Quality of U.S. Soybean Meal Compared to the Quality of Soybean Meal from Other Origins

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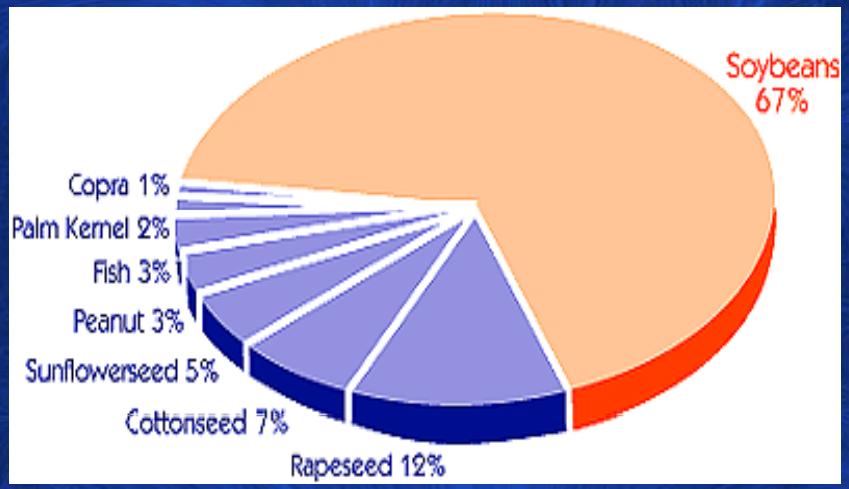
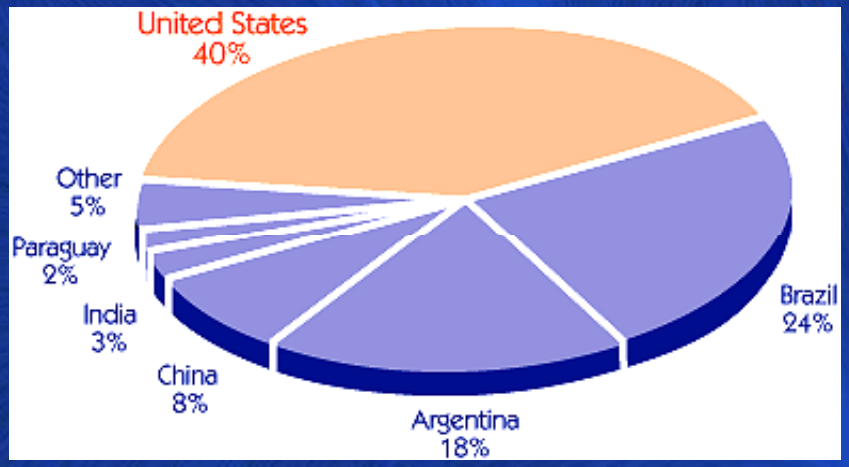
Introduction



World Protein Meal Consumption 2004

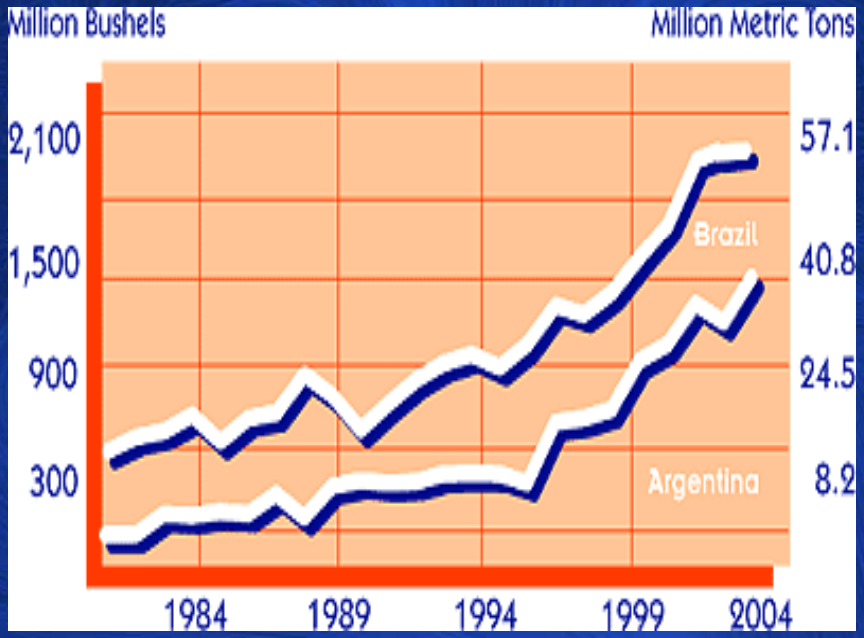


World Protein Meal Production 2004

Source: Soy Stats 2005

- Soybeans - important source of protein and oil
- US - dominant producer
- Year 2004:
  - Area planted: 75.2 million acres
  - Production: 3.14 billion bushels
  - Crop value exceeding $17.7 billion

