
TYR	78.97	75.42	76.10	76.46	76.13	79.23	75.89	83.66	77.25	75.41	69.98	72.09
PHE	82.21	79.41	82.01	83.71	79.82	82.24	82.38	83.17	80.34	78.71	81.53	79.52
LYS	72.84	67.15	75.51	72.75	72.39	74.69	74.94	74.32	71.03	69.36	69.43	67.21
HIS	74.81	67.53	78.07	78.47	74.35	71.55	72.59	71.54	67.65	66.73	69.31	68.98
ARG	78.43	78.70	77.47	82.43	79.26	79.27	79.30	80.33	80.49	80.53	79.46	78.75
TRP	89.09	83.99	85.68	83.36	84.72	87.72	88.96	84.47	83.82	83.76	86.51	83.00

Animal Proteins …

% Proteina	% CEN	% CA	% FOS	LYS	MET	CYS	THR	VAL	ARG
55.727	23.693	8.640	3.950	3.087	0.995	0.460	1.917	2.263	3.977
53.889	23.459	8.531	3.851	2.771	0.853	0.561	1.843	2.335	3.744
52.735	24.394	8.830	4.055	2.529	0.775	0.538	1.740	2.278	3.583
53.702	23.448	8.584	3.904	2.592	0.768	0.608	1.832	2.448	3.628
54.013	23.748	8.646	3.940	2.562	0.778	0.560	1.748	2.318	3.628
51.120	22.948	8.760	4.015	2.405	0.708	0.543	1.708	2.255	3.438
52.356	24.948	8.640	4.060	2.743	0.831	0.437	1.744	2.111	3.633
52.356	24.948	8.640	4.060	2.788	0.860	0.404	1.742	2.026	3.678
52.261	23.524	8.544	3.886	2.734	0.831	0.421	1.728	2.024	3.581
53.483	23.800	8.596	3.919	2.901	0.900	0.418	1.785	2.125	3.708
52.469	23.834	8.543	3.910	2.926	0.901	0.387	1.779	2.146	3.716
52.818	23.535	8.568	3.912	2.910	0.883	0.427	1.795	2.170	3.695

Pork …

% Proteina	% CEN	% CA	% FOS	LYS	MET	CYS	THR	VAL	ARG
54.760	23.420	8.571	3.699	2.670	0.784	0.636	1.850	2.468	3.708
53.889	23.459	8.531	3.851	2.771	0.853	0.561	1.843	2.335	3.744
54.100	24.210	8.064	3.624	2.620	0.768	0.676	1.820	2.460	3.654
54.200	25.030	8.548	3.668	2.553	0.735	0.668	1.783	2.430	3.625
52.915	24.485	8.033	4.130	2.548	0.748	0.672	1.784	2.382	3.696
55.490	26.453	8.267	4.265	2.480	0.700	0.592	1.723	2.338	3.575
54.300	24.660	8.838	3.557	2.568	0.760	0.435	1.588	1.830	3.380
54.141	24.073	7.720	3.013	2.698	0.834	0.340	1.658	2.044	3.622
55.718	23.733	8.015	4.393	2.863	0.883	0.360	1.770	2.188	3.725
54.083	25.144	9.366	4.881	2.822	0.867	0.410	1.767	2.148	3.755
54.588	24.825	8.477	4.390	2.723	0.845	0.370	1.705	2.078	3.645
54.885	25.745	8.708	4.710	2.813	0.860	0.345	1.723	2.150	3.700

Animal Proteins …

% Proteina	% CEN	% CA	% FOS	LYS	MET	CYS	THR	VAL	ARG
65.528	14.030	3.380	2.180	3.390	1.302	0.606	2.146	2.180	4.124
65.620	13.935	3.286	2.150	3.478	1.301	0.619	2.188	2.320	4.213
61.702	13.770	3.088	2.107	3.113	1.140	0.702	2.083	2.433	3.787
66.271	14.020	3.371	2.163	3.229	1.170	0.726	2.154	2.497	4.026
65.543	13.787	3.126	2.105	3.223	1.077	0.801	2.232	2.768	4.033
64.933	13.723	3.060	2.083	3.168	1.065	0.793	2.213	2.735	3.960
65.317	13.633	2.967	2.060	3.427	1.137	0.790	2.333	2.863	4.037
65.090	13.687	3.017	2.077	3.197	1.130	0.687	2.137	2.390	3.840
65.437	14.000	3.343	2.153	3.230	1.177	0.633	2.090	2.377	3.863
65.318	13.933	3.277	2.132	3.100	1.158	0.647	2.028	2.347	3.688
66.180	13.223	3.375	2.158	3.040	1.120	0.663	1.993	2.428	3.635
66.280	13.190	3.490	2.260	3.025	1.133	0.655	2.013	2.438	3.623

