Spartan Dairy 3

 If you find a bug, please report it to us. You can either send to mikevh@msu.edu with Spartan Dairy bug in the subject line or make a comment in the discussion forum on the ANGEL site.

Tips for using Spartan 3

- If something quits working while using the program, save the file as a new name. Then exit the file and try opening it again. If that does not work, exit the program, and then get back into it and open the file.
- **Evaluating nutritional adequacy.** Whether a diet already being fed or starting from scratch, the nutrient balance graph can help. Turn it on or customize it with Settings in the menu. When formulating a new diet, it is especially helpful to change settings so you can see ForNDF (forage NDF). The graph should have DMI, NDF, EfNDF, ForNDF, NEL, CP, RDP, MP, Ca, P, Na, Se, and Vit A. To formulate the diet, work your way down the graph.
- Editing Feed Characteristics. If you have a new feed to put in the Spartan 3 library or a ration, first find a feed that is similar. Then select the feed and use Feeds > Nutrient Composition and, at the minimum, edit %DM, %NDF, and %CP.
 - If you have information, edit %ash, %EE, %Ca, and %P.
 - If you have information on lignin you can enter it. If lignin is much different than the original value, you should edit NDF digestibility. See help on this. Higher lignin means lower digestibility, which will decrease energy value.
 - Energy values are calculated in Spartan 3, so they will change as you alter other nutrients.
 - If this was a new feed test, change the TestDate.
 - If you know more mineral information, change that too.
 - RUP and RDP are calculated fields in Spartan 3. To adjust them, you must change the B and C protein fractions. It is best to do this in the protein tab, so you can see the resulting values for RUP and RDP as you change them.
 - NFC is a calculated field in Spartan 3. If you have NFC or NSC , and the value in Spartan is not close, you can adjust it by editing either ash or EE.
 - For commercial feeds, you might want to make an equal mix of the first 3 ingredients, copy it to be a real feed, and then edit as needed. Remember that nutrient content on a feed tag is on an amount AsFed basis, but Spartan has nutrients on a DM basis (except Cost AsSold).
 - Alfalfa haylage is the same as legume silage.
- **Target animal.** For most early lactating cows, set TARGET MILK to match the average milk actuall produced. ACTUAL MILK does not impact requirements but is used as a monitor, and is especially useful if you lead feed a group—feed for more milk than the average.
- Working in the worksheet. When you balance a diet, work mostly in the Home tab. The order of columns within the home tab can be rearranged. Just click on a heading and drag it. Unfortunately, sometime when you do this, the columns order in the feeds sections can become out of sync with the columns of the ration summary. If his happens, either save the file and reopen or use the Settings > Column Order menu command. To move columns and ensure proper synchronization, move to either about the 12th or later place or to the first place (right after Amount DM). A good order is: %diet, NDF, EfNDF, NEL, CP, RUP dig, FA, Ca, P, Se, CostDM, AsFed, and DM%. If you move these to the first column using the reverse order, it will work perfectly. You also should consider sorting feeds according to feed type. Either

click the Feed Type heading once in the Misc tab or use the **Feeds > Sort Feeds By** command.

- **Formulating a diet.** When you balance a diet, adjust feeds on a DM basis or percent of diet basis. Work your way down the nutrient balance graph.
 - a. add forages to meet the ForNDF requirement on fiber tab,
 - b. adjust concentrates until 98% of the predicted DMI is met. Adjust forages and concentrates to meet energy and fiber requirements.
 - c. replace some of the concentrates with protein supplements to meet CP reqt.
 - d. replace some of the CP supplementw with MP supplements if necessary
 - e. recheck to make sure NDF, EfNDF, ForNDF, NEL, CP, and MP are reasonable
 - f. add salt at ~.25-0.5% of DMI and limestone and/or dical to meet Ca and P
 - g. add a trace mineral and vitamin supplement .
- **Printing.** When you Print, only one file can be open. If more than one file is open, the program always prints the first one that was opened. To PRINT, go the Reports Summary Report and input your name in the prepared by spot. Then hit the print button on right side. Then choose preview. If everything looks okay, press Print.
- **Computer vs cow.** As with any computer program, the cow should be the judge of nutritional adequacy. Evaluate the actual response to a diet change by monitoring DMI, estimate energy intake, and milk production and then fine tune the diet accordingly. Body condition is helpful too but takes longer to evaluate. The DM content of wet feeds should be checked regularly.

Tutorial Creating a Ration for Scratch

In this exercise, we will formulate a diet using defined feeds and determine if it would be costeffective to use cottonseed in the diet.

The **target animal** will be a Holstein cow in early lactation. She is 2^{nd} lactation, has a mature BW of 700 kg and a current total BW of 600 kg with a body condition of 2.5. She is at 60 days after calving and is producing 110 lb of milk at 3.5% fat and 3.2% protein.

The **feeds** to use in this example are in the following table. We will use library values for any feed characteristics that are not known. We will use feed test results for the mixed alfalfa/grass silage.

Corn silage	\$41		SAMPLE DESCRIPTION MIX	ked Silage I	D #331585
34% DM, 41% NDF, 7.0% CP	/ton				
Alfalfa grass mixed silage	\$46		WET CHEMISTRY A	ANALYSIS RE	SULIS
Specs are in lab report	/ton		COMPONENTS	AS SAMPLE	D DM
Cottonseed	\$225			BASIS	BASIS
	/ton		% MOISTURE	67	*****
Corn grain, ground	\$4.10		% DRY MATTER	33	*******
9.5%CP	/bushel		% CRUDE PRUTEIN % AVAILADEE DOOTEIN	6.5 6.0	19.6 10.1
Canola meal	\$280		% AVAILADLE PROTEIN % ΠΝΔΥΔΙΙ ΔΒΙ Ε ΡΡΩΤΕΙΝ	0.0	10.1
	¢200		% ACID DETERGENT FIBER	10.8	32.4
Understand tallow fatty aside	¢ 15	-	% NEUTRAL DETERGENT FI	BER 15.0	45.1
Hydrofyzed tallow fatty acids	\$45		% NSC	7.6	22.7
	/100 lb	_	% TDN	16	58
Soybean meal-48	\$340		NEL, (MCAL/LB)	0.17	0.60
	/ton		NEM, (MCAL/LB)	0.16	0.58
Expeller soybean meal	\$388		NEG, (MCAL/LB)	0.09	0.32
	/ton		% CALCIUM	0.33	1.01
Limestone	\$7.50		% PHOSPHORUS	0.10	0.30
	/100 lb		% MAGNESIUM	0.07	0.24
MSU MinVit premiy	\$31		%POTASSIUM	0.95	2.85
08% DM 8 6% C ₂ 8 2% P	φ31 /100 lb			0.008	0.024
75% Mg 0.6% K 13% Na	/10010		PPM 7INC	10	30
20% Cl $2.8%$ S 600 ppm Cu			PPM COPPER	4	11
4000 ppm Fe - 2500 ppm Mn			PPM MANGANESE	12	37
2500 ppm Te, 2300 ppm Mil,			PPM MOLYBDENUM	0.8	2.3
20 npm Se = 120 kIU vit A/lb					
30 kIU vit D/lb 1200 IU vit F/lb					

Whenever you make a new feed in Spartan 3, always use an existing similar feed as the template. Although Spartan 3 has about 120 feed characteristics, only about 10 need editing from a feed test report. The easiest way to do this is with Edit Nutrient Composition dialog under Feeds in the worksheet menu.

1. Setting up the ration.

Choose new ration and select Holstein lactating cow.





The last step in describing the cow is the **Set Daily Body Weight Gain Parameters** dialog. Note that when you change the current body condition score to 2.5, the current nonpregnant body condition 3 (BC3)adjusted BW stays the same and the total BW is altered. Go ahead and change it back to 600 kg (1320 lb). The target BC3 BW is the mature wt—just leave it there. Put the target BCS at 3.5 in 240 days. This will result in a target frame gain of 0.20 kg/d and a BC gain of 0.19 kg/d for a total gain of 0.39 kg/day or 0.86 lb/day.