Project Motivation



Soybean Production in Brazil & Argentina

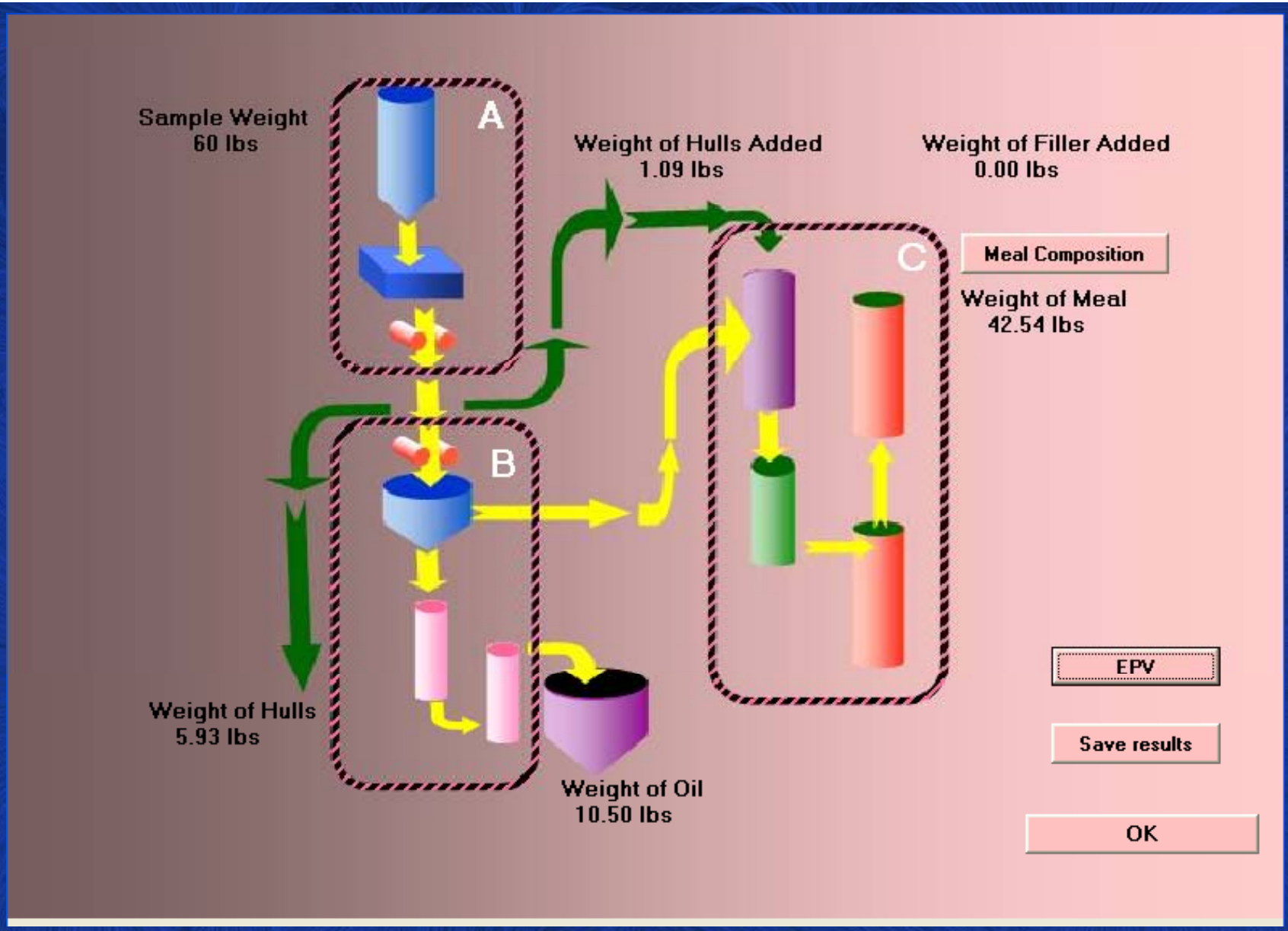
Source: Soy Stats 2005

- South America
- Soybean production increasing in Brazil and Argentina- 34% in 1999 to 42% in 2004
- NOPA soybean meal trading specifications
- True Processed Value of soybeans ≈ End-use

Objectives

- To survey the quality of 2004 crop soybeans and soybean meal from non-U.S. vs. U.S. origins
- To compare the results from this survey with the data from previous studies

Soybean Processing Model



Source: SPROC 3

Methods

- Samples
  - 115 soybean and 153 SBM samples
  - 500-1000g each
  - Collected by ASA representatives in 8 countries
  - Shipped to GQL, Iowa State University

Soybeans

Soybean Meal

Analysis

- All samples divided into 4 fractions: Electric Grain Divider

Analysis- Soybeans

1: Eurofins Scientific, Des Moines, Iowa

- Moisture: AOCS Ac 2-41
- Oil: AOCS Ba 3-38
- Protein: AOCS Ba 4e-93
- FFA: AOCS Ac 5-41

