Economics and use of SBM in feeding programs for pigs. Importance of the origin of the soybeans

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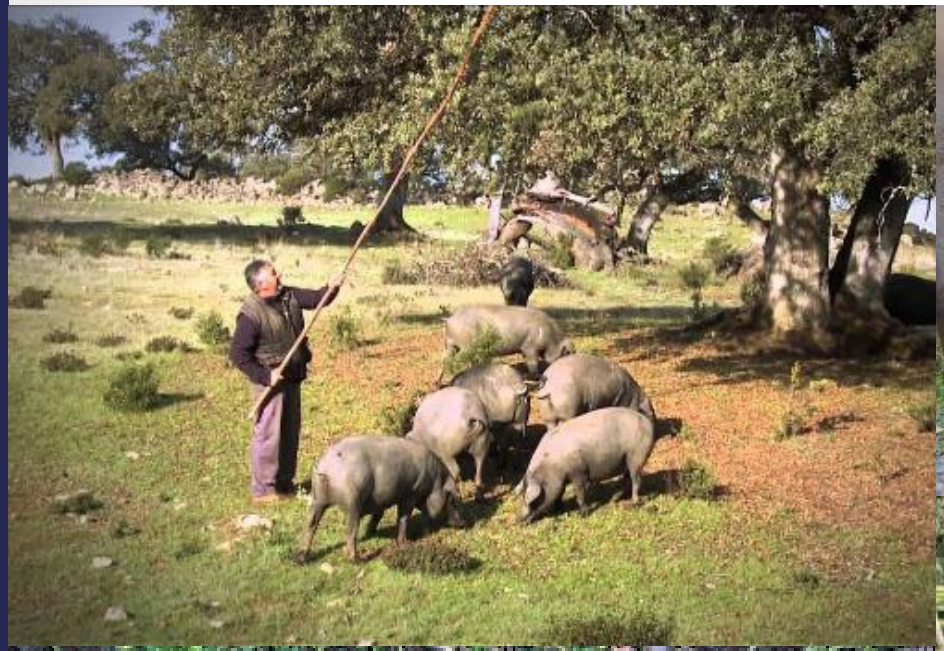
Swine feeding, EU-27
Main areas of interest

- ✓ Hyper-prolific sows: What does it means?
  - ✗ More piglets weaned than mammary glands?
  - ✗ Main problems: extra work and poor uniformity
- ✓ Piglet feeding and BW uniformity at weaning
  - ✗ Ban on in feed antibiotics and ZnO use
  - ✗ Main objective changes: GIT health vs. growth
- ✓ Fatteners. Cost of pork meat
  - ✗ Genetics, castration, BW at slaughter
    - Pietrain vs. Duroc vs. “traditional Iberian”
  - ✗ Fresh meat vs. further processing

Iberian pigs

Dried cured ham: up to 300 €/kg at the supermarket



Swine productivity
Spain, EU-27

Farrowings/sow/year	2.20
Piglets weaned/farrowing	12.3
Piglets weaned/sow/year	27.0
Mortality, pre-fattening, %	7.5[1]
Mortality, fattening, %	6.2[2]
Pigs sold/sow/year	23.3

