Feed Formulating Alternatives to Corn and Soy!

How to save money using the other grains and proteins.

The Value of Corn

- 7 9% Protein
- 75% NFC
- 95% digestible NFC
- 1475 –(1540 avg) 1600 Kcal/Lb
- 70% Starch
- Xanthophyll (yellow color) for yolk and body color

Corn Alternatives

- Grain Sorghum
- Wheat
- Triticale
- Barley
- Oats & Spelts

Grain Sorghum – a.k.a. Milo

Red Milo







Grain Sorghum

Feeding Value

- 7-9% protein
- 71.4 % NFC
- 68 Starch
- 1400 Kcal/Lb
- It's feeding value is essentially 95 - 96% the same as corn.

Limitations

- Should be limited to 30-40% of the total diet based on tannin content.
- Limitation is primarily it's tannin content. The red or rusty color of the seed.
- (6% reduction for every 1% of tannins)
- White or light varieties are available and contain less tannins.

Wheat

Hard Red Spring Wheat



Soft White winter Wheat



- 9 16 % protein
- 69.8% NFC
- 64% Starch
- 1440 Kcal/Lb
 - Hard red spring wheat varieties have higher protein vs. Soft white winter varieties.
 - Ruminant feed limitations are due rapidly fermenting Starch

- Diets should be limited to 4-6 lbs per day for mature cattle.
- Feed limitations are due to Pentosans content and the lack of Xylanase enzymes produced by the poultry digestive tract.
- Diets should be limited to 30% for young poultry and 50% for mature poultry.

Triticale



- 11-13% Protein
- 69.2% NFC
- 64% Starch
 - Feeding limitation similar to wheat, rapidly fermenting NFC & Starch
 - Diets should be limited to 4-6 lbs per day for mature cattle

- Diets should be limited
 - 30% for young poultry
 - 50% for mature poultry
- May be fed at higher levels when correct enzymes are added to the diet.

Barley



- 11-12% protein
- 63.5 NFC
- 58% Starch
- 1250 Kcal/lb
- Ruminant feeding limits are due highly fermentable starch.
- Monogastric feeding limits are due to β-*Glucans* content of barley, 5-8%.

- Should be limited to 4-6 lbs per day for adult cattle
- Poultry should be limited to 15% of the diet
- Swine have a much higher tolerance as high as 35% of the diet
- May be fed at higher levels when β-*Glucanase* enzymes are added



- 10-12% protein
- 48.1% NFC
- 43% Starch
- 1100 Kcal/lb
 - Similar limitations are due to highly fermentable starches
 - Similar limitations are due to β-Glucans content of oats, 5-8%.

- Mature Cattle should be limited to 4-6 lbs per day
- Poultry feeds should be limited to 15% in any combination with Barley
- May be fed at higher levels if β-Glucanase enzymes are added

Carbohydrate Sources Comparison Chart

	%	
Mcal/lb	NFC	TDN
3.19	75	93.9
2.62	82	80.1
2.81	70	84.9
2.8	69	84.5
2.89	70	86.8
2.7	63	82.1
2.55	44	78.1
2.49	48	76.6
2.67	57	81.4
2.76	69	83.5
	Mcal/lb 3.19 2.62 2.81 2.8 2.89 2.7 2.55 2.49 2.67 2.67 2.76	%Mcal/lbNFC3.19752.62822.81702.8692.89702.7632.55442.49482.67572.7669

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Carbohydrates comparison - Monogastrics

Grain	Kcal/Lb
Corn grn, fine grnd	1540
Wheat grn, grnd	1440
Triticale grn	1400
Sorghum grn, grnd	1400
Barley grn, grnd	1250
Spelt grain	1100
Oat grn, gnrd	1100
Buckwheat grn, grnd	1200
Rye grn	1340

Protein Alternatives to Soy

Protein alternative sources for Soy Peas Cull Beans Linseed (flax) Meal Sunflower Meal Camelina Meal

Nutritional Values of Soy

- Expelled soy meal
 - 40%-48%
 - 6-9% remaining fat = energy
 - 2.9 Mcal/lb & 87% TDN
 - 1320 Kcal/lb

- Roasted, Raw or Extruded
 - 36%-40%
 - 16%-20% naturally occurring Fat = energy
 - 3.3 Mcal/lb energy & 96% TDN
 - 1540 Kcal/lb

40-50% Rumen Degradable protein

Protein alternative

- Peas
- Sunflower meal
- Linseed Meal
- Cull Beans
- Camelina Meal
- Monogastric proteins
 - Fish & Crab Meal

Peas Field, Cow, Cull, etc.







- 22 24% protein
- 1300 Kcal/Lb
- Limitations to feeding peas
 - Low in Sulfur Amino Acids
 - Methionine
 - Cystine
 - Tannins the darker the color the higher tannin content
 - Every 1% of tannin content will reduce protein digestibility by 6%

- Ruminant feeds should be limited to 30 – 40% of the grain mix in most diets.
- Poultry diets should be limited to 20 – 25%
- Swine diets should be limited to 25 30%

Dry Edible Beans

- 24 26% protein
- 1225 Kcal/lb
- Limitation to feeding beans is Urease, Trypsin inhibitor
 - May be heat treated like soy to break down the Urease.
 - Ruminant, poultry and swine feed should be limited to 20 – 25%



Linseed Meal

- Linseed Meal- 30-37% protein
- 1300 1600 Kcal/lb depending on remaining oil content after pressing.
 - Linseed meal is widely used in ruminant and poultry feeds.
 - Maybe fed up to 4-6 lbs to adult cattle
 - Poultry & Swine diets up to 20% may be used
 - Higher levels may have a potential for milk or meat off flavoring





Sunflower Meal

- Sunflower meal, protein 34-38%
- 1000 1100 Kcal/lb
 - Ruminant feeds up to 30% be used.
 - A maximum of 4-6 lbs for adult cattle
 - Poultry & Swine diets up to 10 -15% can be used when fresh
 - Limiting concerns of sunflower meal – highly oxidative and very high non digestible fiber.



