Should forages be priced like a sack of nutrients ?

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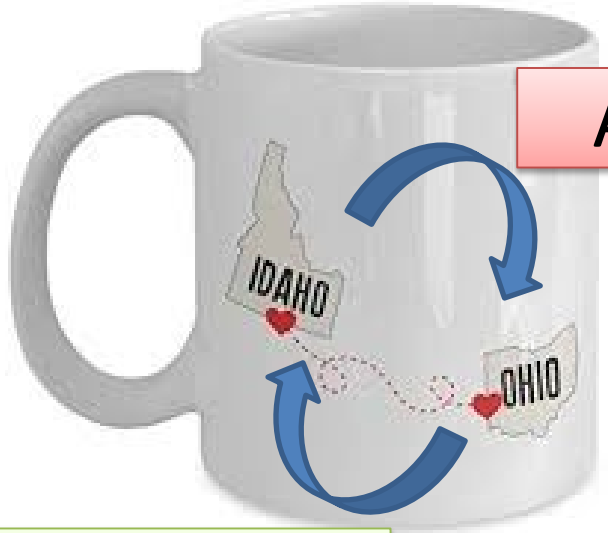
CFAES

Economic value (price) of feeds

1. Local and broad markets ultimately determine price
2. Ingredient prices are correlated but not perfectly
3. Value to livestock producer depends on:
    a. Ability to support milk/meat production
    b. Price relative to other feeds
    c. Ability to incorporate into cost-effective diet

Valuing Feeds Based on Nutrients

1. Must be based on appropriate market
   - Geography and time
   - Transportation costs
   - Appropriate ingredients must be used



Alfalfa hay

Soyhulls

Corn silage
Alfalfa hay
Corn
Organic spelts

Valuing Feeds Based on Nutrients

2. Must pick the right nutrients

   - Must account for most of economic value
     - Energy (NEL)
     - Protein (MP)
     - Effective fiber (forage NDF)
   - Labs must be able to measure or estimate accurately
   - **Assumed to describe milk potential perfectly**

Nutrient Composition

Energy

- Dairy is NEL but other terms can be used
- All calculated, use same equations for everything (check with lab)

Alfalfa hay sample

NRC NEL: 0.59 Mcal/lb

ADF NEL: 0.65 Mcal/lb

102 Mcal/ton of hay ~$8/ton

Nutrient Composition

Protein

- Crude protein is measured but not adequate
- Across feeds MP better describes milk potential but not measurable

RDP/RUP

Digestibility of RUP

Metabolizable Protein in Feeds

Feed	CP	MP	MP/CP
Good alf hay	23.0	13.1	0.57
Avg alf hay	18.0	10.1	0.56
Avg alf silage	23.0	12.9	0.56
Soybean meal	54.0	37.7	0.70
Distillers	30.0	20.0	0.67

For hay crop forage: MP = CP x 0.57

Nutrient Composition

Fiber (NDF)

- Digestible fiber provides energy (in energy equation)
- Dairy cows require forage NDF (value independent of energy)
- Whole cottonseed NDF is ~forage NDF

<u>For pricing</u>

Forage NDF = eNDF

Cottonseed NDF =eNDF

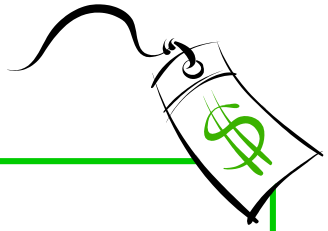
All other feeds eNDF = 0

Economic Value of Feeds

The value of a feed should approximate the sum of the value of its nutrients

$/ton = Mcal NEL x $/Mcal + lbs MP x $/lb MP + lbs eNDF x $/lb eNDF + . . .