Select	Animal Breed and Type		
Breed:	Holstein	•	🗸 ок
Туре:	Lactating cow	-	🗙 Cancel
	Heifer		
	Lactating cow Dry cow/Late pregnant heifer		

Describe the target cow. Enter information given on the previous page for this cow. In the **Describe the Target Cow** dialog, choose early lactation and lactation number 2. The program should automatically list 60 days in milk. Then enter a mature BW of 700 kg and a current total BW of 600 kg. If the information is listed in pounds instead of kg, you can enter 1540 lb for mature weight and 1320 lb for current weight. Currently if you change mature BW, current total BW may be altered. If it is wrong, just edit it again.

Next enter 50 kg (or 110 lb) of milk at 3.5% fat and 3.2% protein. The dialog should look like this if you are in metric basis.

Set Daily Body Weight Gain P	arameter	S	
Current Information			
Total body weight:	600.0	kg	🗸 ок
Body condition score:	2.50 🌲		Canad
Days pregnant:	0		
Body weight without fetus:	600.0	kg	
Non-pregnant BC3 body wt:	644.1	kg	
Mature body weight:	70 0 .0	kg	
Daily Pregnancy Gain	0.00	kg/day	
Target Frame Growth			
Non-pregnant BC3 body wt:	700.0	kg	
Days to achieve frame growth:	280	days	
Target frame growth:	55.88	kg	
Target Daily Frame Growth:	0.20	kg/day	
Target Rody Condition Gain			
Target body condition score:	3.00 🚖		
Days to achieve body condition:	240	davs	
Target body condition gain:	45.76	kg	
Target Daily BC Gain:	0.19	kg/day	
Target Daily Body Wt. Gain:	0.39	kg/day	

Choose feeds. Next the program opens the dialog in which you choose a library for selecting feeds.

You can choose any library or ration file for this, but we will choose the Master feed library.

The Add Feeds dialog opens and you can select the feeds that were mentioned at the beginning of this exercise. The left bottom panel of this dialog shows the feeds in the source file (Master Feed Library in this case) that match the criteria in the top panel of the dialog. In this example, the only feeds shown are those that have the word "soy" in the feed name field. Note that as you try to find feeds that match your descriptions, you can expand the left side of the dialog so that you can see the test date, %DM, %CP, and %NDF of the library feeds. When you find a feed you want, simply double click it or

Add Feeds

Feed type:

Soybean hulls



click it once and press Add Selected.

For our exercise, the "legume silage w grass, mid mature" seemed closest to our tested mixed silage and the 1.5% MinVit mix seemed a reasonable template for our minvit premix. After the feeds have all been selected, press

Sort feeds. Choose **Feeds>Sort Feeds**

By>Feed type and name to arrange the feeds in an organized fashion. This will make balancing the diet more methodical and easier.



Adjust feed characteristics to match actual feeds on farm

First we will edit feed names, % DM, and costs for our feeds. Just type over existing fields to edit them.

Then highlight MSU MinVit mix row and select **Feeds>Nutrient Composition** or press **Ctrl+P** to pull

Feed name	Amount DM Ib	DM %	Cost AsSold \$	Wt AsSold Ib	Cost DM \$/Ib	Pur- chased?
Corn silage	0.00	34.0	41.00	2000	0.060	
Mixed alfalfa grass silage	0.00	33.0	46.00	2000	0.070	
Cotton seed, whole with lint	0.00	90.1	225.00	2000	0.125	~
Corn grain, ground, dry	0.00	88.1	4.10	56	0.083	
Hydrolyzed tallow fatty acids	0.00	99.8	45.00	100	0.451	•
Soybean meal, solvent, 48	0.00	89.5	340.00	2000	0.190	
Soybean meal, expellers, 4	0.00	89.6	388.00	2000	0.217	•
Limestone	0.00	99.0	7.50	100	0.076	
MSU MinVit mix	0.00	98.0	31.00	100	0.316	

up the **Edit Nutrient Composition** dialog. Edit the values for minerals and vitamins according the specifications given at the beginning of this exercise.

Edit Nutrient Composition								
General	Lipid					Vitamin		
Feedname: MSU MinVit mix	EE:	0.0 🤤	%DM	BHFA:	0 🚔 %FA	Vit A:	120 🌲 kiU/ib	
Test Date: 2/25/10 💌 DM: 98.0 🜩 %DM	SFA:	0 🌲	%FA	FA dig:	0 🔶 %FA	Vit D:	30 🜩 kIU/lb	
Common Feed: Feed Type: Mineral	PUFA:	0 🜲	%FA			Vit E:	1200 🜩 IU/Ib	X Cancel
Fiber	- Minera	al				Amino Acid		07
NDF: 3.0 🜩 %DM NDF dig: 40.0 🌩 %NDFn	Ca:	8.60 🌲	%DM	K:	0.60 🚖 %DM	Lys:	0.00 🔷 %dRUP	
efNDF: 0.0 🜩 %NDF ADF: 0.0 🜩 %DM	abs Ca:	75 韋	%Ca	Na:	13.00 🚖 %DM	Met	0.00 🜲 %dRUP	
Lignin: 0.0 🜩 %DM RDNDF: 30.0 🌩 %NDF	P:	8.20 🌲	%DM	Cl:	20.00 🜩 %DM	TEAA:	0.0 🗢 %dRUP	
English	abs P:	75 韋	%P	S:	2.80 🚖 %DM			
Disc Fac: 3.0 A % NEL89: 0.00 A Mcal/b	Mg:	7.50 韋	%DM	Ash:	93.0 🔷 %DM	Cost	22.00 🔺 🖡	
ME89: 0.00 A Mcal/b	abs Mg:	70 🌲	%Mg			Lost AsSold:	22.00 😴 💲	
	Trace	Mineral -				Wt AsSold:		
Protein	Carl	7.00	0		0.0 1	Purchased:	·	
CP: 0.0	C0.	7.00	ppm	MO.	0.0 • ppm	Miscellaned	s	
RUP dig: 0 🔹 %RUP RUP89: 0 🜲 %CP	Cur	600.0 🤤	ppm	Mn:	2500.0 ppm	Blank1.	0.00 A 20M	
B prot: 0 🜩 %CP NDICP: 0.0 🜩 %CP	abs Cu:	5 🌲	%Cu	abs Mn:	1.00 🚔 %Mn	Didnici.		
C prot: 0 🚔 %CP ADICP: 0.0 🚔 %CP	Fe:	4000 韋	ppm	Se:	20.00 🌩 ppm	Blank2:	0.00 - %DM	
Kd Bprot 0.0 1 %/br	abs Fe:	40 🌲	%Fe	abs Se:	45 🔷 %Se	Blank3:	0.00 🛫 %DM	
	l:	40.00 🚖	ppm	Zn:	2500 🌲 ppm	Blank4:	0.00 🚖 %DM	
Carbohydrate	abs I:	90 🚖	%	abs Zn:	15 🚔 %Zn	Blank5:	0.00 🜲 %DM	
NFC dig: 0.0 🜩 %NFC Sugar: 0.0 🜩 %DM						Contraction of the		

Now do the same for the mixed alfalfa grass silage. Only adjust values for which new information is known. Calculated fields, such as NEL, are not shown in this dialog.