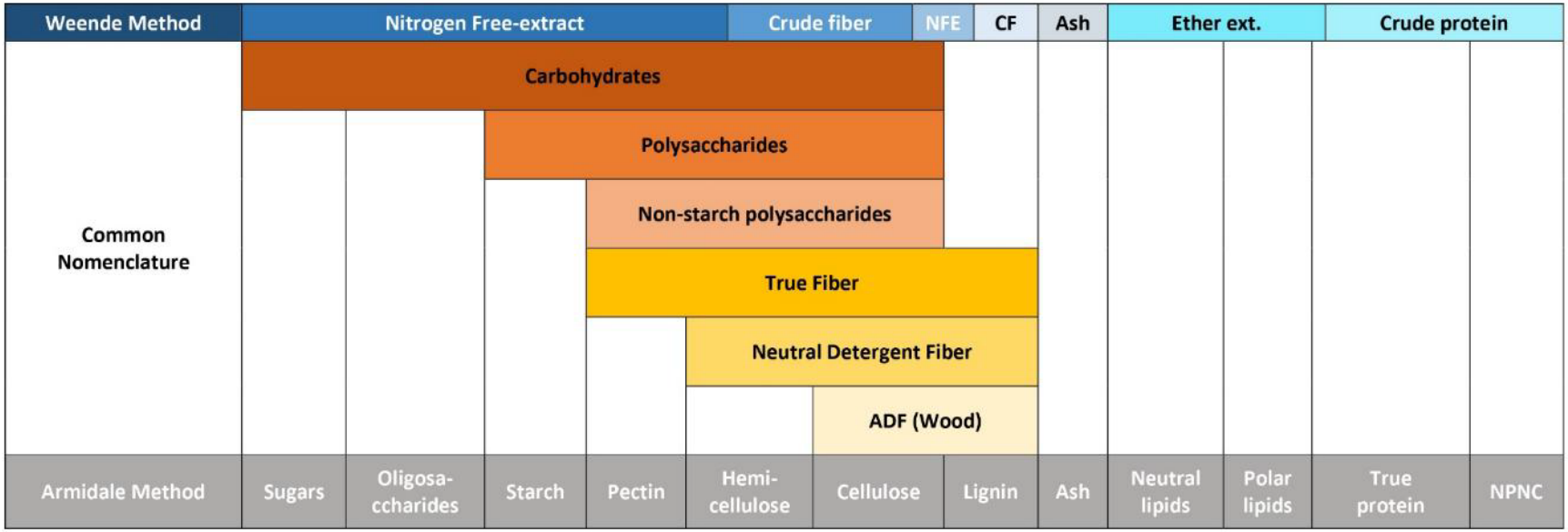
[1] Ban on ZnO
[2] Incidence of diseases (PRRS)

SIP consultores, 2024

Proximal analyses (Weende, 1986)
Crude protein and energy issues

- ✓ Still in use after 160 years. Why?
- ✓ Crude protein is defined as N x 6.25 (?)
  - ✗ NPN is included as real protein but it does not provided energy or valuable AA to the pig
    - The system over-value "poor protein" sources
- ✓ Net energy is estimated based on old prediction equations and traditional pigs with low N retention
- ✓ New evaluation system is needed
  - ✗ CP = ∑ all AA ⇒ Check Dig. Lys: CP ratio
  - ✗ NE: Reset current evaluation procedures

Ingredient composition
Weende (1886) vs. Armidale (2024)



Do we need to move to a new system?

Protein sources
Crude protein vs. ∑ AA (g/kg)

	CP definition		Difference	
	N x 6.25	∑ AA's	g/kg	%
Corn	80	74	6	7.5
SBM	468	430	38	8.1
RSM	365	310	55	15.1
SFM	358	313	45	12.6
FM	682	575	107	15.7

How about "algae"?

