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Calculation of Complete Diets for SWINE and Checking for Nutrient Balance (NEWSWINE)

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The swine diet (NEWSWINE) program has two functions. The first function is to calculate the nutritional composition of a feed mixture. The second function is to look up some of the nutritional requirements of swine. By using the two functions together it is possible to develop a ration which is correctly balanced for a specific body weight and type of swine. The top screen will hold up to 10 feed ingredients and their nutrient composition. The "as fed" composition of the ration is entered by the user in the "C" column. It is not necessary for the total amount of feed entered in the C column to add to 100. This program can calculate the nutrient composition on any amount of feed (for example 13.5 lbs, 100 lbs, or 2000 lbs). The first example screen output is shown below. The type of animal for which the feed is being formulated is selected from Table 1, i.e. Class 3, in the example and entered in cell C20. The user of the program need only change the feeds or the makeup of feeds to bring the amount of each nutrient up to the level of the requirement. A label will indicate if a nutrient is deficient (DFN) or adequate (ADQ).

Obtaining nutritional balance by trial and error can become very fast and efficient as the user develops an intuitive feeling to the affects of an increase or decrease in the concentration of a feed on the nutrient levels in the ration. With the advent of the microcomputer and spreadsheets, these formerly time consuming chores become very quick and easy.

This swine ration balancing spreadsheet was written for Lotus 1-2-3 or can be obtained from OSU compiled for use without spreadsheet software. To load the program, place the data disk in the drive specified by your computer spreadsheet instructions. When ready, load the spreadsheet by typing /FR NEWSWINE.

Four different Macro programs have been incorporated to aid the user of this program. The first of these activated by simultaneously pressing the Alt and S keys, allows SELECTION of feeds to use in the program. The feeds included with the program are shown in Table 2. Write down the numbers

of the feeds you wish to use and then press the "HOME" key on your computer. This should place the cursor in cell A1. Type the numbers of the feeds you want to use starting in cell A2. A zero placed in column A, rows 2 to 11 will blank out the feed name and data on rows not used.

After the feeds are selected the next important function is the FORMULATE command. To activate press simultaneously Alt and F. This command will place the cursor in cell C1 and will place a title lock on the feed names so that the user can scroll to the right to check nutrient composition of the feeds selected. If nutrient value changes must be made in the feed library, use the EDIT function (Alt E). To add a feed not in reference area, first use the SELECTION command and type the new feed name next to an unused number. Then use the EDIT to enter the nutrient coefficients. When completed use the FORMULATE command which will place the cursor in column C. The amounts of each feed selected for your ration are entered in the appropriate row in column C.

A large number of calculations are hidden off to the right of the screen. This portion of the program contains nutrient totals. In the example ration supplied with this program, 6.53 units of protein came from corn and 10.12 units came from soybean meal (column S). These cells should never be altered because they contain necessary intermediate steps for computing the ration. Any cell that should not be changed is protected to prevent inadvertent removal of an equation.

Important information about the animal for which the nutrient requirements are being evaluated is located at the bottom of the screen. These are the Oklahoma State University recommendations for the animal described. The status of each nutrient is shown to the right of the requirement.

Nutrient Levels

The suggested nutrient levels of swine rations for the different classes of swine in the "NEWSWINE" program are

Table 1. Suggested Nutrient Levels.

	<i>Class 1 (10-14 lb)</i>	<i>Class 2 (15-20 lb)</i>	<i>Class 3 (21-44 lb)</i>	<i>Class 4 (45-75 lb)</i>	<i>Class 5 (76-140 lb)</i>	<i>Class 6 (141 lb & up)</i>	<i>Class 7^a Gestating Sows</i>	<i>Class 8^a Lactating Sows and Boars</i>
Metabolizable energy, kcal/lb	1450	1450	1450	1400	1400	1400	1350	1350
Calcium, %	.95	.90	.80	.70	.65	.60	.90	.90
Phosphorus, %	.85	.80	.70	.60	.55	.50	.70	.70
Crude protein, % ^b	19.0	18.0	17.0	16.00	15.0	13.0	13.50	15.0
Lysine, %	1.50	1.30	1.15	.85	.75	.62	.65	.75
Thyptophan, %	.21	.18	.16	.14	.13	.11	.13	.14
Threonine, %	.85	.71	.66	.50	.45	.40	.43	.48
Methionine+Cystine, %	.70	.60	.50	.45	.40	.36	.40	.43

^a Based on a feeding level of 4-6 lb per day for bred sows and boars and full feeding for lactating females.