Economic Evaluation of Feeds



Cost of a feed = Σ value of its nutrients

Nutrient	Central OH October, 2019
NEL, $/Mcal	0.09
MP, $/lb	0.30
eNDF, $/lb	0.13
neNDF, $/lb	-0.05

Valuing Feeds Based on Nutrients

3. Value has uncertainty (value ± something)

Soybean meal

Value is
$280 - 310

Economic Values are estimated with statistical technique (probabilities)

Nutrient	Central OH October, 2019
NEL, $/Mcal	0.09 **± 0.017**
MP, $/lb	0.30 **± 0.053**
eNDF, $/lb	0.13 **± 0.039**
neNDF, $/lb	-0.05 **± 0.033**

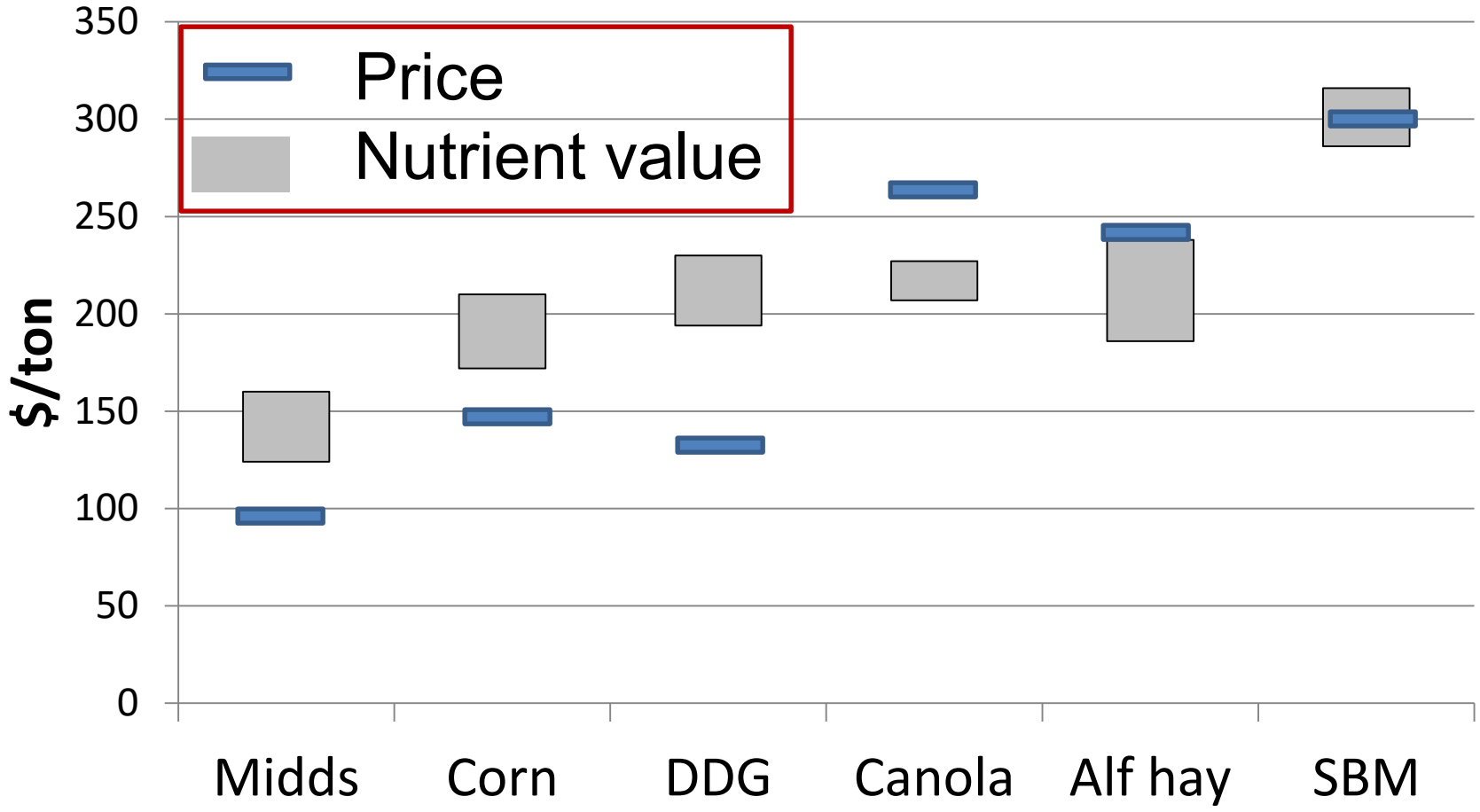
Dairy.osu.edu

Example: Alfalfa hay (Central OH, Oct 2019)