Evonik-Aminodata 6.3
Alhotan and Pesti, 2015

Energy content (Mcal/kg DM)
Soybean meal

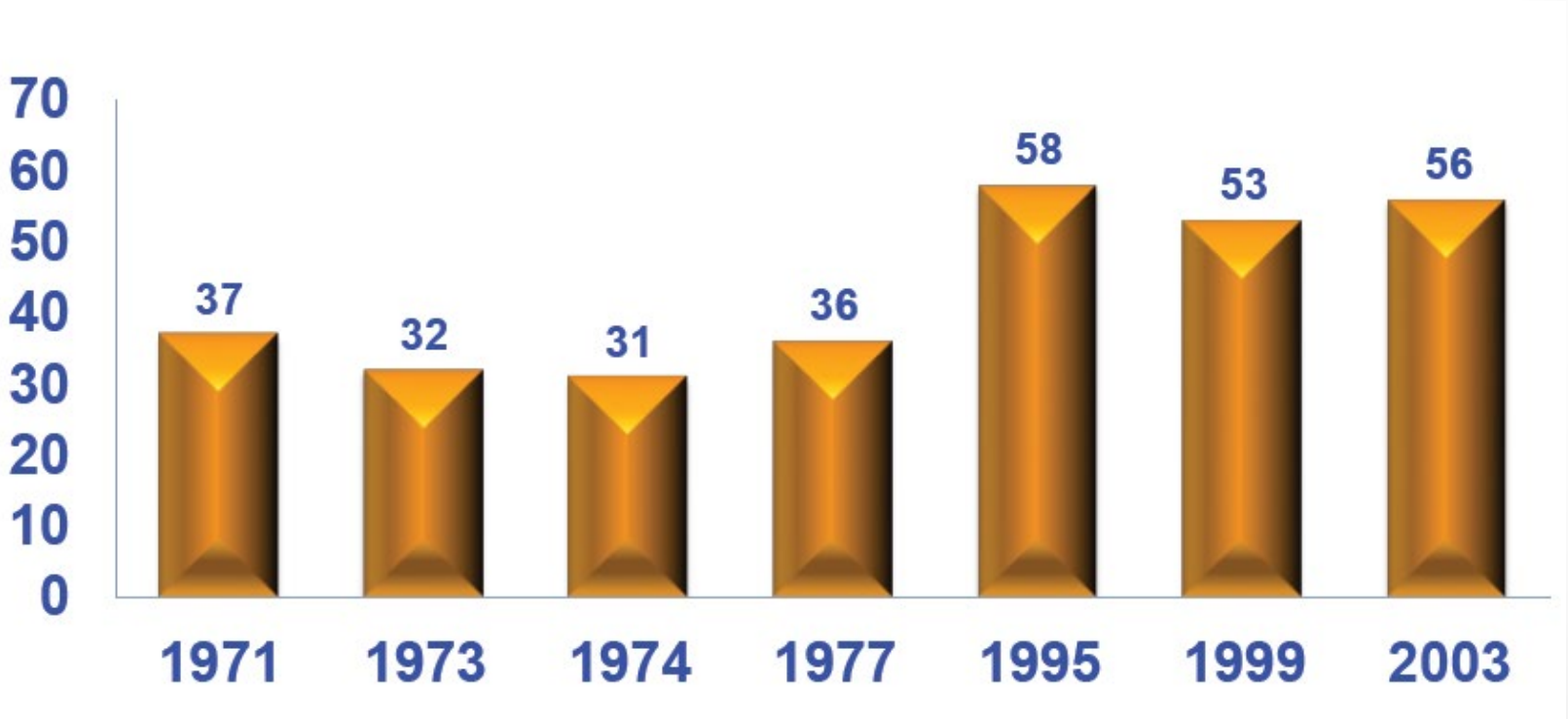
Item	DE	ME	NE	ME:NE
NRC, 2012	4.02	3.66	2.32	63
France, 1987	3.96	3.61	2.26	63
Brazil, 2024	3.99	3.72	2.34	63
Illinois[1], 2015	4.26	4.04	2.47	61
FEDNA, 2025	4.09	3.64	2.27	62
Pr. Atlas 2025	4.16	3.80	2.27	60

[1] Illinois: 7.7% and 9.8 % extra DE and NE vs. France data

Net energy estimation
Noblet, 1994

- ✓ NE pigs = (0.70 × DE) + (1.61 × EE) + (0.48 × starch) – (0.91 × CP) – (0.87 × ADF)