^b The levels of protein will vary somewhat according to the grain and protein source used. It is critical that the rations be calculated to meet the amino acid requirements of swine, e.g. lysine, tryptophan and methionine+cystine.

FEED NAME	AMOUNT	FIB	M.E.	CA.	PHOS	C.P.	LYSINE	TRYPT	THREO	MET+CY	COST
Corn, yellow	1485	2.5	1550	0.02	0.25	8.80	0.24	0.09	0.32	0.40	
Soybean meal, 44%	460	7.3	1460	0.30	0.60	44.00	2.90	0.63	1.70	1.18	
Calcium carbonate	15	—	—	38.00	—	—	—	—	—	—	
Dicalcium phosphate	30	—	—	22.00	18.50	—	—	—	—	—	
Salt	7	—	—	—	—	—	—	—	—	—	—
Vitamin trace mineral mix	3	—	—	—	—	—	—	—	—	—	—

	IN FEED	REQUIRED	IN FEED	REQUIRED
Batch size	2000		Lysine, %	0.85
Crude Fiber, %	3.54		Tryptophane, %	0.19
ME kcal/lb	1486.	1400 ADQ	Threonine, %	0.63
Calcium, %	0.70	0.70 ADQ	Methionine+Cystine, %	0.57
Phosphorus, %	0.60	0.60 ADQ	Cost per cwt \$	0.45 ADQ
Crude protein, %	16.65	16.0 ADQ	Cost per batch \$	
Class————>>>	4	46-75 lb pig		

FEED NAME	PERCENT	BATCH SIZE	
		1000	2000
Corn, yellow	74.25	742.5	1485
Soybean meal, 44%	23.00	230	460
Calcium Carbonate	0.75	7.5	15
Dicalcium phosphate	1.50	15	30
Salt	0.35	3.5	7
Vitamin trace mineral mix	0.15	1.5	3
	100	1000	2000

presented in Table 1. These are guidelines only. The levels may vary depending on the grain, protein source and other ingredients used.

It is critical that the suggested levels for the amino acids, e.g., lysine, tryptophan, threonine and methionine + cystine are met. With some grain and protein sources, it will require more protein than is suggested in Table 1 in order to meet the pigs amino acid requirement, especially lysine. If synthetic lysine is added to the ration, it may be possible to lower the crude protein level 1 to 2% if the lysine requirement is met.

The suggested nutrient levels listed for classes 4 through 6 are for average barrows. Lysine and other essential amino acids need to be increased for gilts and high lean gain barrows (see OSU Extension Facts No. 3509, "Protein Needs of High Lean Gain Pigs"). The suggested nutrient levels listed in Class

Table 2. Feed list.

