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GUIDE

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Ration Work Sheet With Example

(Supplement to UMC GUIDE 3104, "Calculating Rations for Dairy Cattle")

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RATION WORK SHEET

	Crude Protein (lbs.)	Estimated Net Energy (therms)	Calcium (lbs.)	Phosphorus (lbs.)
1. Daily Requirements of Nutrients for the Dairy Animal. (See Table 1, UMC Guide 3104)	(a)	(b)	(c)	(d)
a. For maintenance (and growth, if not mature; and last 2 months of pregnancy, for dry cows) of a cow weighing 1400 lbs.	1.12	10.12	.048	.039
b. For milk production, 65 lbs. per day, testing 3.5 %	5.33	20.15	.169	.117
c. Total daily requirements	6.45	30.27	.22	.16
2. Nutrients Supplied by the Forages. (See Table 4, UMC Guide 3104, or better yet use your own laboratory analysis results for age)				
a. 5 lbs. of Alfalfa Hay (1/10 bloom)	.84	2.75	.083	.012
b. 50 lbs. of Corn Silage (well-eared)	1.4	12.65	.045	.035
c. ____ lbs. of ____				
d. Total nutrients from the forages	2.24	15.40	.13	.05
3. To be supplied by the Ration. (Total daily requirements - Total nutrients from the forages 1c -2d)	4.21	14.9	.09	.11

4. Pounds of Ration Required. ENE to be supplied by the ration (3, col. b) ÷ ENE of ration. Use .76 therms/lb. ENE for ration. (Use .70 if grain is high moisture grain or ear corn). Example:
   14.9 therms ÷ .76 therms/lb. = 19.6 lbs.

5. Percent Protein Needed in the Ration. Lbs. of crude protein to be supplied by the ration (3, col. a) ÷ lbs. of ration required (4) x 100. Example:
   4.21 lbs. ÷ 19.6 lbs. x 100 = 21.5 % protein.

6. Percent Calcium Needed. Lbs. calcium to be supplied by the ration (3, col. c) ÷ lbs. of ration required (4) x 100. Example:
   .09 lbs. ÷ 19.6 lbs. x 100 = .46 % calcium.

7. Percent Phosphorus Needed. Lbs. of phosphorus to be supplied by the ration (3, col. d) ÷ lbs. of ration required (4) x 100. Example:
   .11 lbs. ÷ 19.6 lbs. x 100 = .56 % phosphorus.

8. Use Pearson's square to calculate percent ingredients, to get a 21.5 % protein ration. Refer to Guide 3104, Step 5 for use of the square.

9. Calculate the nutrients supplied by each ingredient of the grain ration: % of ingredient in the ration x % or therms/cwt of the nutrient in the ingredient.

10. Find the percent phosphorus still needed to be supplied: phosphorus specifications of the ration (7) - phosphorus supplied by the grain ration. Example:
    .56 % - .41 % = .15 % phosphorus needed.

11. Use a phosphorus source, for example, dicalcium phosphate, to supply the needed phosphorus: % phosphorus needed (10) ÷ % phosphorus in ingredient (Table 3, Guide 3104) x 100 = % phosphorus source in the ration. Example:
    .15 % ÷ 18 % x 100 = .83 % Dical in the ration.

12. Calculate the amount of calcium supplied by the phosphorus source: % phosphorus source in the ration (11) x % calcium in the ingredient (Table 3, Guide 3104) ÷ 100. Example:
    .83 % x 22.75 % ÷ 100 = .19 % calcium supplied.

13. Calculate the % calcium still needed to be supplied: calcium specification of the ration (6) - % calcium in the ration (this includes calcium supplied by the phosphorus source in step 12) = % percent calcium still required in the ration. Example:
    .46 % - (.13 % + .19 %) = .14 % calcium required.

14. Use a single source of calcium to fulfill the calcium requirements, for example, limestone: calcium % required (13) ÷ % calcium in the calcium source (Table 3, Guide 3104) x 100 = % calcium source in ration. Example:
    .14 % ÷ 36 % x 100 = .39 % Limestone in the ration.

15. If your percentages do not add up to 100% go back to the grain and either increase or decrease its proportion in the ration.