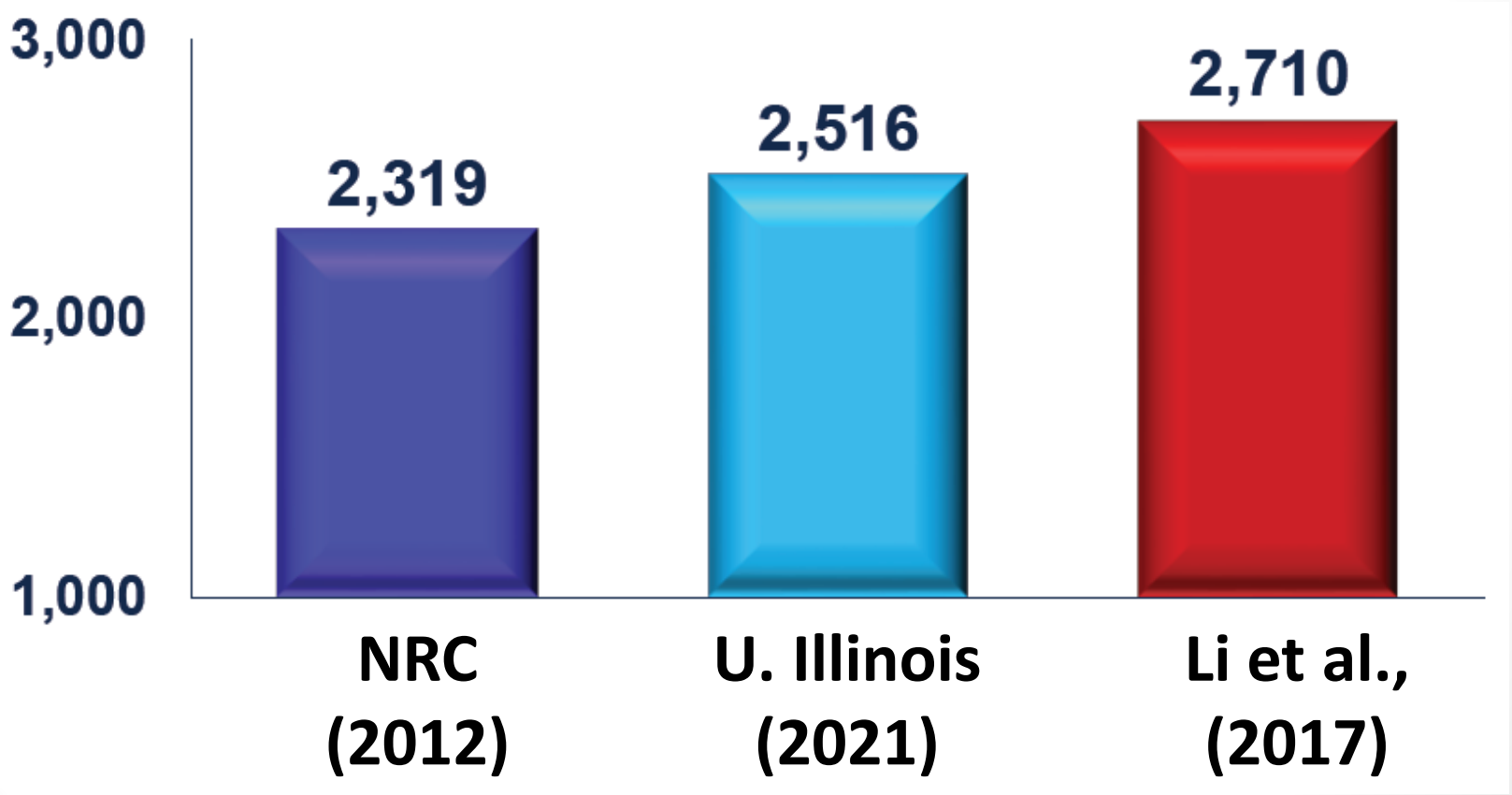
Nitrogen retention (% of intake)
Growing pigs. Historical data



N retention data: France (45 %) vs. USA (70 %)

