Optimizing Income over Feed Supplement Costs

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OUTLINE

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INTRODUCTION

- Large fluctuations in milk and supplemental feed prices create anxiety and uncertainties.
- Usually, more than 90% of dairy farm revenue comes from the milk check and more than 40% of the expenses are used on purchased feeds
- It is important that correct decisions are made to maximize return on supplemental feed expenses.

JUSTIFICATION

- Analyses from surface responses to income over feed cost for different crude protein (CP) levels have been studied in the past (Roffler et al., 1986)
- the distinction between rumen undegradable protein (RUP) protein and rumen degradable protein (RDP) creates a need to further fine-tune the formulation of supplements for maximum income over feed cost.

JUSTIFICATION

- Traditional diet formulation is based on finding the least cost ration that provides the minimum level of required nutrients for a desired level of milk production (Tozer, 2000; Howard et al., 1968)
- Typically, diet formulation does not consider changes in milk production due to changes in CP, RUP and RDP that could be fine-tuned to maximize income over feed supplement costs

JUSTIFICATION

- Rotz et al. (1999) found that profitability of dairy farms could be improved by decreasing CP intake and adjusting RUP and RDP through a better selection of fed ingredients, which vary according to market prices of feed stuffs
- Lower CP diets decrease N excretion and consequently environmental impacts (Rotz et al., 1999; Broderick, 2003; Wattiaux and Karg, 2004)

JUSTIFICATION

- Rotz et al. (1999) developed the dairy farm model (DAFOSYM) capable to estimate the income over supplement costs, which nowadays has evolved to the integrated farm system model (IFSM) (Rotz et al., 2007)
- Although very complete, IFSM is i) complex and serves the scientific community more than field-based end-users and ii) it does not perform optimization analyses.

OBJECTIVE

- Present a simple formulation to optimize income over feed supplement costs (IOFSC), implement the formulation into a user-friendly spreadsheet, and perform some case studies.

MATERIALS AND METHODS

$$\max(MV - \sum_{i=1}^{N} SV_i)$$

MV = milk value = Mp x MPx

SV_i = value of the *i* supplement = Sp_i x SQ_i

$$DMI = (0.372 * FCM + 0.0968 * BW^{0.75}) * (1 - e^{(-0.192*(WOL+3.67))})$$

$$MPx = -55.61 + 1.15 * DMI + 8.79 * RDP - 0.36 * RDP^2 + 1.85 * RUP$$

NRC (2001)

MATERIALS AND METHODS

$$\sum_{i=1}^{N} SQ_i = DMI$$

$$SQ_i \leq \max SQ_i \ldots for \ldots i = 1 to N$$

$$RUP \leq \max RUP$$

$$RDP \leq \max RDP$$

$$CP \leq \max CP$$

MATERIALS AND METHODS

Feed Stuff	A (%)	B (%)	C (%)	Kd	Calculated Kp	RUP (%)	RDP (%)	CP (%)
Forages								
35-Corn silage	51.00	30.20	18.80	4.40	5.93	3.15	5.62	8.80
74-Mixed silage	58.10	34.20	7.70	10.40	5.93	3.82	15.18	19.00
83-Alfalfa silage	57.30	35.30	7.40	12.20	5.93	4.15	17.75	21.90
Energy Supplements								
27-Corn grain	23.90	72.5	3.60	4.90	8.34	4.63	4.77	9.40
8-Barley grain	30.20	61.20	8.60	22.70	8.34	3.11	9.29	12.40
Protein Supplements								
106-Soybean meal	22.50	76.80	0.70	9.40	8.34	18.37	31.53	49.90
25-Corn gluten meal	3.90	90.90	5.20	2.30	8.34	49.69	15.31	65.00
23-Corn distiller grains	28.50	63.30	8.20	3.60	8.34	15.57	14.13	29.70
104-Soybean meal expellers	8.70	91.30	0.00	2.40	8.34	32.83	13.47	46.30

MATERIALS AND METHODS

INPUT		OUTPUT				
ENERGY	PROTEIN	RUP	RDP	CP	MILK	IOFSC
20.42	7.656	5.5%	9.7%	15.1%	77.43	4.75
….						
18.29	9.783	5.9%	10.0%	15.9%	80.43	4.78
….						
16.16	11.91	6.3%	10.4%	16.7%	83.22	4.79
….						
14.46	13.61	6.6%	10.7%	17.3%	85.3	4.78
….						
13.61	14.46	6.7%	10.8%	17.6%	86.29	4.76
….						
12.76	15.31	6.9%	11.0%	17.9%	87.25	4.75

PRACTICAL APPLICATION

Income Over Feed Supplement Cost (IOFSC)*

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Overwrite **yellow** cells and make appropriate selections. Click on **blue button** to optimize IOFSC: results appear in **blue** cells. Click on **red button** to substitute between feed ingredients: results appear in **figures** and **table.**

Units: ○ Metric ◉ English

1	Calculate Dry Matter Intake (DMI)		
1.1	Milk Production (MP)	lb/cow/day	110
1.2	Body Weight (BW)	lb/cow	1377
1.3	Days in Milk (DIM)	day	180
1.4	Dry Matter Intake (DMI)	lb/cow/day	67.53

2	Fix the Amount of Forage Used in Diet		
2.1	Proportion of Forage in Diet	% of Diet	50%
2.2	35-Corn Silage-CoSi	% of Forage	50%
2.3	83-Alf. Silage-AlSi	% of Forage	50%
2.4	74-Mx. Silage-MxSi	% of Forage	0%
2.4	Crude Protein in Diet Provided by Forage	lb/cow/day	5.38