2: University of Missouri-Columbia Exp Station Labs

- Amino Acids - AOAC 982.30 (a,b,c)

3 & 4: Retained for other work

Analysis- Soybean Meal

1: Eurofins Scientific, Des Moines, Iowa

- Moisture: AOCS Ba 2a-38
- Protein: AOCS Ba 4e-93
- Oil: AOCS Ba 3-38
- Fiber: AOCS Ba 6-84
- Ash: AOCS Ba 5a-49
- NSI: AOCS Ba 11-65
- Non Protein Nitrogen: AOAC 941.04
- Mold Count: AACC 42-50
- KOH Protein Solubility: AOAC 971.09

Analysis- Soybean Meal

2: University of Missouri-Columbia Exp. Station Labs

- Amino Acids: AOAC 982.30E (a,b,c)

3: Grain Quality Lab, Iowa State University

- Particle Size Analysis: ASAE S319.2

4: Retained for other work

Comparison with previous studies

- Soybeans
  - Grieshop & Fahey: 2001
  - U.S. annual soybean quality surveys
    - 2003
    - 2004
- Soybean meal
    - 1995-1999 by Moizzudin
    - 1999 by John Baize and Associates

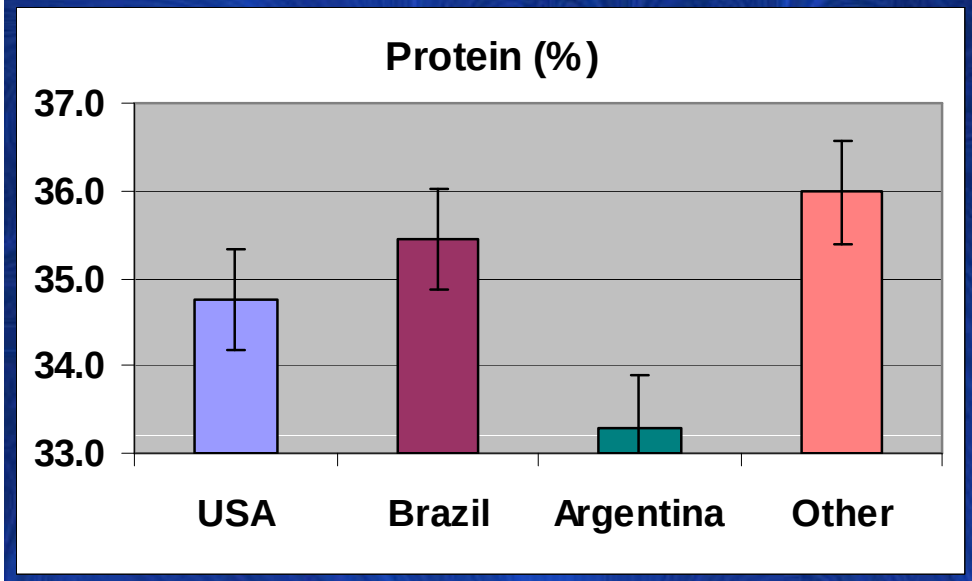
Amino Acids

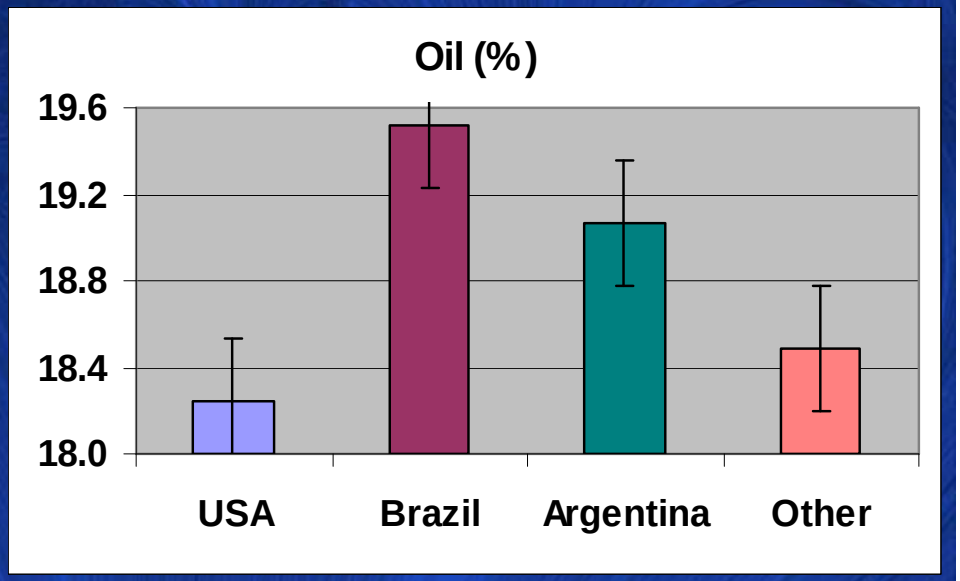
- 5 key AA: Lysine, Threonine, Methionine, Cysteine, Tryptophan
  - % by weight
  - % of protein
- Measure of Protein Quality:
  - Digestible AA = AA * KOH Solubility