16. To determine the pounds of each ingredient in a given size batch, multiply the percent of each ingredient x total pounds in the batch. a ration (To calculate a ration on a dry matter basis refer to UMC Guide 3104, section entitled "Calculating a Ration on Dry Matter Basis").

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		GRAIN SPECIFICATIONS										
	INGREDIENTS	Crude Protein 21.5 %		ENE 76 Therms/cwt.		Calcium .46 %		Phosphorus .56 %			COST	
%		%	Lbs./cwt.	Therms/ lb.	Therms/ cwt.	%	Lbs./cwt.	%	Lbs./cwt.	Lbs./ batch	Assigned cost/cwt.	Cost/ cwt.
61.91 / 61.6	corn dent yellow ground	8.9	5.48	.82	50.5	.027	.02	.276	.17	1238.2	4.50	2.79
36.4	SBOM 44%	44.14	16.07	.75	27.3	.32	.12	.67	.24	728	10.85	3.95
	Subtotal		21.55		77.8		.14		.41			
.83	Minerals Dicalcium Phosphate					22.8	.19	18	.15	16.6	12.00	.10
.36	Limestone					36	.13			7.2	2.50	.01
.5	TM Salt									10	3.60	.02
100	Total		21.55		77.8		.46		.56	2000		6.87

A. Use Pearson's Square to calculate percent ingredients, to get a 21.5% protein grain ration (refer to Guide 3104).

B. Meet phosphorus first by difference .56 (phosphorus specifications) - .41 (phosphorus supplied) = .15 % (phosphorus need). Use a phosphorus source, e.g. dicalcium phosphate. Percent phosphorus needed ÷ by % phosphorus in ingredient x 100. .15 ÷ 18 % x 100 = .83 % dicalcium phosphate in ration. Then calculate amount of calcium supplied by dicalcium phosphate. Percent of dicalcium phosphate in ration x percent calcium in ingredient ÷ 100, e.g., .83 x 22.8 % ÷ 100 = .19 calcium.

C. By difference determine remaining calcium to be supplied. Use limestone. Calcium percent needed ÷ percent calcium in limestone x 100, e.g., .13 ÷ 36 % x 100 = .36 % limestone.

D. This method may give an answer of slightly more than 100%. To bring back to 100%, adjust grain (e.g.: Corn to 61.91%).

E. To determine pounds of each ingredient in a given size batch, multiply the percent of each ingredient x the total batch size ÷ 100. 2000 lbs. mix batch x 61.91 ÷ 100 = 1,238.2 pounds.

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		GRAIN SPECIFICATIONS										
	INGREDIENTS	Crude Protein ______%		ENE ______Therms/cwt.		Calcium ______%		Phosphorus ______%			COST	
%		%	Lbs./cwt.	Therms/ lb.	Therms/ cwt.	%	Lbs./cwt.	%	Lbs./cwt.	Lbs./ batch	Assigned cost/cwt.	Cost/ cwt.
	Subtotal											
	Minerals											
	Total											

A. Use Pearson's Square to calculate percent ingredients, to get a 21.5% protein grain ration (refer to Guide 3104).

B. Meet phosphorus first by difference ______(phosphorus specifications) - ______(phosphorus supplied) = ______% (phosphorus need). Use a phosphorus source, e.g. dicalcium phosphate. Percent phosphorus needed ÷ by % phosphorus in ingredient x 100. ______÷ ______% x 100 = ______% dicalcium phosphate in ration. Then calculate amount of calcium supplied by dicalcium phosphate. Percent of dicalcium phosphate in ration x percent calcium in ingredient ÷ 100, e.g., ______ x ______% ÷ 100 = ______calcium.

C. By difference determine remaining calcium to be supplied. Use limestone. Calcium percent needed ÷ percent calcium in limestone x 100, e.g., ______÷ ______% x 100 = ______% limestone.

D. This method may give an answer of slightly more than 100%. To bring back to 100%, adjust grain (e.g.: Corn to 61.91%).

E. To determine pounds of each ingredient in a given size batch, multiply the percent of each ingredient x the total batch size ÷ 100. 2000 lbs. mix batch x 61.91 ÷ 100 = ______pounds.