General	Lipid	Vitamin
Feedname: Mixed alfalfa grass silage	EE: 2.1 🔷 %DM BHFA: 50 🖨 %FA	Vit A: 0 🜩 klU/kg
Test Date: 2/25/10 💌 DM: 33.0 🜩 %DM	SFA: 36 🔷 %FA FA dig: 90 🜩 %FA	Vit D: 0 🜩 klU/kg
Common Feed: Feed Type: Other wet forage	PUFA: 56 🜩 %FA	Vit E: 0 🖨 klU/kg
Fiber	Mineral	Amino Acid
NDF: 45.0 🜩 %DM NDF dig: 43.9 🜩 %NDFn	Ca: 1.01 🔷 %DM K: 2.85 🗬 %DM	Lys: 4.13 🚔 %dRUP
efNDF: 100.0 🔷 %NDF ADF: 32.4 🖨 %DM	abs Ca: 30 🔹 %Ca Na: 0.02 🚔 %DM	Met 1.33 A %dRUP
Lignin: 7.3 🖨 %DM RDNDF: 39.0 🖨 %NDF	P: 0.30 🔷 %DM CI: 0.60 🜩 %DM	TEAA: 34.9 🚔 %dBUP
-	abs P: 70 🔷 %P S: 0.25 🔷 %DM	
Dire Fac 30 4 % NEL 89 135 4 Meal/kg	Mg: 0.24 🔷 %DM Ash: 10.8 🜩 %DM	Cost
	abs Mg: 8 🔷 %Mg	Cost AsSold: 46.00 😴 \$
ME03. Z.20 TIMCA/Kg		Wt AsSold: 907 🚔 kg
Protein		Purchased:
CP: 19.6 🜩 %DM NPNCPE: 5 🜩 %CP	Co: U.UU	Miscellaneous
RUP dig: 65 🔹 %RUP RUP89: 24 🚔 %CP	Cu: 11.0 🗣 ppm Mn: 37.0 🗣 ppm	Blank1: 0.00 🚔 %DM
B prot: 34 🔹 %CP NDICP: 2.7 🚔 %CP	abs Cu: 4 € %Cu abs Mn: U.75 € %Mn	Blank2 0.00 Å 2DM
C prot: 8 🔹 %CP ADICP: 1.7 🚔 %CP	Fe: 225 🜩 ppm Se: 0.00 🌩 ppm	Blank2: 0.00 ▲ 2DM
Kd Bprot: 10.4 🚔 %/hr	abs Fe: 10 ♣ %Fe abs Se: 40 ♣ %Se	
	I: 0.00 🜩 ppm Zn: 30 🜩 ppm	
	abs I: 85 🜩 %I abs Zn: 15 🌩 %Zn	Blank5: U.UU 🚽 %DM
	Comments	
Starch: 1.0 - 20M INFA: 8.0 - 20M	WF	
RDStarch: 90.0 🔿 %Starch RDSolF: 90.0 🍨 %SolF		

МХ

Check feed characteristics Fiber tab.

We will use the default values for NDF effectiveness and NDF digestibility. NDF digestibility is a major determinant of the energy value of high fiber feeds. If lignin was in the forage test, we could have used help in Feed Characteristics: Fiber to edit NDF digestibility.

Protein tab

This is just a quick check to make sure the RUP and RPD values of our feeds seem reasonable. These are calculated from the A, B, and C fractions and KdB of a feed. See help on Feed Characteristics: Protein.

Carbohydrate tab

This is just quick check to see if NFC seems reasonable. It is a

calculated value and will likely change anytime other nutrients are edited.

Energy tab

Go to the energy tab to see the new calculated values for energy of the silage or other feeds. Switch between "kg" and "lb" basis to get the value you want.

Modify the Nutrient Balance Graph

Choose **Settings>Nutrient Balance Graph** from the menu or right-click on the graph and then edit the selection of nutrients displayed on the graph. In this example, we added Forage NDF, NRC 2001 NEL, and NRC 2001 MP.

				>	Ь	ZDM	%NDF	ZDM	ZDN	1 %N	DFn 7	SDM	%DM
		Corn sila	ge		0.	00 45.0	100.0	1 2.	6 4	5.0	59.8	45.0	28.1
		Mixed alf	alfa grass s	silage	0.	00 45.0	100.0	1 7.	3 4	5.0	43.9	45.0	32.4
		Cotton se	eed, whole	with lint	0.	00 50.3	50.0	12.	9	0.0	32.0	25.2	40.1
3		Corn grai	in, ground,	dry	0.	00 9.5	25.0	0.	9	0.0	52.7	2.4	3.4
, , , , , , , , , , , , , , , , , , , ,		Hydrolyz	ed tallow fa	itty acids	0.	00 0.0	0.0	0.	0	0.0	0.0	0.0	0.0
JF		Soybean	meal, solv	ent, 48	0.	00 9.8	25.0	0.	5	0.0	60.7	2.5	6.2
ts.		Soybean	meal, expe	ellers, 4	0.	00 21.7	25.0	1.	5	0.0	49.4	5.4	10.4
l y		MSU Mir	Wit mix		0.	00 3.0	0.0	0.	0	0.0	40.0	0.0	0.0
		Limeston	e		0.	00 0.0	0.0	0.	0	0.0	0.0	0.0	0.0
da	3												
us.		Concent	ration supr	liad	0	00 00	0.0	0	0	0.0	0.0	0.0	0.0
	Concentration supplied		0.	00 0.0	0.0	0.	•	0.0	0.0	0.0	0.0		
1	<								Law	-			
ea					Amount D	M NDF	EfNDF	Lignin	ForNE	F ND	Folig E	INDF	ADF
				Cumula			io/day			0.0			
			Desiste	Supply		00 0.0	10.0	U.	-	1.0	0.0	12.0	0.0
			Requir	ements		05 15.4	12.3			1.0		12.3	
		1772	niu	erence	-57.	05 -15.4	-12.3	1		1.6		-12.3	
	Home	Fiber	Energy	Protein	Carbohydi	ate Lipid	Minera	al Trace	Min. Vit	amin A	mino Acid	Cost	Misc.
-								-					
F	Feed nan	ne	Amount	DM C	P RU	P RDF	C MP	RUP	lig Ap	rot E	f prot	C prot	Kd Bprot
Constitute				/6L		- <u>%</u> Ur	C4	/ %hUI	70		20 CF	-%LF	/%/ni
Corn silag	le K	1.1		.00	0.0	30	00		70	51	30	19	4.4
Mixed aira	aira grass	sliage	U	.00	22.5	20	80	1	60	58	34	8	10.4
Cotton se	ea, whoi	e with lint	0	.00	23.5	23	(/ E1	10	80	45	47	8	15.7
Lorn grain	n, ground	l, dry	0	.00	9.4	49	51	•	90	23	73	4	4.9
Hydrolyze	d tallow	ratty acids		.00	0.0	0	0		0	100	0	U	0.0
Soybean	meal, sol	vent, 48		.00	53.8	44	56	1	93	15	84	1	7.5
Soybean	meal, ex	pellers, 4		.00	47.0	69	31		93	9	91	U	2.4
MSU Min	Vit mix			.00	0.0	U	U		U	100	U	U	0.0
Limestone	9		U U	.00	0.0	U	U		U	100	U	U	0.0
					1								
X F	eed name		Amount DM	NFC %DM	NFC dig	Starch %DM	RDStarch	Sugar %DM	INFA 20 M	SolFiber	RDSolF %SolF	RDOM	tdNFC %DM
Corn silar	0		0.00	41	3 90.0	32.0	60.0	1.0	80	03	90.0	50.0	37.2
Mixed alfa	alfa grass :	silage	0.00	26	96.0	10	90.0	0.0	8.0	17.8	90.0	49.2	25.8
Cotton se	ed, whole	with lint	0.00	6.1	1 96.0	1.0	50.0	5.0	0.0	0.1	90.0	38.2	5.9
Corn grain	n, ground,	dry	0.00	77.	1 96.0	70.0	70.0	2.0	0.0	5.1	90.0	64.9	74.0
Hydrolyze	d tallow fa	atty acids	0.00	0.	96.0	0.0	0.0	0.0	0.0	0.8	90.0	0.7	0.8
Soybean	meal, solv	ent, 48	0.00	30.	6 96.0	6.0	50.0	0.0	0.0	24.6	90.0	60.9	29.4
Soybean	meal, exp	ellers, 4	0.00	32.	4 96.0	6.0	50.0	10.0	0.0	16.4	90.0	51.7	31.1
MSU Min	√it mix		0.00	4.1	0.0	0.0	0.0	0.0	0.0	4.0	0.0	0.9	0.0
Limestone			0.00	0.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Amount DM NDF EfNDF Lignin ForNDF NDF dig EfNDF ADF