Camelina Meal

- 37%, protein
- 1510 Kcal/lb.
- It has the same protein and energy of roasted soybeans after the oil has been removed!
- Unfortunately it is limited by the FDA to not exceed 10% of Layer and Broiler diets.
- So far does not appear to oxidize quickly and cause feed refusal.
- The biggest limitation so far is availability. Grown mostly in Montana and Eastern Washington





Monogastric Protein Alternatives

Fishmeal

- Fishmeal: 55 72% protein, 1280 – 1550 Kcal/Lb
 - Limitations to feeding
 - High oil varieties-Herring, Menhaden and Anchovies may cause off flavoring due to the fish oil, High oil meals, should not exceed 5% of the ration.
 - Low protein & oil varieties-Catfish meal, comes from farm raised catfish. May contain higher levels contaminants, antibiotics or heavy metals.



Crab Meal

- Crab meal is a by product of the food industry.
- Crab meal has typical protein levels of 30-36% and an energy of 900-1100 Kcal/lb.
- Salt and low energy are crab meals feeding restrictions.
- Crab meal is commonly between 2-3 salt from natural sources.
- Very low availability in most areas.



Protein Sources Comparison Charts

Proteins	%	%	%
Feed Name	СР	RDP	RUP
Soybeans, roasted	42.8	50	50
Soybean meal, exp	47.5	40	60
Beans, culls	29.4	85	15
Linseed meal, exp	36.5	65	35
Peas	25.3	82	18
Sunflower meal, exp	39	70	30

Value comparisons <u>Organic</u>	Cost	Protein %	Pound of protein per ton	Price per pound of protein	Energy Value Kcal/Lb	Corn Energy Value
Expeller Meal-Soy plus	\$ 1,300	44%	880	\$ 1.48	1280	83%
Roasted Soy	\$ 1,100	38%	760	\$ 1.45	1500	97%
Corn	\$ 600	7%	140	\$ 4.29	1540	100%
Great Mixed Hay	\$ 400	22%	440	\$ 0.91	800	52%
Good Mixed Hay	\$ 300	20%	400	\$ 0.75	750	49%
Average Mixed Hay	\$ 200	18%	360	\$ 0.56	700	45%

Sprouts

- There is a huge revived interest in Sprouting small grains
- Are fairly labor intensive and difficult to manage
- Are a excellent source of Chlorophyll, Vitamins found in fresh forages and Protein for ruminants
- Are not suitable replacement for balanced grain mixes for poultry and swine
- But they are a great supplement to balanced grain mixes for poultry and swine

Sprout Analysis

Barley – no roots

- Moisture 89.75%
- Protein 17.82%
- Calories 689
- Starch 8.97%
- Lignin 2.13%
- ADF 26.22%
- NDF 39.66%

* This was the highest of all samples taken to date

* All values on a dry matter basis. Test results performed by Analab, sample from Amish farmer in Allensville, PA

Barley – Whole sprout

- Moisture 80.55%
- Protein 13.87%
- Calories 647
- Starch 41.84%
- Lignin 1.80%
- ADF 11.33%
- NDF 23.29%

* This was the highest of all samples taken to date

* All values on a dry matter basis. Test results performed by Analab, sample from Amish farmer in Allensville, PA

Sprout Analysis

Barley Fodder Sprouts Dry Matter values

- Moisture 86.0%
- Protein 13.8%
- Crude Fiber 11.0%
- Calories 1087
- Starch 34.1%
- Sugar 13.4%
- ADF 14.5%
- NDF 30.0%

* All values on a dry matter basis.

* Test results performed by Agri Analysis, Leola, PA. Sample collected from Amish farmer in Quarryville, PA

Barley Fodder Sprouts As Received values

- Moisture 80.55%
- Protein 1.9%
- Crude Fiber 1.5%
- Calories 152
- Starch 4.8%
- Sugar 1.9%
- Calcium .02%
- Phosphorus .07%
- * All values on a As Received basis.

* Test results performed by Agri Analysis, Leola, PA. Sample collected from Amish farmer in Quarryville, PA

Sprouting continued

excerpts from Morrison's Feeds and Feeding, 22nd Edition, 1957 page 432, Para. 730

- ...sprouted oats were used to a considerable extent in the winter feeding of poultry to furnish green and succulent feed.
- ...efficient rations were developed that made the labor and expense of sprouting oats unnecessary. Therefore the practice has been practically discontinued.
- It was claimed some years ago that the feeding of sprouted oats aided in overcoming sterility in dairy cows and heifers that failed to conceive....experiments have shown that sprouted oats are not usually beneficial to such cases.

Sprouting

- Outstanding way to extend the input of fresh forage for all classes of livestock
- Most beneficial for ruminant livestock
- While eaten very aggressively by poultry and swine the maximum potential for grain replacement is 10-15% as with any fresh forage.
- Many unexplainable benefits from fresh forage
 - Chlorophylls
 - Vitamins
 - Highly digestible fiber for ruminants

Thank You!

Questions?

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