Stein, 2025

Net energy
Soybean meal, kcal/kg DM



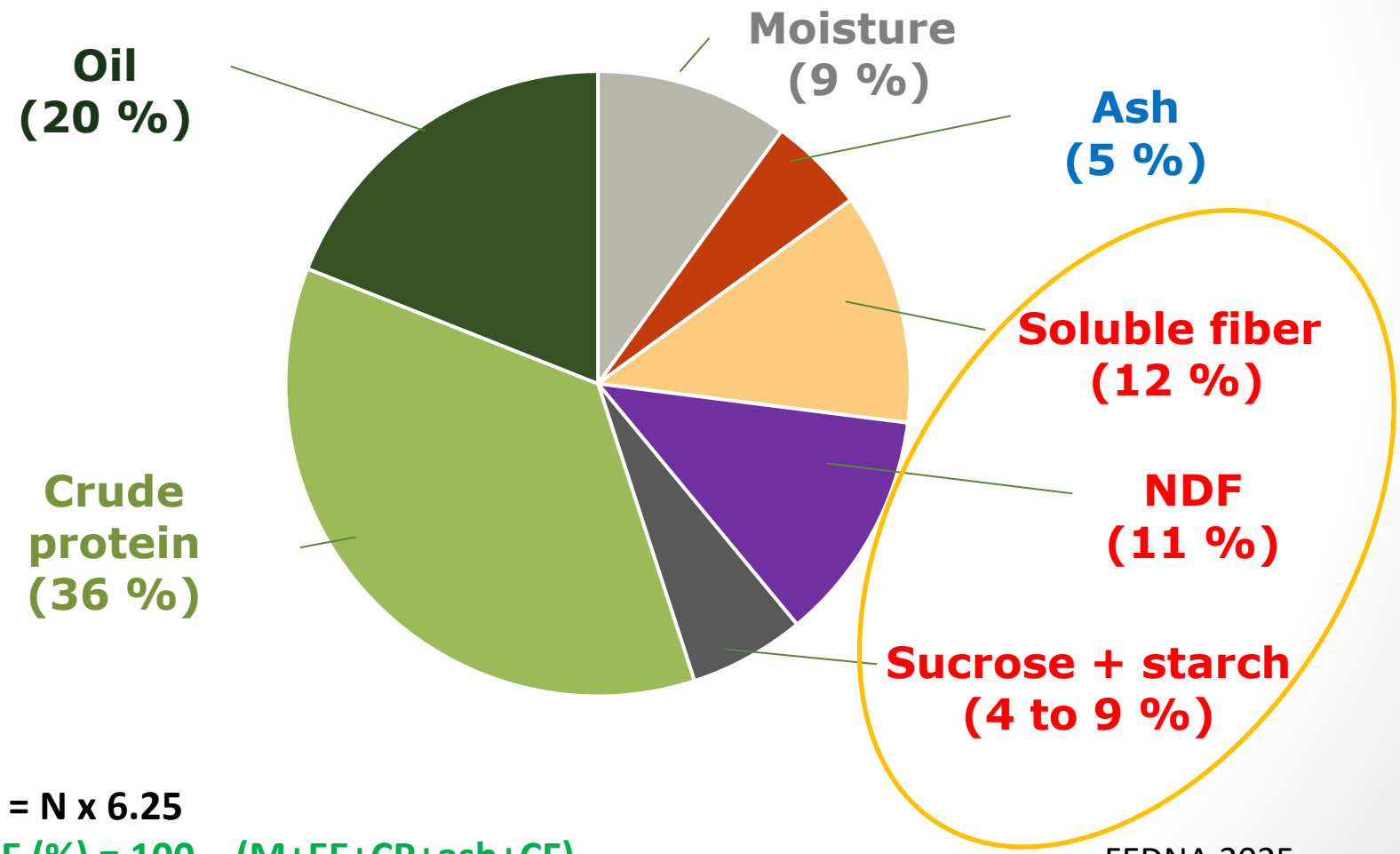
Stein, 2025

NE = (0.70 × DE) + (1.61 × EE) + (0.48 × starch) – (0.91 × CP) – (0.87 × ADF)