Feed name	Amount DM Ib	NEL Mcal/lb	ME Mcal/lb	Disc. Fac. %	NEL 89 Mcal/lb	ME 89 Mcal/lb	NEL 01 Mcal/lb
Corn silage	0.00	0.64	1.03	3.0	0.73	1.21	0.60
Mixed alfalfa grass silage	0.00	0.52	0.86	3.0	0.61	1.00	0.51
Cotton seed, whole with lint	0.00	0.81	1.23	3.0	1.01	1.74	0.79
Corn grain, ground, dry	0.00	0.88	1.37	3.0	0.89	1.51	0.83
Hydrolyzed tallow fatty acids	0.00	2.46	3.08	3.0	2.65	3.31	2.32
Soybean meal, solvent, 48	0.00	0.91	1.41	3.0	0.91	1.55	0.91
Soybean meal, expellers, 4	0.00	0.90	1.40	3.0	0.89	1.51	0.90
MSU MinVit mix	0.00	0.00	0.00	3.0	0.00	0.00	0.00

Moonly Norrient Balance Grap

Minimum value: -20 🚖	Maximum value: 20 🌩	X C.
Select Nutrients to Graph -		
🔽 Dry mattter intake	Rumen degraded protein	Copper
Neutral detergent fiber (NDF)	☑ Metabolizable protein (MP)	F Iron
Effective NDF	RC 2001 MP	🔲 lodine
Forage NDF	🔽 Calcium	Manganese
Net energy	Phosphorus	🔽 Selenium
Metabolizable energy (ME)	🔲 Magnesium	🕅 Zinc
NRC 1989 NEL	F Potassium	🔽 Vitamin A
T NRC 1989 ME	🔲 Sodium	🔲 Vitamin D
NRC 2001 NEL	T Chlorine	🕅 Vitamin E
T NRC 2001 ME	🖵 Sulfur	🖵 Lysine
Crude protein	Cobalt	E Methionine

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2. Balancing the ration

We will now work our way down the list of feeds and down the nutrient balance graph to systematically balance the diet. Here is what the ation worksheet looks like in pounds to start off.

S e	ile F <u>e</u> eds	Animal Ration	Reports <u>S</u> et	tings Ial	os <u>W</u> in B] [3	dow <u>H</u> elp												_ 8 ×
New	fiet: 1 Hols	tein, Lactating cow, l	.ac:2, Wt132	3 <mark>њ,</mark> DIM:6	0, MPD:	110.2 lb, M	Fat:3.5%, DI	G:0.86 lb/	day, DMI:57	7.0 lb								
м	×	Feed name	Amount DM Ib	%Diet %DMI	NDF %DM	EfNDF %DM	NEL Mcal/lb	CP %DM	RUP dig %RUP	FA %DM	Ca %DM	P %DM	Se ppm	Cost DM \$/lb	As Fed Ib	C ^	Nutrient Ba	ilance
	Corn sila	ige	0.00	0.00	45.0	45.0	0.64	8.8	70	2.2	0.28	0.26	0.00	0.060	0.00			-DMI
	Mixed al	lfalfa grass silage	0.00	0.00	45.0	45.0	0.52	19.6	65	1.1	1.01	0.30	0.00	0.070	0.00			-NDF
	Cotton s	eed, whole with lint	0.00	0.00	50.3	25.2	0.81	23.5	80	18.3	0.17	0.60	0.00	0.125	0.00			-EfNDF
	Corn gra	ain, ground, dry	0.00	0.00	9.5	2.4	0.88	9.4	90	3.2	0.04	0.30	0.00	0.083	0.00			-ForNDF
	Hydrolyz	ed tallow fatty acids	0.00	0.00	0.0	0.0	2.46	0.0	0	99.2	0.00	0.00	0.00	0.451	0.00			-NEL
	Soybear	n meal, solvent, 48	0.00	0.00	9.8	2.5	0.91	53.8	93	0.1	0.35	0.70	0.00	0.190	0.00			-NEL01
	Soybear	n meal, expellers, 4	0.00	0.00	21.7	5.4	0.90	47.0	93	3.0	0.36	0.66	0.00	0.217	0.00	_		CD
	Limesto	ne	0.00	0.00	0.0	0.0	0.00	0.0	0	0.0	36.00	0.02	0.00	0.076	0.00			- UP
	MSU Mi	nVit mix	0.00	0.00	3.0	0.0	0.00	0.0	0	0.0	8.60	8.20	20.00	0.316	0.00	_		-RDP
	Concen	tration supplied	0.00	0.00	0.0	0.0	0.00	0.0	0.0	0.0	0.00	0.00	0.00	0.000	0.00	~		-MP -MP01
<	1)															>		-Ca
			Amount DM Ib/day	%Diet %DMI	NDF lb/day	EfNDF Ib/day	NEL Mcal/day	CP Ib/day	RUP dig Ib/day	FA Ib/day	Ca g/day	P g/day	Se mg/day	Cost DM \$/day	As Fed Ib/day	DM %		-P
		Supply	0.00	0.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0		-Se
		Requirements	57.05		15.4	12.3	47.7	10.62	7.16		231.79	113.54	7.76					-Vit A
		Difference	-57.05		-15.4	-12.3	-47.7	-10.62	-7.16		-231.79	-113.54	-7.76				10 0 10	10
Hom	e Fiber	Energy Protein	Carbohydrate	Lipid	Mineral	Trace Mi	n. Vitamin	Amino A	cid Cost	Misc.							+/- % of reqt	
															a	mount	Mcal Ib	

Balance for fiber and energy.

First add forage to make up about half of the diet until we meet the requirement for Forage NDF. We start with 8 lb alfalfa/grass silage and find it takes 18 lb corn silage to meet ForNDF requirement. We are short on total NDF and EfNDF, but the other feeds we add do have some of these.

	мι×	Feed name	Amount DM Ib	%Diet %DMI	NDF %DM	EfNDF %DM	NEL Mcal/lb		Nutrient Balance
Г		Corn silage	18.00	69.23	45.0	45.0	0.64		-DMI
		Mixed alfalfa grass silage	8.00	30.77	45.0	45.0	0.52		-NDF
		Cotton seed, whole with lint	0.00	0.00	50.3	25.2	0.81		-EfNDE
		Corn grain, ground, dry	0.00	0.00	9.5	2.4	0.88	=	
		Hydrolyzed tallow fatty acids	0.00	0.00	0.0	0.0	2.46		-ForNDF
		Soybean meal, solvent, 48	0.00	0.00	9.8	2.5	0.91		-NEL
		Soybean meal, expellers, 4	0.00	0.00	21.7	5.4	0.90		-NEL01
		Limestone	0.00	0.00	0.0	0.0	0.00		-CP
		MSU MinVit mix	0.00	0.00	3.0	0.0	0.00		-RDP
		Concentration supplied	26.00	100.00	45.0	45.0	0.60	~	-MP
<		6					>		-MP01

Add the MSU MinVit mix at 1.5% using the %Diet column (it was designed to be fed at this rate).

Add corn grain to get close to the predicted DM intake of 57 lb. In the end, we will not be feeding this much corn because we will need some protein supplement, but this gives us an idea of how the

balance of	20	-	Fredmann	Amount DM	Diet	NDF	EfNDF	NEL	CP	RUP dig	FA	Nutri	ent Ba	alance
fiber and		MIX	reed name	lb	%DMI	%DM	%DM	Mcal/lb	%DM	%RUP	%			1
		-	Corn silage	18.00	31.66	45.0	45.0	0.64	8.8	70			1	-DMI
energy will			Mixed alfalfa grass silage	8.00	14.07	45.0	45.0	0.52	19.6	65			18	-NDF
look. We are	_	_	Cotton seed, whole with lint	0.00	0.00	50.3	25.2	0.81	23.5	80				-EfNDF
aleantan	_		Corn grain, ground, dry	30.00	52.77	9.5	2.4	0.88	9.4	90			8 B -	ForNDE
snort on			Hydrolyzed tallow fatty acid:	0.00	0.00	0.0	0.0	2.46	0.0	0				TOTAD
energy but			Soybean meal, solvent, 48.	. 0.00	0.00	9.8	2.5	0.91	53.8	93				-NEL
energy sur			Soybean meal, expellers, 4.	. 0.00	0.00	21.7	5.4	0.90	47.0	93			1	-NEL01
that may			Limestone	0.00	0.00	0.0	0.0	0.00	0.0	0			1	- CP
happen with a			MSU MinVit mix	0.86	5 1.51	3.0	0.0	0.00	0.0	0			ł.	RDP
very high			Concentration supplied	56.86	100.00	25.6	21.8	0.74	10.5	81.5	~			-MP
producing	<										>			-MP01
cow at 60				Amount DM Ib/day	%Diet %DMI	NDF Ib/day	EfNDF Ib/day	NEL Mcal/day	CP Ib/day	RUP dig Ib/day	FA Ib/day			-Ca
DIM We can			Supply	56.86	100.0	14.6	12.4	41.9	5.97	1.84	1.4		l l	гΡ
			Requirements	57.05		15.4	12.3	47.7	10.60	4.94				-Se
move on.			Difference	-0.19		-0.8	0.1	-5.8	-4.63	-3.10				-Vit A
	Н	ome	Fiber Energy	Protein	Carbohydr	ate	Lipid	Mineral	Trace M	fin. Vita	amin	10.0	10	d 🔰

Balance for protein by altering the concentrate portion of the ration.