Nutrient	Conc	/ton	$/unit	$/ton
DM	85%	1700	- - -	- - -
NEL	0.62 Mcal/lb	1050	0.09	94.50
MP (CP)	13 (23)%	221	0.30	66.3
fNDF	40%	680	0.13	88.4
nf-NDF	0%	0	-0.05	0
				$249
				± $31

Reasonable estimate of price variance ± 12%

Range in nutrient values and actual prices (Central OH Oct, 2019)



Tebbe, Buckeye Dairy News

Forage isn't so simple

Corn grain vs. Barley

- **Corn = $44/ton underpriced**
- Barley = $18/ton underpriced

Soybean meal vs Canola meal

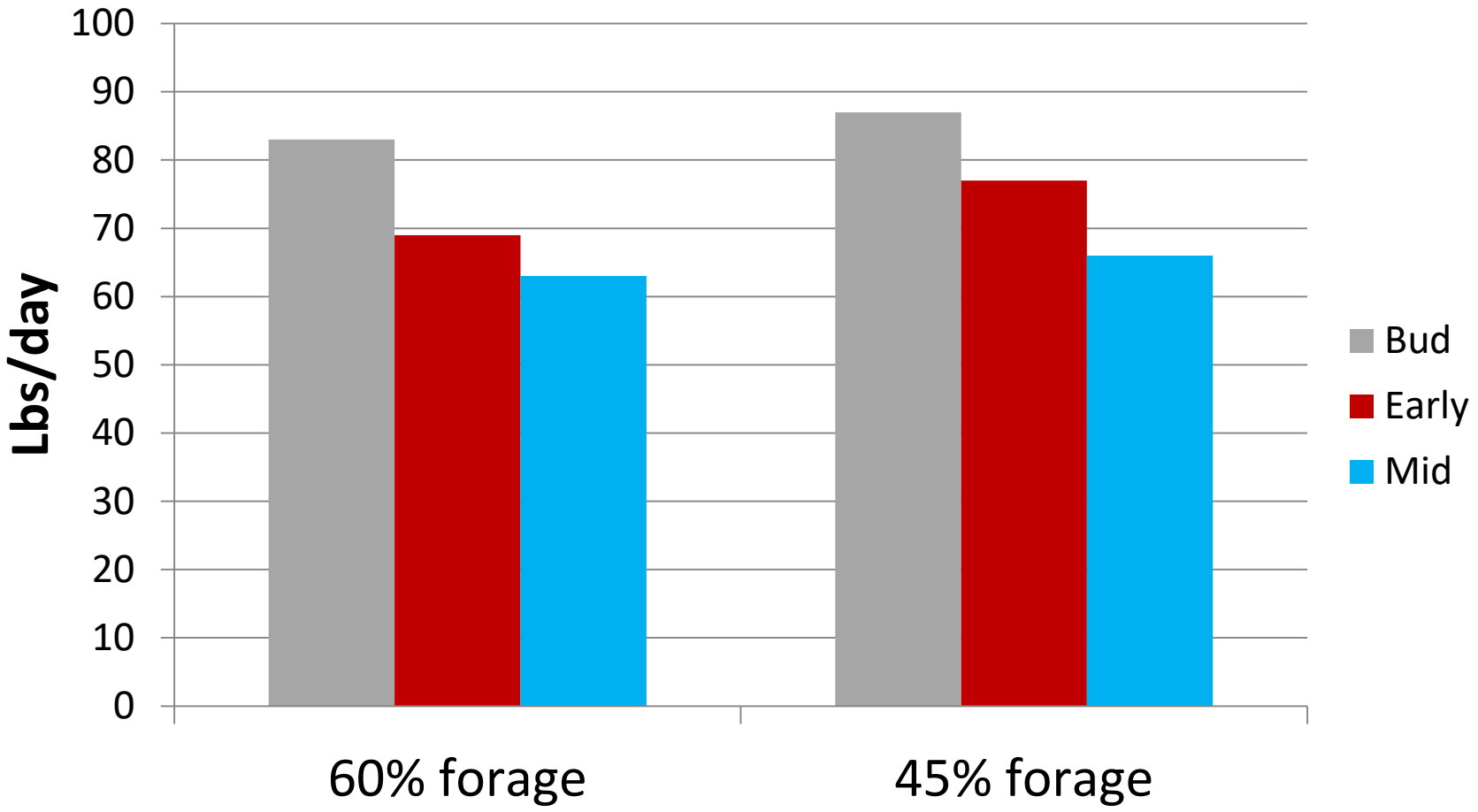
- **SBM = $6/ton overpriced**
- Canola = $53/ton overpriced