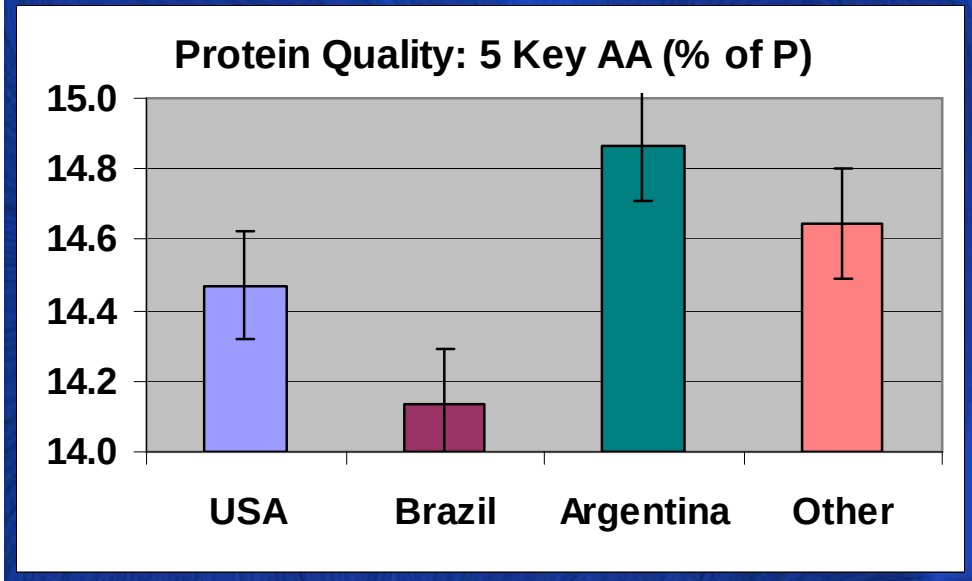
Statistical Analysis by Origin

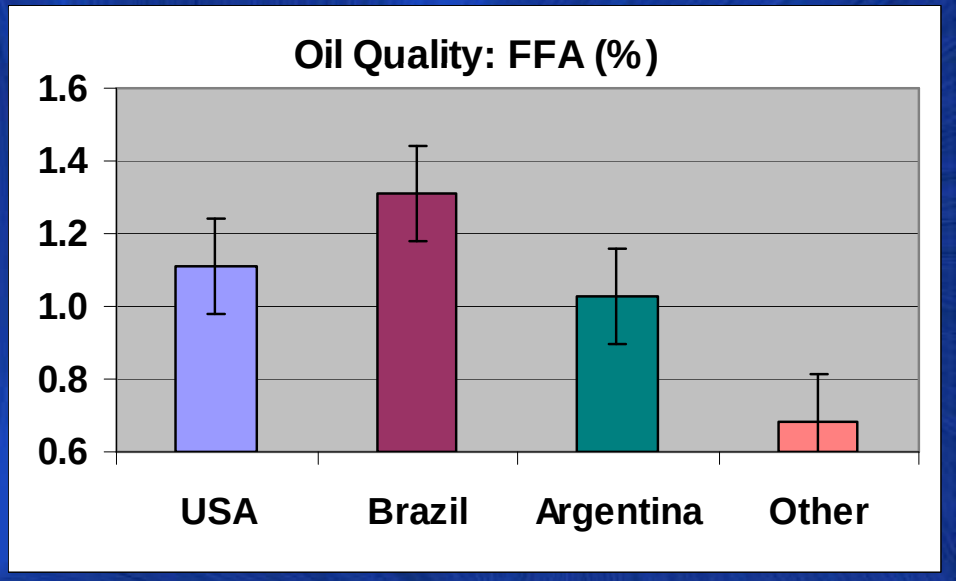
- Soybeans: 13% moisture basis
- Soybean meal: 12% moisture basis
- Asia: UAE, Indonesia, Malaysia, Philippines & Korea (n = 15)
- Others: Guatemala, El Salvador, Panama, Costa Rica, Trinidad, Barbados & Paraguay (n = 7)
- Least Significant Difference (LSD, P = 0.05) in JMP 5.1