First add the regular SBM until the CP and MP supplies are close to meeting requirements.

Note that after adding the soy, the fiber supply looks good.

The diet is a little short on MP, so we will try some expeller SBM (high in RUP). We take

	міх	Feed	d name	Amount DM Ib	%Diet %DMI	NDF %DM	EfNDF %DM	NEL Mcal/lb	CP %DM	RUP dig %RUP	* ^	Nutrient Ba	lance 1
		Corn silage		18.00	31.66	45.0	45.0	0.64	8.8	70		(I)	-DMI
		Mixed alfalfa	grass silage	8.00	14.07	45.0	45.0	0.52	19.6	65		1 🖬 🕴	-NDF
		Cotton seed,	whole with lint	0.00	0.00	50.3	25.2	0.81	23.5	80			-EfND
		Corn grain, gr	ound, dry	20.00	35.18	9.5	2.4	0.88	9.4	90			Forb
		Hydrolyzed ta	llow fatty acids	0.00	0.00	0.0	0.0	2.46	0.0	0		1 1 1	1 On A
		Soybean mea	al, solvent, 48	10.00	17.59	9.8	2.5	0.91	53.8	93			-NEL
		Soybean mea	al, expellers, 4	0.00	0.00	21.7	5.4	0.90	47.0	93			-NELC
		Limestone		0.00	0.00	0.0	0.0	0.00	0.0	0		111	- CP
		MSU MinVit r	nix	0.86	1.51	3.0	0.0	0.00	0.0	0			-RDP
		Concentratio	n supplied	56.86	100.00	25.7	21.8	0.74	18.3	87.1	-		-MP
<	1111										>		-MP01
				Amount DM Ib/day	%Diet %DMI	NDF Ib/day	EfNDF Ib/day	NEL Mcal/day	CP Ib/day	RUP dig Ib/day	FA Ib/day		-Ca
			Supply	56.86	100.0	14.6	12.4	42.2	10.41	3.61	1.1		PΡ
		H	equirements	57.05		15.4	12.3	47.7	10.61	3.91			-Se
			Difference	-0.19		-0.8	0.1	-5.5	-0.19	-0.30			-Vit A
Ho	ome	Fiber	Energy	Protein	Carbohydr	ate	Lipid	Mineral	Trace M	lin. Vita	amin	10 0 10	8
An	nino.	Acid		Cost				Misc				-10 0 10	

out 5 lb of Soy-48 and add in 5 lb expeller SBM. The protein now looks pretty good. The CP is a little short, but that is fine because MP is more important. The MP system depends on more calculations, however, so we would want the CP to be somewhat close to requirements. In this case, we are only 5-6% short on CP, so it's okay. RDP supply is good.

MI>	K Feed name	Amount DM Ib	%Diet %DMI	NDF %DM	EfNDF %DM	NEL Mcal/lb	CP %DM	RUP dig %RUP	FA %DM	Ca %DM	P %DM	Se ppm	Cost DM \$/lb	As 🔨	Nutrie	nt Balance
-i-	Corn silage	18.00	31.66	45.0	45.0	0.64	8.8	70	2.2	0.28	0.26	0.00	0.060	_		-DMI
	Mixed alfalfa grass silage	8.00	14.07	45.0	45.0	0.52	19.6	65	1.1	1.01	0.30	0.00	0.070		1 I E	-NDF
	Cotton seed, whole with lint	0.00	0.00	50.3	25.2	0.81	23.5	80	18.3	0.17	0.60	0.00	0.125	11		-EfNDF
	Corn grain, ground, dry	20.00	35.18	9.5	2.4	0.88	9.4	90	3.2	0.04	0.30	0.00	0.083			-ForNDF
	Hydrolyzed tallow fatty acids	0.00	0.00	0.0	0.0	2.46	0.0	0	99.2	0.00	0.00	0.00	0.451			-NEI
	Soybean meal, solvent, 48	5.00	8.79	9.8	2.5	0.91	53.8	93	0.1	0.35	0.70	0.00	0.190			LNEL 01
	Soybean meal, expellers, 4	5.00	8.79	21.7	5.4	0.90	47.0	93	3.0	0.36	0.66	0.00	0.217			
	Limestone	0.00	0.00	0.0	0.0	0.00	0.0	0	0.0	36.00	0.02	0.00	0.076			-CP
	MSU MinVit mix	0.86	1.51	3.0	0.0	0.00	0.0	0	0.0	8.60	8.20	20.00	0.316			-RDP
	Concentration supplied	56.86	100.00	26.7	22.1	0.74	17.7	87.7	2.2	0.44	0.47	0.30	0.099	1~		-MP -MP01
< 111														>		-Ca
		Amount DM Ib/day	%Diet %DMI	NDF lb/day	EfNDF Ib/day	NEL Mcal/day	CP Ib/day	RUP dig Ib/day	FA Ib/day	Ca g/day	P g/day	Se mg/day	Cost DM \$/day	As Fec Ib/day		-P
	Supply	56.86	100.0	15.2	12.6	42.2	10.07	4.04	1.28	112.62	122.00	7.76	5.61	111.		-Se
	Requirements	57.05		15.4	12.3	47.7	10.61	3.92		231.79	113.54	7.76				-Vit A
	Difference	-0.19		-0.2	0.2	-5.5	-0.54	0.11		-119.17	8.46	0.00			-10 0	 10

Now go to the Mineral tab and add limestone until you meet Ca requirement. In this case, we are 2% short on total Ca, but we have plenty of absorbed Ca. The other minerals all are okay, although Na is 10% short. We will ignore this, although it might be worth supplementing more Na.

	МΙΧ	Feed name	Amount DM Ib	Ca %DM	abs Ca %Ca	P %DM	abs P %P	Mg %DM	abs Mg %Mg	K %DM	Na %DM	CI %DM	S %DM	DCAD meg/100g	^	Nutrient Ba	lance
F		Corn silage	18.00	0.28	30	0.26	70	0.17	12	1.20	0.01	0.29	0.14	14.2			-DMI
		Mixed alfalfa grass silage	8.00	1.01	30	0.30	70	0.24	8	2.85	0.02	0.60	0.25	41.2			-NDF
		Cotton seed, whole with lint	0.00	0.17	60	0.60	64	0.37	16	1.13	0.02	0.06	0.23	13.7			-EfNDF
		Corn grain, ground, dry	20.00	0.04	60	0.30	64	0.12	24	0.42	0.02	0.08	0.10	3.1	-1	II STE	-ForNDF
		Hydrolyzed tallow fatty acids	0.00	0.00	60	0.00	64	0.00	16	0.00	0.00	0.00	0.00	0.0			-NEL
		Soybean meal, solvent, 48	5.00	0.35	60	0.70	64	0.29	8	2.41	0.03	0.13	0.39	34.9			NEL 04
		Soybean meal, expellers, 4	5.00	0.36	60	0.66	64	0.30	8	2.12	0.04	0.10	0.34	31.9			
Þ		Limestone	0.70	36.00	75	5 0.02	75	5 2.06	30	0.12	0.06	0.03	0.04	2.3			-CP
		MSU MinVit mix	0.86	8.60	75	5 8.20	75	5 7.50	70	0.60	13.00	20.00	2.80	-157.8			-RDP
		Concentration supplied	57.56	0.87	0.5	5 0.47	0.3	0.32	0.1	1.32	0.21	0.52	0.22	14.7	~		-MP -MP01
<														>			-Ca
			Amount DM Ib/day	Ca g/day	abs Ca g/day	P g/day	abs P g/day	Mg g/day	abs Mg g/day	K g/day	Na g/day	Cl g/day	S g/day	DCAD meq/day	,4 IЬ.		-P
		Supply	57.56	226.93	140.46	6 122.07	83,56	82.51	28.39	344.95	55.60	135.65	57.13	3847.81			-Se
		Requirements	57.05	231.79	88.08	3 113.54	76.07	59.51	9.52	304.76	62.51	80.21	57.21				-Vit A
		Difference	0.51	-4.86	52.38	8.52	7.48	23.00	18.86	40.19	-6.91	55.44	-0.08	j.		-10 0 10	1
H	lome	Fiber Energy Protein	Carbohydrate	Lipid	Mineral	Trace Min.	Vitamin	Amino Acid	Cost	Misc.						+/-% of reqt	20