Bud vs midbloom alfalfa hay

$249 vs. 236/ton

Is bud worth only $13/ton more?

Alfalfa quality affects milk yield



Kawas et al., 1990

Adjusting for Forage Quality

NDF

- Correlated to intake and milk

- Doesn't work well with mixtures
- Doesn't account for substantial variation

RFV

- Just another name for NDF

RFQ

- Accounts for additional variation

- Very limited data relating to milk yield
- Analytical ?

Adjusting for Forage Quality

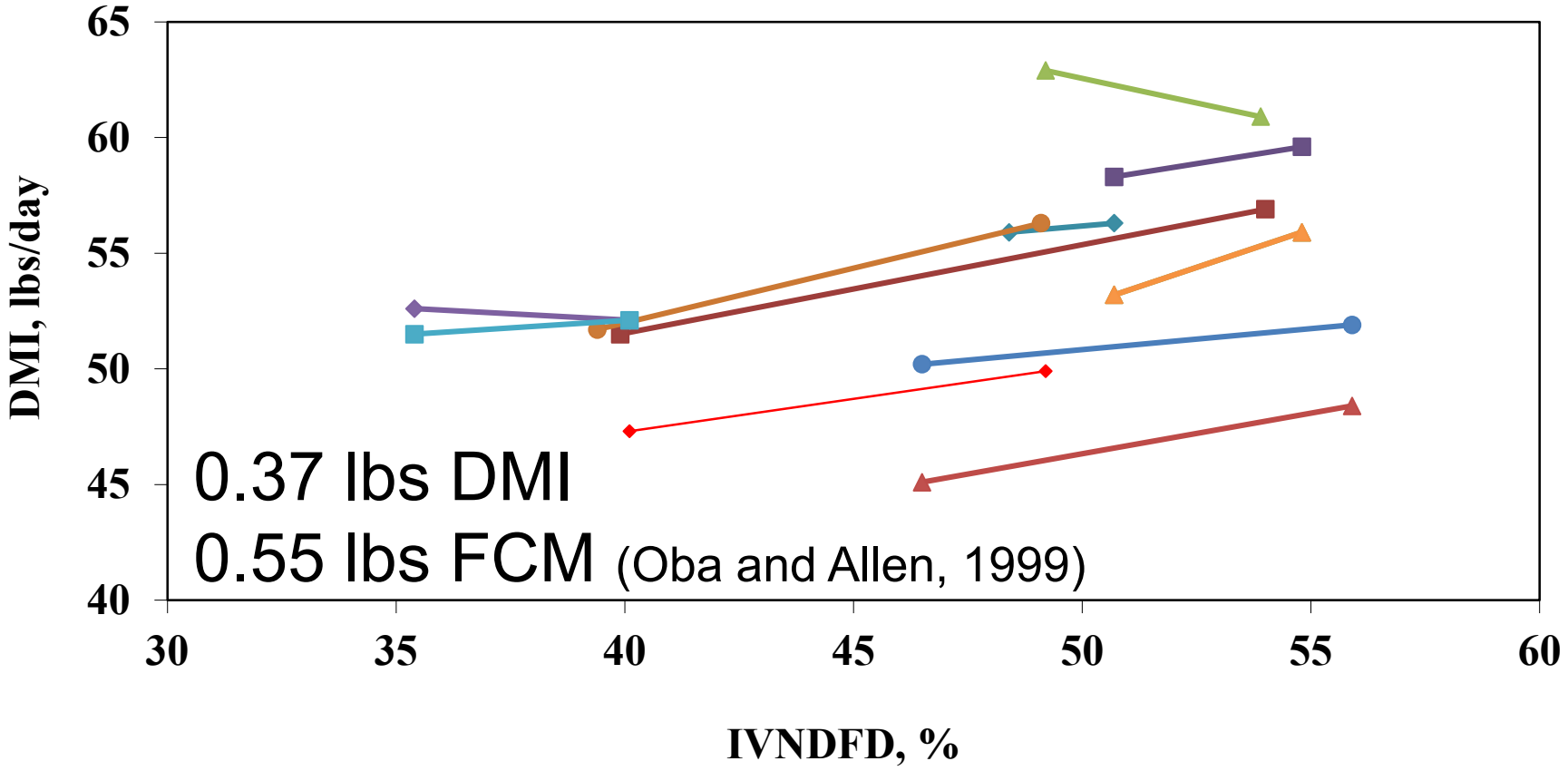
In vitro NDF digest (30 to 48 hr)