Net energy, SBM
Conclusions

- The prediction equation used in Europe for estimating the DE content of the ingredients, penalizes high quality protein sources
  - NE = (0.70 × DE) + (1.61 × EE) + (0.48 × starch) – (0.91 × CP) – (0.87 × ADF)
- Nitrogen retention is greater in modern pigs than 40 years ago
  - 40 to 50 % vs. 65 to 70 %
- Some "biological" components of the SBM might benefit further its use in swine diets

Soybeans
FEDNA, 2025



CP = N x 6.25

NFE (%) = 100 – (M+EE+CP+ash+CF)

FEDNA 2025

Soybean meal quality
Main factors

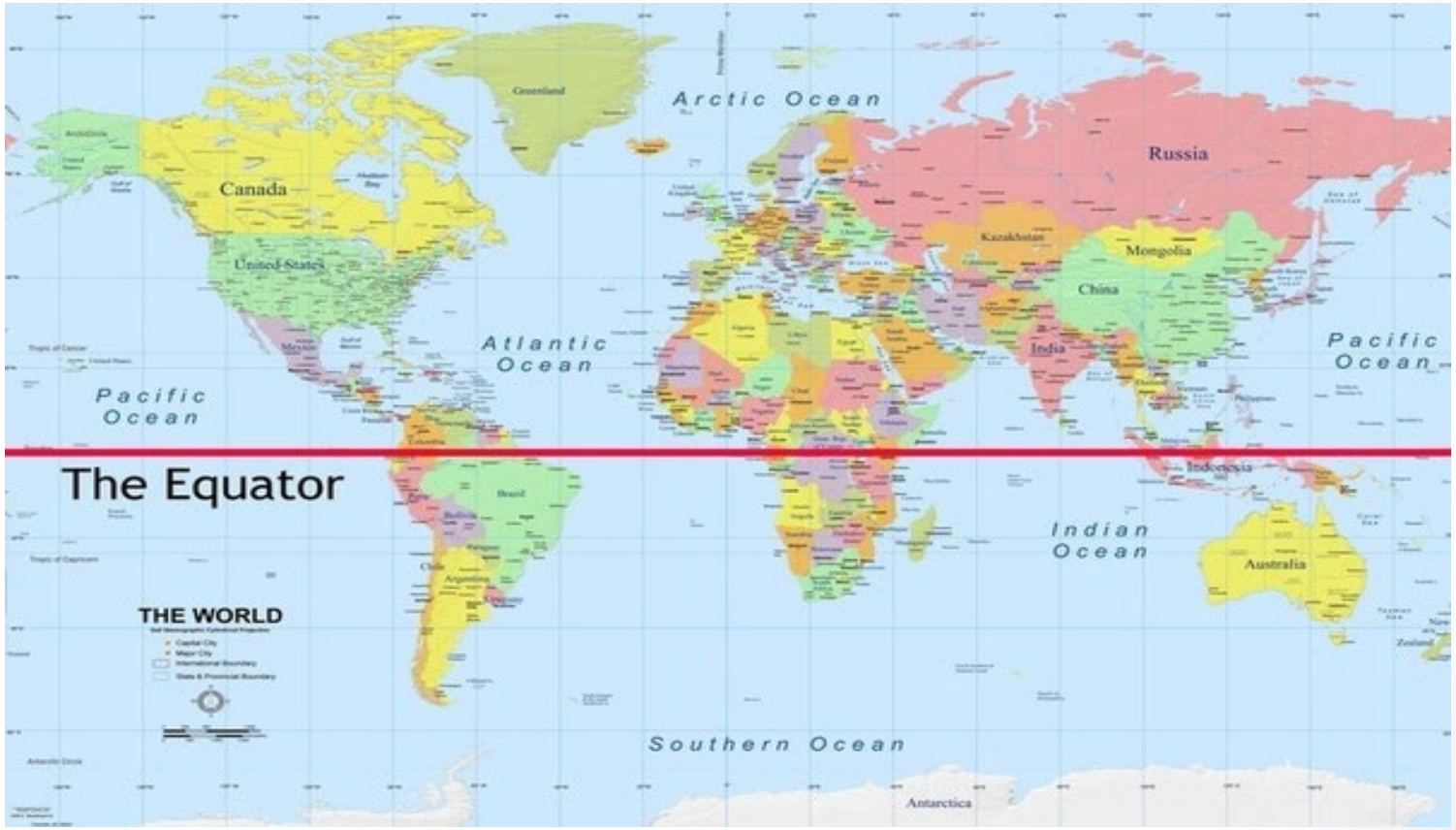
- ✓ **Harvest year** and weather conditions at harvest
  - ✗ Fall vs. summer
  - ✗ Tropical vs. temperate areas
  - ✗ Sprouting, fermentation, fungi…….
- ✓ **Origin of the soybeans**
  - ✗ Latitude, altitude, light, day length
  - ✗ Genetic, type of soil, fertilization
- ✓ **Pre-storage**, storage, and truck transport of the beans
  - ✗ Humidity, air dried flow, T ºC
  - ✗ Insects, fungi, microbial contamination
- ✓ **Crushing plant:** new vs. old equipment, processing …
  - ✗ Logistic flow: from farm to crushing plant to feed mill