We are now ready to check over the diet and reassess our fiber, energy, and protein work in light of the total DM supply relative to requirements. We actually have a little more EfNDF and ForNDF than needed, and we are about a half pound over on feed DM. So we will drop the legume silage to 7.5 lb. It is not necessary to be so close on feed DM (being within 1% of the requirement is perfectly fine), but in our case, we wanted to minimize the fiber in the diet (while still supply enough to keep the rumen healthy) so that we could maximize the amount of feed and energy the cows would consume. We are ready for our final checks.

N	ew die	t: 1 Holst	ein, Lactatin	g cow, l	.ac:2, Wt:132	З Ib, DII	M:60, MPD:	110.2 lb, М	IFat:3.5%, [) G:0.86 lb/	day, DMI:5	7.0 lb					
	МΙΧ		Feed name		Amount DM Ib	NDF %DM	EfNDF %NDF	Lignin %DM	ForNDF %DM	NDF dig %NDFn	EfNDF %DM	ADF %DM	RDNDF %NDF	tdNDF %DM	^	Nutri	ent Balance
		Corn sila	ge		18.00	45.0	100.0	2.6	45.0	59.8	45.0	28.1	54.0	26.1			-DMI
D		Mixed al	ialfa grass sil	age	7.50	45.0	100.0	7.3	45.0	43.9	45.0	32.4	39.0	18.6			-NDF
		Cotton s	eed, whole v	vith lint	0.00	50.3	50.0	12.9	0.0	32.0	25.2	40.1	29.0	15.3	1		-EfNDF
		Corn gra	in, ground, d	ry	20.00	9.5	25.0	0.9	0.0	52.7	2.4	3.4	47.0	4.6			-ForNDF
		Hydrolyz	ed tallow fat	y acids	0.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			-NEL
		Soybear	meal, solve	nt, 48	5.00	9.8	25.0	0.5	0.0	60.7	2.5	6.2	55.0	5.5	-		LNEL 01
		Soybear	meal, expel	lers, 4	5.00	21.7	25.0	1.5	0.0	49.4	5.4	10.4	44.0	6.0			
	33	Limesto	ne		0.70	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			-CP
		MSU Mi	nVit mix		0.86	3.0	0.0	0.0	0.0	40.0	0.0	0.0	30.0	1.2			RDP
	(10) (10)	Concen	tration suppli	ed	57.06	26.2	82.4	2.3	20.1	56.1	21.6	15.8	49.0	13.3	~	Ę	-MP -MP01
Ľ										T					>		-Ca
					Amount DM Ib/day	NDF Ib/day	EfNDF Ib/day	Lignin Ib/day	ForNDF Ib/day	NDF dig Ib/day	EfNDF Ib/day	ADF Ib/day	RDNDF Ib/day	tdNDF lb/day			■ - Р
			:	Supply	57.06	15.0	12.3	1.3	11.5	7.8	12.3	9.0	7.3	7.6			-Se
			Require	ments	57.05	15.4	12.3		11.6		12.3						-Vit A
			Diffe	rence	0.01	-0.4	0.0		-0.1	ļ.	0.0					-10_0	10
ł	Home	Fiber	Energy F	rotein	Carbohydrate	Lipid	Mineral	Trace M	in. Vitamir	n Amino A	cid Cost	Misc.				+/- %	of reqt.

Check the Trace mineral tab. In this case, some such as Cu and Zn are a little short, but note that we did not give most of our feeds any credit for trace minerals. Given that our MinVit mix is supplying well above 50% of the requirement, this calculated shortage is not a concern.

Γ	MIX	Feed name	Amount DM	Co	Cu	abs Cu %Cu	Fe	abs Fe %Fe	l ppm	abs I %I	Mo	Mn	abs Mn %Mn	Se	abs Se %Se	Zn	abs Zn %Zn	^		Nutrie	int Bal	lance
ŀ		Corn silage	18.00	0.00	0.0	4	0	10	0.00	85	0.0	0.0	0.75	0.00	40	0	15			1		-DMI
Þ		Mixed alfalfa grass silage	7.50	0.00	11.0	4	225	10	0.00	85	0.0	37.0	0.75	0.00	40	30	15			1.1		-NDF
		Cotton seed, whole with lint	0.00	0.00	0.0	4	0	10	0.00	85	0.0	0.0	0.75	0.00	40	0	15			11		-EfNDF
		Corn grain, ground, dry	20.00	0.00	0.0	4	0	10	0.00	85	0.0	0.0	0.75	0.00	40	0	15			11		ForNDF
		Hydrolyzed tallow fatty acids	0.00	0.00	0.0	4	0	10	0.00	85	0.0	0.0	0.75	0.00	40	0	15			1		- MEI
		Soybean meal, solvent, 48	5.00	0.00	0.0	4	0	10	0.00	85	0.0	0.0	0.75	0.00	40	0	15	-	Ш.			NEL 04
		Soybean meal, expellers, 4	5.00	0.00	0.0	4	0	10	0.00	85	0.0	0.0	0.75	0.00	40	0	15		112			
		Limestone	0.70	0.00	0.0	5	3500	40	0.00	90	0.0	0.0	1.00	0.00	45	0	15			1		FUP
		MSU MinVit mix	0.86	7.00	600.0	5	4000	40	40.00	90	0.0	2500.0	1.00	20.00	45	2500	15			1.		-RDP
		Concentration supplied	57.06	0.10	10.4	0.5	132.5	44.1	0.60	0.5	0.0	42.4	0.41	0.30	0.1	41.4	6.2					-MP
	12 (111)	1	1		1 (01)	0.000	10000	1 1979	1 7077			10 1000		1 0.00	[1 2 2 2				1.5		- MP01
L			Amount DM	C-	C.,	she Cur	F- 1	she Fa		aka I		bla -	ale a bela	C -	-h. C.	7.	-4.7.1			1		-Ca
			lb/day	mg/day	mg/day	mg/day	ng/day	mg/day	mg/day	mg/day	mg/day	mg/day	mg/day	mg/day	mg/day	∠ri mg/day	mg/day					-Р
		Supply	57.06	2.72	270.3	13.4	3429	1142	15.53	13.97	0.0	1096	10.65	7.76	3.49	1072	160.9					-Se
		Requirements	57.05	3.15	307.6	12.3	815	82	15.69	13.34		390	2.93	7.76	3.43	1559	233.8					-Vit A
		Difference	0.01	-0.43	-37.3	1.0	2614	1061	-0.17	0.63		706	7.72	0.00	0.06	-486	-72.9		5	10 0	10	1
H	Home	Fiber Energy Protein	Carbohydrate	Lipid	Mineral T	race Min.	Vitamin /	Amino Acid	Cost	Misc.										+/- % (of reqt.	

Check the Vitamin tab. In this case, all three vitamins are short, but again we did not give most of our feeds any credit for vitamins. Given that our MinVit mix is supplying about 40% of the requirement, this calculated shortage is not a concern.