- Correlated to intake and milk
- Works ok with mixtures

- Best for change or comparison (not actual)
- Analytical ?

Effect of **Change** in IVNDFD on DMI

12 new comparisons (Oba and Allen, 2005)
Avg: **0.26 lbs**/IVNDFD unit = **0.5 lbs FCM**



Adjusting Nutrient Value for Quality

1. Measure 30 or 48 h IVNDFD
2. Compare to standard (Sample – Std)

3a. Multiple difference by 0.5 lbs of milk
3b. Multiple difference by 0.26 lbs of intake

4. Convert to income over feed costs
5. Convert to ton basis

Must use change; need a standard

Forage	NDF	30 h IVNDFD	48 h IVNDFD
Alfalfa	39	41	47
Corn silage	43	53	62
Grass	57	61	65

Data is from Dairy One (dairyone.com)

Ideally the standard is from same lab that did sample analysis

Example: Quality Adjustment

Alfalfa hay: 0.62 NEL, 13% MP, 40% NDF, 48 h IVNDFD = 55%; Nutrient $ = $248/t

1. Difference in IVNDFD: 55 – 47 = +7 units
2. Expected increase in milk: 7 x 0.5 = 3.5 lbs
3. Expected increase in DMI: 7 x 0.26 = 1.8
4. Increase IOFC: $0.52/day (Milk = $19/cwt, feed = $8/cwt)
5. At 22 lb fed rate: $40/ton + 248 = **$288/ton**

Value of quality depends on milk and feed prices

Quality adjustment/ton of DM

	$16/cwt	$20/cwt	$24/cwt
$0.06/lb DM	5.4	7.1	8.6
$0.08/lb	5.0	6.7	8.4
$0.10/lb	4.5	6.2	7.9
$0.12/lb	4.0	5.7	7.4

Add or subtract value/% unit change in IVNDFD

Quality adjustment/ton of DM

	$16/cwt	$20/cwt	$24/cwt
$0.06/lb DM	5.4	7.1	8.6
$0.08/lb	5.0	6.7	8.4
$0.10/lb	4.5	6.2	7.9
$0.12/lb	4.0	5.7	7.4

Example:

Test forage is 5% units lower in IVNDFD than standard: -5 x 6.2 = -$31/ton DM

Add (subtract) that to nutrient value

Limitations

1. Assumed diet inclusion of 22lbs (40% of diet); effect of quality should be related to inclusion rate

2. We assume effect is same for all herds but high producing herds probably more sensitive

3. Based heavily on corn silage and alfalfa

Conclusions

1. Nutrient composition and nutrient prices is base for determining $ value

2. Quality must be considered when pricing forage (IVNDFD)

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