Results: Soybean Quality



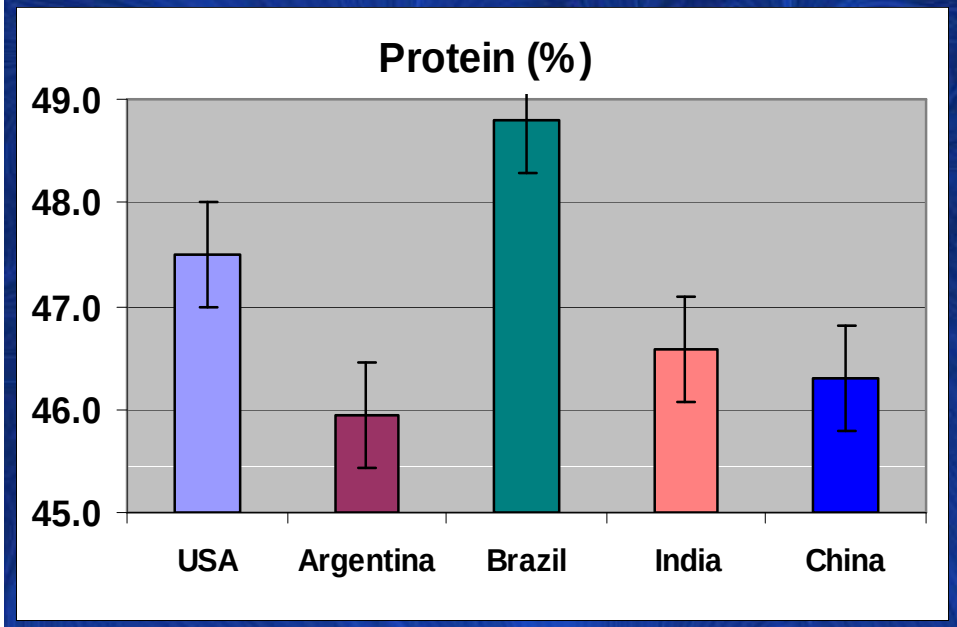


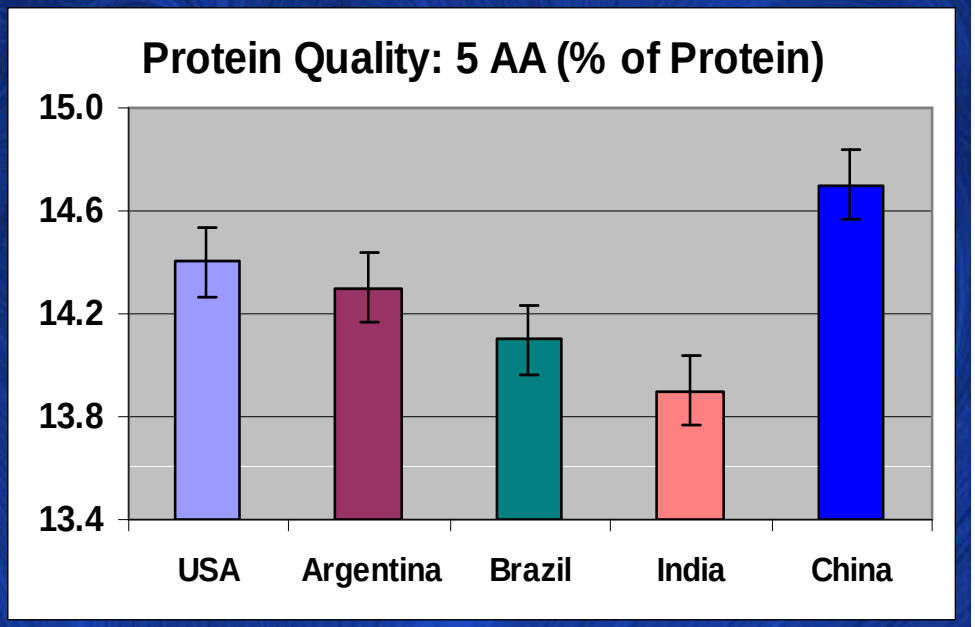


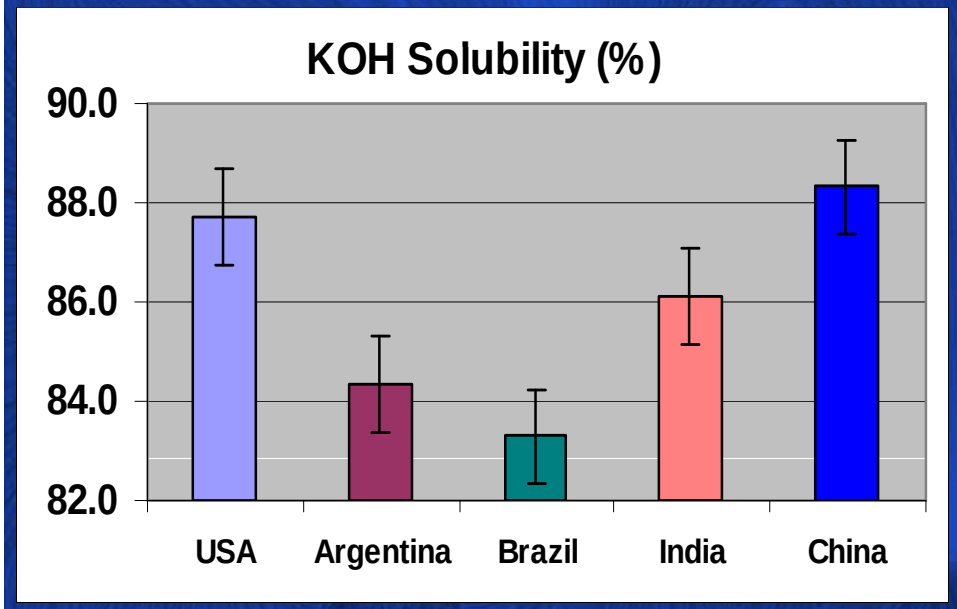


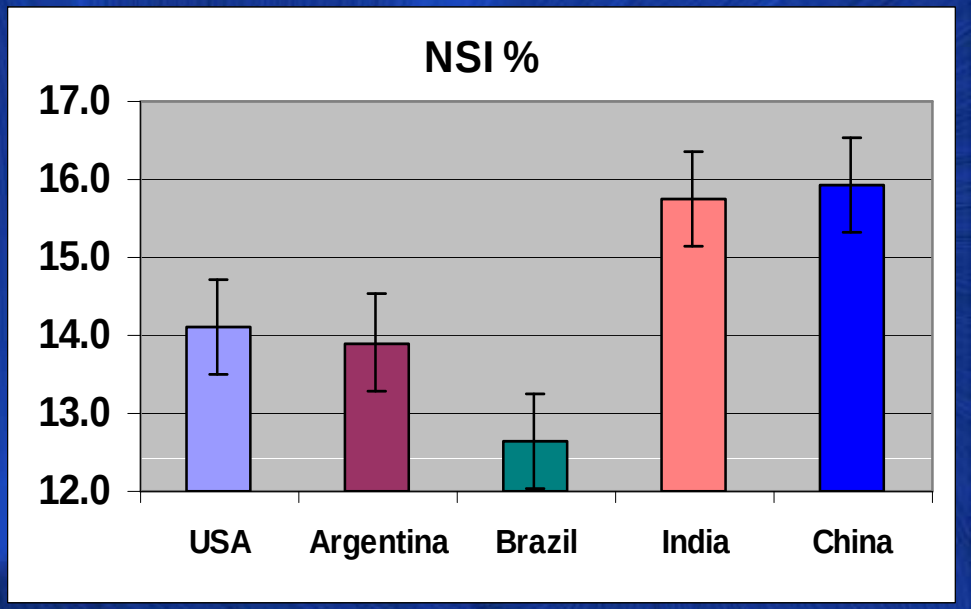
13% Moisture Basis

Results: Soybean Meal Quality









12% Moisture Basis

Results- Soybean Meal Quality

Particle Size

Origin	Mean particle size (microns)	% in desired range (250-1700 microns)
USA	1070	84.1
Argentina	1074	79.8
Brazil	1088	83.7
India	1262	65.5
China	1131	88.1
Asia	1138	91.1
Others	1125	82.3