Feed name	Amount DM Ib	Vit A kIU/lb	Vit D kIU/Ib	Vit E IU/Ib	
Corn silage	18.00	0	0	0	
Mixed alfalfa grass silage	7.50	0	0	0	
Cotton seed, whole with lint	0.00	0	0	0	
Corn grain, ground, dry	20.00	0	0	0	
Hydrolyzed tallow fatty acids	0.00	0	0	0	
Soybean meal, solvent, 48	5.00	0	0	0	
Soybean meal, expellers, 4	5.00	0	0	0	
Limestone	0.70	0	0	0	
MSU MinVit mix	0.86	120	30	1200	
Concentration supplied	57.06	0.8	0.2	8.2	
	Amount DM Ib/day	Vit A kIU/day	Vit D kIU/day	Vit E IU/day	
Supply	57.06	46.58	11.64	465.8	
Requirements	57.05	112.45	29.53	888.3	
Difference	0.01	-65.87	-17.89	-422.5	
Fiber Energy Protein	Carbohydrate	Lipid	Mineral 1	Frace Min.	Vitamin

Check the Ratios and Relationships dialog. Select **Ration>Ratios and Relationships**, press Ctrl+R, or press the ^R button.

Note energy-allowable milk is less than the target of 110 lb but protein-allowable milk is close. Unless the cow eats more than predicted, or the energy value of our feeds is greater than predicted, this cow will likely lose some body condition and/or

ation Ratios and Relatio	onships					
Intake			Diet Composition			1
Actual DMI:	57.06	lb/day	Forage in diet:	44.69	%DM	0
DML/ BW:	4.02	%BW	Forage NDF:	76.6	%NDF	
NRC01 Predicted DMI:	57.72	lb/day	CP / ME3X:	597.15	g/Mcal	
DEp / DE1X:	91.53	%	MP / ME:	51.31	g/Mcal	
Energy-corrected milk (ECM):	112.20	lb/day	Lys : Met:	3.11	2015-0	
ECM / DMI:	1.97		NRC01 Lys : Met:	3.50		
			NRC01 Lys:	2.74	%MP	
Production / Daily Gain			NRC01 Met	0.78	%MP	
Energy-allowable milk:	93.82	lb/dav				
Protein-allowable milk:	108.84	lb/day	– Nutrient Management (N	I. P. KI		1
Target body energy balance:	1.95	Mcal/day	Predicted Fecal DM:	18.25	lb/day	
Target body protein balance:	0.16	lb/day	N captured:	40.7	%	
			Total N excreted:	0.947	lb/day	
			Fecal N:	0.369	lb/day	
Losts			Urinary N:	0.578	lb/day	
Feed cost / ME3X:	17.74	\$/100 Mcal	P captured:	39.3	%	
Purchased feed costs:	4.02	\$/day	P excreted:	0.162	lb/day	
Feed cost / 100 wt milk:	5.10	\$/10016	P excreted as P205:	0.372	lb/day	
Income over feed costs:	-5.63	\$/day	K excreted as K20:	0.698	lb/day	

produce less than expected. Note that income over feed costs is negative –this is because we did not enter a milk price in the cow description. Press okay.

Check the home tab again and note the cost of the ration---\$5.63 per day.

N	ew die	et: 1 Holstein, Lactating cow, L	.ac:2, Wt:132	з I <mark>Б,</mark> DIM:6	io, MPD:	110.2 lb, М	IFat:3.5%, D	G:0.86 lb/	day, DMI:57	7.0 lb							1 1
	МΙΧ	Feed name	Amount DM Ib	%Diet %DMI	NDF %DM	EfNDF %DM	NEL Mcal/lb	CP %DM	RUP dig %RUP	FA %DM	Ca %DM	P %DM	Se ppm	Cost DM \$/lb	A <u>^</u>	Nutrient Bal	ance
Þ		Corn silage	18.00	31.55	45.0	45.0	0.64	8.8	70	2.2	0.28	0.26	0.00	0.060			-DMI
		Mixed alfalfa grass silage	7.50	13.15	45.0	45.0	0.52	19.6	65	1.1	1.01	0.30	0.00	0.070		1 I E I I	-NDF
		Cotton seed, whole with lint	0.00	0.00	50.3	25.2	0.81	23.5	80	18.3	0.17	0.60	0.00	0.125			-EfNDF
		Corn grain, ground, dry	20.00	35.05	9.5	2.4	0.88	9.4	90	3.2	0.04	0.30	0.00	0.083			-ForNDF
		Hydrolyzed tallow fatty acids	0.00	0.00	0.0	0.0	2.46	0.0	0	99.2	0.00	0.00	0.00	0.451			- NEL
		Soybean meal, solvent, 48	5.00	8.76	9.8	2.5	0.91	53.8	93	0.1	0.35	0.70	0.00	0.190			NEL 01
		Soybean meal, expellers, 4	5.00	8.76	21.7	5.4	0.90	47.0	93	3.0	0.36	0.66	0.00	0.217	_		CD
		Limestone	0.70	1.23	0.0	0.0	0.00	0.0	0	0.0	36.00	0.02	0.00	0.076			-CP
		MSU MinVit mix	0.86	1.50	3.0	0.0	0.00	0.0	0	0.0	8.60	8.20	20.00	0.316			-RDP
		Concentration supplied	57.06	100.00	26.2	21.6	0.73	17.5	87.7	2.2	0.87	0.47	0.30	0.099			-MP -MP01
<															>		-Ca
			Amount DM Ib/day	%Diet %DMI	NDF Ib/day	EfNDF Ib/day	NEL Mcal/day	CP Ib/day	RUP dig Ib/day	FA Ib/day	Ca g/day	P g/day	Se mg/day	Cost DM \$/day	As Fe Ib/da		-Р
		Supply	57.06	100.0	15.0	12.3	41.9	9.97	4.02	1.27	224.64	121.39	7.76	5.63	111		-Se
		Requirements	57.05		15.4	12.3	47.7	10.62	3.95		231.79	113.54	7.76				-Vit A
		Difference	0.01		-0.4	0.0	-5.8	-0.65	0.07		-7.15	7.84	0.00			-10 0 10	ŝ
ŀ	lome	Fiber Energy Protein	Carbohydrate	Lipid	Mineral	Trace Mi	in. Vitamin	Amino A	cid Cost	Misc.						+/- % of reqt.	

3. Save the file.

After creating the ration, you should save it. In this example, the ration is for a group of cows at the MSU Dairy, so I save the file in a folder called MSU Dairy. Choose **File>Save as...** and save as with any other windows program.

Save As		? 🔀
Save AS Save in: Wy Recent Documents Desktop My Documents	C Spartan Dairy 3 C Sample Files C config Master Feed Library MSU Dairy	
My Network Places	File name:	<u>O</u> pen Cancel

4. Consider feed options

Currently Spartan 3 does not have an optimizer cost evaluator. (its completely designed but not coded). But we can easily check the impact on nutrients and ration cost of other available feeds. Let's first check the impact of adding 2% Hydrolyzed Tallow Fatty Acids in place of corn. Type 2 into the %Diet column for HTFA, and subtract 1.14 lb from corn grain.