DARE to COMPARE US SOY

Soybean quality

Humidity, T°C, day length, luminosity

Latitude 0°



Logistic problems: transport time, roads conditions….

Soybeans, post-harvest storage

Air dried at 40°C?

SBM, chemical composition, %
Net energy pigs, kcal/kg as fed

	CVB (2023)	Rostagno (2024)	INRAE (2025)	EVONIK (2025)	Pr. Atlas (2025)	FEDNA (2025)
Moisture	11.8	10.5	12.0	10.4	12.0	11.8
Net energy	1,978	2,035	1,980	2,120	2,000	2,005
CP	46.9	46.5	46.2	46.5	46.5	47.0
EE[1]	2.40	1.89	1.50	2.17	2.7	2.2
NDF	8.40	10.4	12.5	11.5	9.3	9.50

[1] Usually ≅ 2.3 % with HCl use

Soybean meal
AA content and digestibility, %

	CVB (2023)	Rostagno (2024)	INRAE (2025)	EVONIK (2025)	Pr. Atlas (2025)	FEDNA (2025)
Total amino acids						
Lys	2.91	2.93	2.88	2.87	2.84	2.87
Met + Cys	1.36	1.28	1.39	1.28	1.26	1.38
Thr	1.83	1.88	1.63	1.79	1.80	1.83
Swine, SID						
Lys	2.68	2.66	2.58	2.55	2.52	2.58
Met + Cys	1.22	1.17	1.23	1.07	1.08	1.22
Thr	1.63	1.63	1.53	1.56	1.53	1.59

Brazil vs. USA. Soybean quality, %
Exports vessels, 2024

	Brazil[1] (21×10^9 T)	USA[2] (46×10^9 T)	ARG[2] (1.3×10^6 T)
Moisture	12.1	10.7	12.9
Crude protein	34.5	33.8	32.8
Oil	21.6	19.8	20.9
Foreign material	0.65	1.27	0.53
Heat damage	0.36	0.05	0.18
Damaged beans	6.0	1.3	2.4
Splits[3]	5.9	9.1	4.1

[1] Agri-Commodities [2] FIGS public data base [3] After loading the vessel
Data correspond to last 12 months (December to December)

Raw soybeans Spain, 2020/2024
Classification, %. Arrival ports

	USA (n = 19)	Brazil (n = 44)	P value
High quality beans[1]	91.9	87.4	**
Damaged beans[2]	6.1	11.1	***
Acidity, %	1.37	2.58	***
Perox. ind., meq/kg	2.18	2.13	NS

[1] Includes split (half) beans
[2] Heat damaged, purple, speckled, immature, greenish, moldy, and sprouted beans
[3] Foreign material (include “fines” in the USA beans)