RATION WORK SHEET

	Crude Protein (lbs.)	Estimated Net Energy (therms)	Calcium (lbs.)	Phosphorus (lbs.)
1. Daily Requirements of Nutrients for the Dairy Animal. (See Table 1, UMC Guide 3104)	(a)	(b)	(c)	(d)
a. For maintenance (and growth, if not mature; and last 2 months of pregnancy, for dry cows) of a cow weighing ____________lbs.	______	______	______	______
b. For milk production, __________lbs. per day, testing ________%	______	______	______	______
c. Total daily requirements	______	______	______	______
2. Nutrients Supplied by the Forages. (See Table 4, UMC Guide 3104, or better yet use your own laboratory analysis results for age)				
a. _________lbs. of ______________________	______	______	______	______
b. _________lbs. of ______________________	______	______	______	______
c. _________lbs. of ______________________	______	______	______	______
d. Total nutrients from the forages	______	______	______	______
3. To be supplied by the Ration. (Total daily requirements - Total nutrients from the forages 1c -2d)	______	______	______	______

4. Pounds of Ration Required. ENE to be supplied by the ration (3, col. b) ÷ ENE of ration. Use .76 therms/lb. ENE for ration. (Use .70 if grain is high moisture grain or ear corn). Example:

______________therms ÷ __________ therms/lb. = ___________lbs.

5. Percent Protein Needed in the Ration. Lbs. of crude protein to be supplied by the ration (3, col. a) ÷ lbs. of ration required (4) x 100. Example:

______________lbs. ÷ ______________ lbs. x 100 = ___________% protein.

6. Percent Calcium Needed. Lbs. calcium to be supplied by the ration (3, col. c) ÷ lbs. of ration required (4) x 100. Example:

______________lbs. ÷ ______________ lbs. x 100 = ___________% calcium.

7. Percent Phosphorus Needed. Lbs. of phosphorus to be supplied by the ration (3, col. d) ÷ lbs. of ration required (4) x 100. Example:

______________lbs. ÷ ______________lbs. x 100 = ___________% phosphorus.

8. Use Pearson's square to calculate percent ingredients, to get a ________% protein ration. Refer to Guide 3104, Step 5 for use of the square.

9. Calculate the nutrients supplied by each ingredient of the grain ration: % of ingredient in the ration x % or therms/cwt of the nutrient in the ingredient.

10. Find the percent phosphorus still needed to be supplied: phosphorus specifications of the ration (7) - phosphorus supplied by the grain ration. Example:

______________% - ________________% = ___________________% phosphorus needed.

11. Use a phosphorus source, for example, dicalcium phosphate, to supply the needed phosphorus: % phosphorus needed (10) ÷ % phosphorus in ingredient (Table 3, Guide 3104) x 100 = % phosphorus source in the ration. Example:

______________% ÷ ________________% x 100 = _____________ % _____________in the ration.

12. Calculate the amount of calcium supplied by the phosphorus source: % phosphorus source in the ration (11) x % calcium in the ingredient (Table 3, Guide 3104) ÷ 100. Example:

______________% x ________________% ÷ 100 = _____________% calcium supplied.

13. Calculate the % calcium still needed to be supplied: calcium specification of the ration (6) - % calcium in the ration (this includes calcium supplied by the phosphorus source in step 12) =% percent calcium still required in the ration. Example:

______________% - (________% + ________%) = ______________% calcium required.

14. Use a single source of calcium to fulfill the calcium requirements, for example, limestone: calcium % required (13) ÷ % calcium in the calcium source (Table 3, Guide 3104) x 100 = % calcium source in ration. Example:

______________% ÷ ________________% x 100 = _____________ % _____________ in the ration.

15. If your percentages do not add up to 100% go back to the grain and either increase or decrease its proportion in the ration.

16. To determine the pounds of each ingredient in a given size batch, multiply the percent of each ingredient x total pounds in the batch. a ration (To calculate a ration on a dry matter basis refer to UMC Guide 3104, section entitled "Calculating a Ration on Dry Matter Basis").

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