	мιх	Feed name	Amount DM Ib	%Diet %DMI	NDF %DM	EfNDF %DM	NEL Mcal/lb	CP %DM	RUP dig %RUP	FA %DM	Ca %DM	P %DM	Se ppm	Cost DM \$/lb	Α 🔨	Nutrient Ba	alance
		Corn silage	18.00	31.55	45.0	45.0	0.64	8.8	70	2.2	0.28	0.26	0.00	0.060			-DMI
		Mixed alfalfa grass silage	7.50	13.14	45.0	45.0	0.52	19.6	65	1.1	1.01	0.30	0.00	0.070			-NDF
		Cotton seed, whole with lint	0.00	0.00	50.3	25.2	0.81	23.5	80	18.3	0.17	0.60	0.00	0.125			-EfNDF
		Corn grain, ground, dry	18.86	33.05	9.5	2.4	0.88	9.4	90	3.2	0.04	0.30	0.00	0.083			-ForNDF
D	•	Hydrolyzed tallow fatty acids	1.14	2.00	0.0	0.0	2.46	0.0	0	99.2	0.00	0.00	0.00	0.451	=		- NEL
		Soybean meal, solvent, 48	5.00	8.76	9.8	2.5	0.91	53.8	93	0.1	0.35	0.70	0.00	0.190			NEL 04
		Soybean meal, expellers, 4	5.00	8.76	21.7	5.4	0.90	47.0	93	3.0	0.36	0.66	0.00	0.217			
		Limestone	0.70	1.23	0.0	0.0	0.00	0.0	0	0.0	36.00	0.02	0.00	0.076			-CP
		MSU MinVit mix	0.86	1.50	3.0	0.0	0.00	0.0	0	0.0	8.60	8.20	20.00	0.316			-RDP
		Concentration supplied	57.06	100.00	26.1	21.6	0.77	17.3	87.7	4.2	0.87	0.46	0.30	0.106			- MP - MP01
8															>		-Ca
			Amount DM Ib/day	%Diet %DMI	NDF lb/day	EfNDF Ib/day	NEL Mcal/day	CP Ib/day	RUP dig Ib/day	FA Ib/day	Ca g/day	P g/day	Se mg/day	Cost DM \$/day	As Fe Ib/da		-P
		Supply	57.06	100.0	14.9	12.3	43.7	9.87	3.98	2.37	224.43	119.84	7.76	6.05	110		-Se
		Requirements	57.05		15.4	12.3	47.7	10.62	3.96		231.79	113.54	7.76				-Vit A
		Difference	0.01		-0.5	0.0	-4.0	-0.76	0.02		-7.36	6.29	0.00			-10 0 10	

Note this increased NEL intake by almost 2 Mcal and energyallowable milk by ~6 lb (press $\stackrel{\text{R}}{\xrightarrow{}}$ button). This costs 40 cents more per day; however, we are assuming the cow will eat the same amount! If she drops her intake 1-2%, we will not have gained anything.



Now let's see what would happen to nutrient specs and to ration

cost if we added 5 lb of cottonseeds. We must also subtract 5 lb of something. Because cottonseeds is high in NDF but we consider it to be only 50% effective, we will drop forage 2.5 lb. The other 2.5 lb will be subtracted from corn. So now we have 5 lb mixed silage, 5 lb cottonseeds, and 17.5 lb corn grain. Note this increased NEL intake by only 0.6 Mcal (2 lb of milk) and increased ration cost by 24 cents /day. However, we are assuming the cow will eat the same amount! If the intake drops, this was an expensive mistake. If the intake increases, it might be

Nev	v diet: 1 Holstein, Lactating cow, I	Lac:2, Wt:132	3 Ib, DIM:6	io, MPD	:110.2 lb, М	1Fat:3.5%, D	G:0.86 lb/	day, DMI:5	7.0 lb							
	AIX Feed name	Amount DM Ib	%Diet %DMI	NDF %DM	EfNDF %DM	NEL Mcal/lb	CP %DM	RUP dig %RUP	FA %DM	Ca %DM	P %DM	Se ppm	Cost DM \$/lb	Α 📩	Nutrient B	alance
	Corn silage	18.00	31.55	45.0	45.0	0.64	8.8	70	2.2	0.28	0.26	0.00	0.060			-DMI
	Mixed alfalfa grass silage	5.00	8.76	45.0	45.0	0.52	19.6	65	1.1	1.01	0.30	0.00	0.070	-		-NDF
	Cotton seed, whole with lint	5.00	8.76	50.3	25.2	0.81	23.5	80	18.3	0.17	0.60	0.00	0.125			-EfNDF
	Corn grain, ground, dry	17.50	30.67	9.5	2.4	0.88	9.4	90	3.2	0.04	0.30	0.00	0.083			-ForNDF
	Hydrolyzed tallow fatty acids	0.00	0.00	0.0	0.0	2.46	0.0	0	99.2	0.00	0.00	0.00	0.451			- NEL
	Soybean meal, solvent, 48	5.00	8.76	9.8	2.5	0.91	53.8	93	0.1	0.35	0.70	0.00	0.190			LNEL 01
	Soybean meal, expellers, 4	5.00	8.76	21.7	5.4	0.90	47.0	93	3.0	0.36	0.66	0.00	0.217			
	Limestone	0.70	1.23	0.0	0.0	0.00	0.0	0	0.0	36.00	0.02	0.00	0.076			-CP
	MSU MinVit mix	0.86	1.50	3.0	0.0	0.00	0.0	0	0.0	8.60	8.20	20.00	0.316			-RDP
	Concentration supplied	57.06	100.00	28.3	21.8	0.75	18.3	87.7	3.6	0.84	0.50	0.30	0.103	~		-MP -MP01
<														>		-Ca
		Amount DM Ib/day	%Diet %DMI	NDF Ib/day	EfNDF Ib/day	NEL Mcal/day	CP Ib/day	RUP dig Ib/day	FA Ib/day	Ca g/day	P g/day	Se mg/day	Cost DM \$/day	As Fe Ib/da		- P
	Supply	57.06	100.0	16.1	12.4	42.5	10.42	4.06	2.08	216.59	128.19	7.76	5.87	106		-Se
	Requirements	57.05		15.4	12.3	47.7	10.63	4.02		231.79	113.54	7.76				-Vit A
	Difference	0.01		0.7	0.1	-5.2	-0.21	0.04		-15.20	14.65	0.00				6.55

worth it.		
5. Print reports.	Modify Summary Report Settings	
First print the summary report. Choose Reports>Summary Report from the menu. In the settings dialog, you can enter your name, give the diet a name, and enter the farm name. Check the box for alternating row colors.	General Notes Diet name: High cow diet Prepared for: MSU Dairy Prepared by: MJ VandeHaar ✓ Color alternating rows?	✓ DK ✓ Cancel Print
		Output Options
The summary report is usually Report Preview Me Bage Zoom Image	2 or 3 pages.	Report Destination OK Preview Cancel Elle Setup Format: Rave Snapshot File (NL) Setup Options Copies 1 Duplex
Holstein, Lactating cow Lactation # 2 Body wt w/o fetus: 644.1 I Days in milk: 60 Current BCS: 2.50 Target Actual Matter body weight: 700.0 I Days pregnant: 0 Milk yield: 50.35.0 % No work Protein: 3.20 3.30 % Feed additive: None	(g/day (g/day (g MJ VandeHaar	If you are happy with the report, choose File>Print or press the button.
Feed name Test DM As Fed DM Corn silage Date kg kg kg % Corn silage 2/25/10 0.00 23.53 34.0 Mixed alfalfa grass silage 2/25/10 3.60 10.61 33.0 Corn grain, ground, dry 2/25/10 2.30 2.57 89.5 Soybean meal, expellers, 45 2/25/10 2.30 2.57 89.5 Soybean meal, expellers, 45 2/25/10 2.30 2.63 99.0 MSU MinVit mix 2/25/10 0.32 0.32 93.0 MSU MinVit mix 2/25/10 0.39 0.40 99.0 DM A 5 Fed DM kg/day % Supply 2.586 50.27 61.4 Requirements 25.68 D27 61.4 Difference -0.02 2 2 DIET SUMMARY %DM %DM %DM Mcal/kg Mcal/kg	%Diet NDF NEL CP RUP AsSold WhAsSold %DM %DM McAlkg %DM %CP \$ kg 30.94 450 1.41 96 20 46.00 907 13.54 450 1.14 19.6 20 46.00 907 35.39 95 19.3 94 49 410 25 8.69 9.8 2.00 53.8 44 340.00 907 1.24 0.0 0.00 0.7 7.50 45 1.50 3.0 0.00 0.0 31.00 45 %Diet NDF NEL CP RUP Cost DM %Diet NDF NEL CP RUP Cost DM %DMI kg/day Mcal/d kg/day \$/day 100.0 6.8 41.9 4.52 2.07 5.62 7.0.2 7.58 -0.32 0.19 10.19 4.52	The second Output Options dialog will appear. In this dialog, you may choose to print only page 1 or pages 1 and 2. Sometimes page 3 has no useful information and you may want to save the paper.
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Next print the batch report to use the recipe for mixing a ration. Choose **Reports>Batch Reports**. In addition to the general settings you set for the summary report, you now can edit setting for batch size and mixing order and type notes.

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This concludes the tutorial on formulating a new lactation diet. I apologize if you use kg instead of pounds. I hope you could follow it anyway.