Poultry …

% Proteina	% CEN	% CA	% FOS	LYS	MET	CYS	THR	VAL	ARG
65.182	11.784	3.923	2.648	3.784	1.259	0.716	2.466	2.861	4.567
65.620	13.935	3.286	2.150	3.478	1.301	0.619	2.188	2.320	4.213
64.563	11.141	3.323	2.504	3.677	1.218	0.733	2.407	2.840	4.435
63.555	10.916	3.185	2.441	3.682	1.234	0.726	2.412	2.834	4.538
63.828	10.839	3.143	2.464	3.752	1.256	0.728	2.432	2.848	4.560
63.557	10.173	3.074	2.466	3.724	1.232	0.730	2.454	2.886	4.584
64.110	10.586	3.226	2.411	3.555	1.228	0.597	2.228	2.442	4.200
64.046	11.785	3.254	2.385	3.692	1.272	0.657	2.350	2.587	4.263
63.626	11.471	3.989	2.514	3.667	1.302	0.537	2.335	2.665	4.315
64.601	14.210	3.791	2.505	3.598	1.274	0.528	2.310	2.592	4.264
64.023	13.500	4.181	2.502	3.742	1.312	0.562	2.393	2.737	4.357
64.817	14.026	4.077	2.451	3.727	1.308	0.522	2.355	2.698	4.350

Animal Proteins … Poultry …

HARINA DE POLLO, n= 259						
	Coeficiente de Digestibilidad, %			g/100 g, Digestible		
	LISINA	METIONINA	TREONINA	LISINA	METIONINA	TREONINA
Promedio	74.76	83.43	75.06	2.75	1.04	1.78
Máximo	83.15	87.34	81.44	3.36	1.18	2.07
Mínimo	58.83	74.02	61.81	1.71	0.69	1.28
D.E.	4.98	2.53	4.00	0.31	0.09	0.15
C.V., %	6.66	3.04	5.33	11.42	8.53	8.44


FEATHER
MEAL

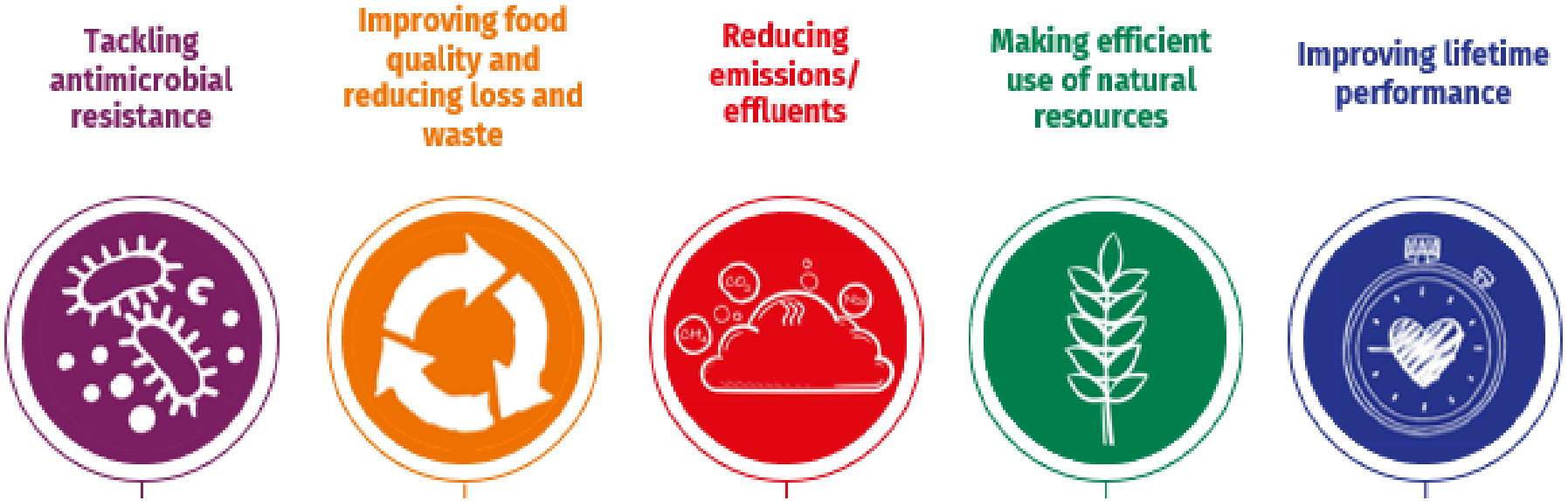
Insects …

Summary …

- Animal Proteins have the potential to be “Excellent Feed Ingredients for Poultry” (Broilers & Layers).

Perspective …

- Transparency & Ethics
- Sustainability
- Information & Vocabulary
- Participate in the Debate



Thank you …