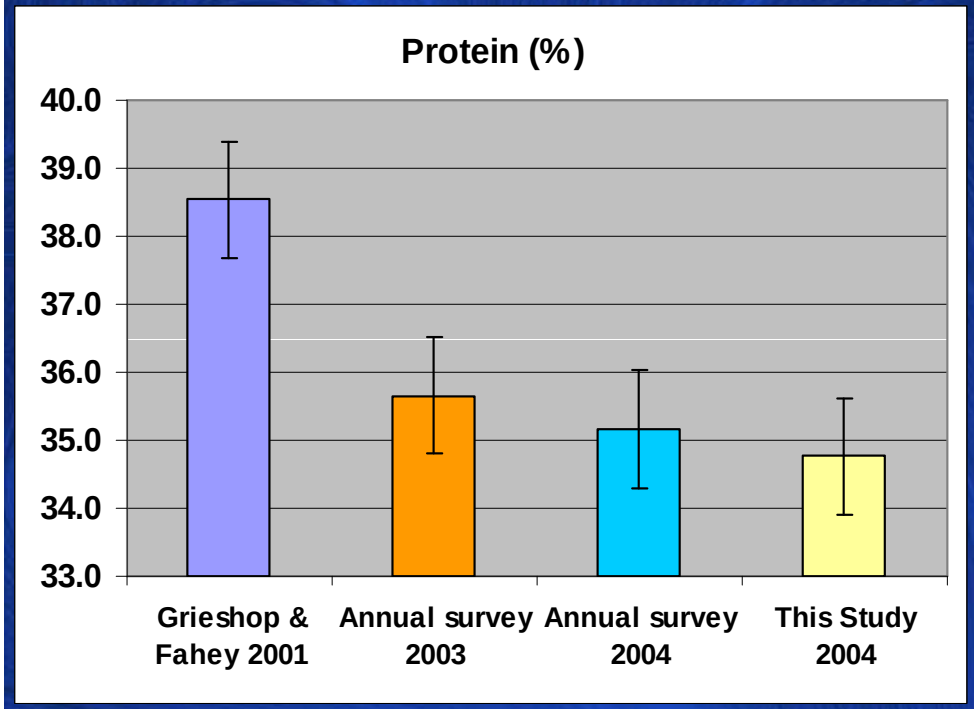
Soybean Meal Samples

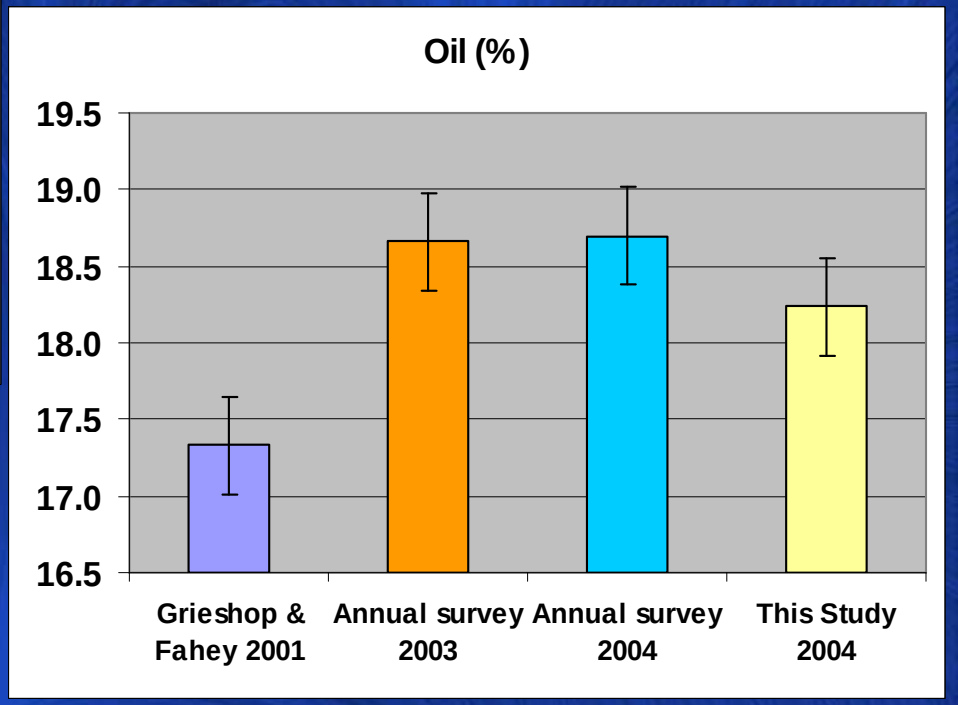
USA

India

Results

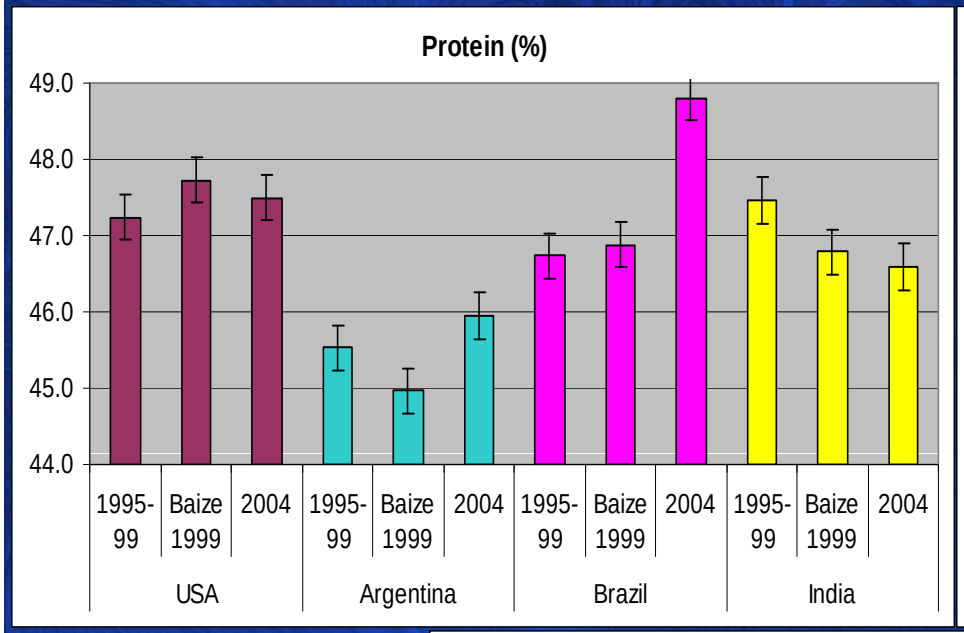
Soybeans: Comparison with previous studies