Raw soybeans[1], 2021/2024
Chemical composition & CP quality

	HQ	Damaged	P-value
DM, %	89.3	89.8	**
CP, %	34.9	36.5	***
Sucrose,%	5.1	3.7	***
TIA, mg/g	25.6	23.7	**
KOH, %	88.8	83.4	***
Acidity, %	1.87	5.82	***
Perox. ind., meq/kg	1.86	5.03	***

[1] USA (n = 19) and Brazil (n = 44)

Percentage of damaged beans[a], %
Brazil vs. USA

	Brazil	USA
Farm gate[b]	≥ 4.0	≤ 1.0
Local port, export[c]	5.6	1.2
Destination port[d]	11.1	6.1

[a] Differences in the criteria used for evaluating "damaged beans"
[b] Mato Grosso and Iowa farms (estimated)
[c] Average of last 8 years (FGIS and Ag Commodities)
[d] Europe, Spanish ports, 63 samples from 2022 to 2025

SBM composition, 88% DM
Historical data[1], 2006 to 2025

	ARG (n = 307)	BRA (n = 320)	USA (n = 327)	P <
Moisture	11.2[b]	11.6[a]	11.5[ab]	*
CP	45.9[c]	47.1[a]	46.5[b]	***
EEh	1.81	1.92	1.88	NS
Sucrose	7.1[a]	5.7[b]	7.2[a]	***
Stach.+raff.	6.1[a]	5.7[b]	6.3[a]	***
CF	4.2[b]	4.9[a]	4.1[b]	***
NDF	8.8[b]	10.1[a]	8.7[b]	***

[1] All data analyzed by wet chemistry
Similar number of samples per year

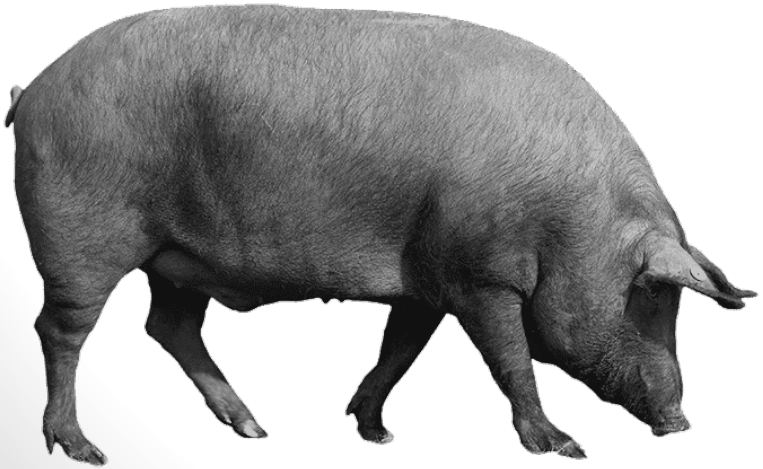
Corrales et al. (2025)

SBM protein quality, 88 % DM
Historical data, 2006 to 2025

	ARG (n = 307)	BRA (n = 320)	USA (n = 327)	P <
AA profile, % CP				
Lys	6.11[b]	6.07[c]	**6.15[a]**	***
Met+Cys	**2.82[a]**	2.77[b]	**2.82[a]**	***
Thr	**3.92[a]**	3.88[b]	3.89[b]	***
Protein quality indicators				
UA, Δ pH	0.022	0.035	0.031	***
PDI, %	**13.3[b]**	**13.6[b]**	**18.1[a]**	*
KOH, %	76.8[b]	77.9[b]	**81.6[a]**	***
TIA, mg/g	2.26[b]	2.53[b]	**2.94[a]**	***

Corrales et al. (2025)

Conclussions

- ✓ As an average, USA beans have less damaged beans, CP, and NDF, better AA profile and uniformity, and more sucrose and stachyose content than the Brazilian beans
- ✓ Based on DE values and protein deposition, the NE content of SBM in modern pigs is under-evaluated
- ✓ Current methods used by the industry to evaluate the quality of the soy products, based on moisture and CP, need re-evaluation

Thanks