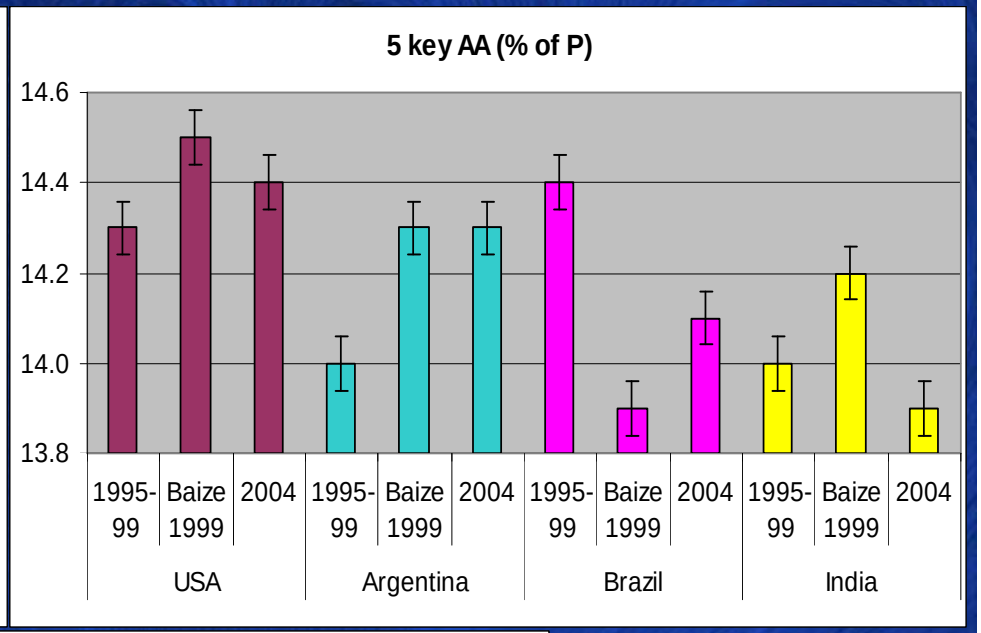


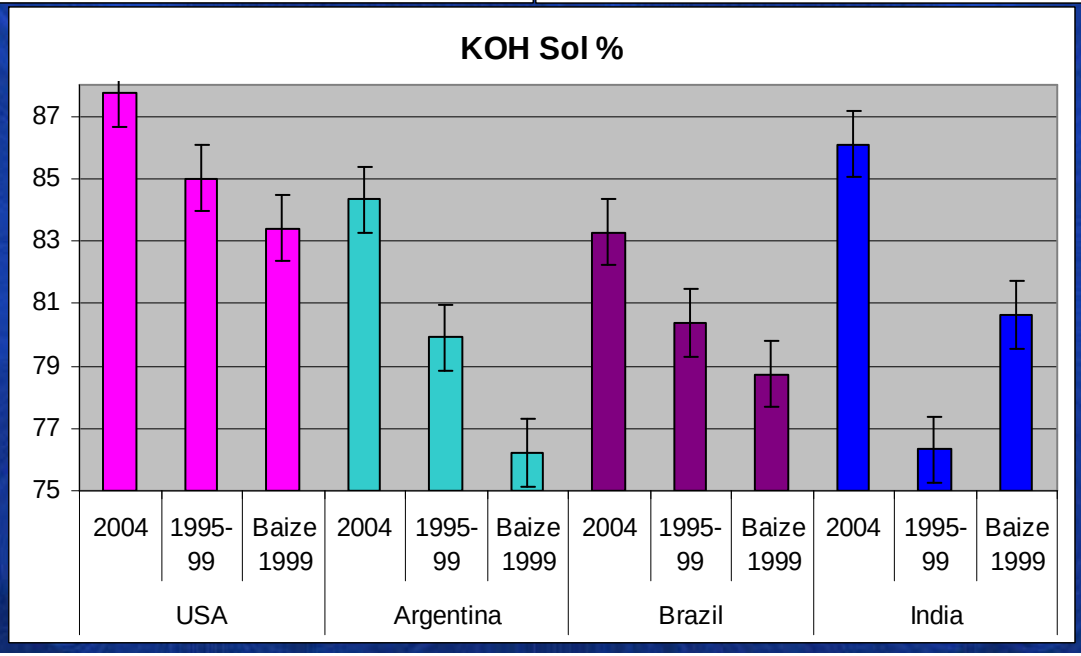


13% Moisture Basis

Soybean Meal: Comparison with previous studies







Conclusions

- U.S. soybeans
  - Lower protein than Brazil, higher than Argentina
  - Crude protein disadvantage of U.S. beans was offset by higher concentrations of AA
  - Advantageous if market recognizes amino acids rather than protein as indicator of feeding value
- U.S. SBM more consistent
  - Higher digestibility
  - Lower fiber
  - Better quality of protein

Conclusions

- U.S. soybean meal
  - Higher digestibility & key AA
  - U.S. producers would benefit if diets were formulated on actual AA of meal being fed
  - Mean particle size: within desired range
- Previous studies
  - General quality trend similar to previous studies
  - U.S. SBM held an advantage in digestibility & concentrations of key amino acids in all three studies
  - U.S. SBM - ↑ Protein Solubility & Brazilian SBM - ↑ Protein

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