	<i>FEED NAMES</i>	<i>C.F.%</i>	<i>M.E.</i>	<i>CA</i>	<i>PHOS</i>	<i>C.P.</i>	<i>LYS</i>	<i>TRYPT</i>	<i>THREO</i>	<i>MET+CY</i>
1	Alfalfa hay	29.00	800	1.20	0.20	14.00	0.55	0.25	0.50	0.35
2	Alfalfa, dehydrated	24.00	775	1.40	0.23	17.00	0.80	0.34	0.70	0.56
3	Barley	6.00	1380	0.05	0.34	11.50	0.40	0.15	0.36	0.37
4	Blood meal, spray dried	.50	1200	0.40	0.30	90.00	9.37	1.62	4.27	2.05
5	Corn, yellow	2.60	1550	0.02	0.25	8.80	0.24	0.09	0.32	0.40
6	Fat	—	3585	—	—	—	—	—	—	—
7	Fish meal, Menhadden	0.90	1500	5.20	2.88	61.00	4.75	0.65	2.50	2.33
8	Lysine, 78%	—	—	—	—	—	78.00	—	—	—
9	M B meal, 50	2.80	1035	9.40	4.58	50.00	2.80	0.28	1.60	1.14
10	Milk, dry skim	—	1620	1.25	1.00	33.00	2.50	0.45	1.57	1.30
11	Mung beans	3.90	1529	0.14	0.46	26.20	1.75	0.20	0.80	0.41
12	Oats	10.70	1240	0.08	0.33	11.80	0.40	0.14	0.38	0.37
13	Oat groats	2.50	1550	0.07	0.40	15.80	0.50	0.18	0.44	0.41
14	Peanut meal, solvent	9.90	1320	0.27	0.61	49.00	1.45	0.48	1.37	1.17
15	Plasma protein	0.30	1500	0.14	0.13	70.00	6.10	1.33	4.13	2.77
16	Rice bran	12.90	1300	0.11	1.37	14.00	0.61	0.21	0.55	0.47
17	Sorgham grain	2.20	1480	0.02	0.27	8.90	0.22	0.09	0.27	0.29
18	Soybean meal, 44%	7.30	1460	0.30	0.60	44.00	2.90	0.63	1.70	1.18
19	Soybean meal, 48%	3.40	1535	0.20	0.65	48.00	3.12	0.64	1.90	1.41
20	Sugar	—	1383	—	—	—	—	—	—	—
21	Tankage, 60%	2.00	980	4.60	2.50	60.00	3.80	0.58	2.48	1.25
22	Wheat, hard red winter	2.60	1475	0.05	0.30	12.20	0.38	0.17	0.37	0.50
23	Wheat bran	11.00	980	0.13	1.15	15.00	0.56	0.25	0.41	0.43
24	Wheat midds	7.50	1340	0.13	0.80	16.00	0.68	0.19	0.54	0.41
25	Whey, dried	—	1405	0.85	0.70	13.00	0.90	0.17	0.80	0.49
26	Calcium carbonate	—	—	38.00	—	—	—	—	—	—
27	Dicalcium phosphate	—	—	22.00	18.50	—	—	—	—	—
28	Dicalcium monosodium phosphate	—	—	16.50	21.00	—	—	—	—	—
29	Salt	—	—	—	—	—	—	—	—	—
30	Vitaimin trace mineral mix	—	—	—	—	—	—	—	—	—

8 for lactating sows are for average sows weaning eight pigs or less on the average. For high producing sows weaning 9 to 11 pigs, the amino acid levels need to be higher (see OSU Current Report CR-3510, "Nutritional Needs of High Producing Sows").

In this program the nutrient requirements are found in the table in column N, rows 19 to 26. To make the program easier to use, the user needs the protein percentage within 0.10 of the requirement to avoid the "deficient DFN" status label. Other nutrients have a tolerance of 0.005 to avoid the deficient status label. In many cases some nutrients will be present in amounts in excess of the minimum requirements. Experience will allow the user to anticipate limiting nutrients in a short period of time. Deficiencies will usually lead to reduced performance.

The feeds shown in the example were chosen because they are familiar to most Oklahoma producers. The coefficients may not be correct for your feeds and analysis of your feeds is suggested. Any of these feeds that are not used may be replaced with a feed useful to you.

If you have a slow computer, and need to speed operations, you may want to set the program "manual recalculation." The keystroke sequence is /WGRM. This permits the user to make any number of changes in feeds and nutrients before the program calculates the ration. When the user is ready to calculate the ration, the "F9" function key is pressed. The program will flash "wait" in the upper right hand corner of the screen while it is calculating. Users with faster computers will want to use the automatic default and let the computer recalculate after each keyboard entry. To reset to automatic, the keystroke sequence is /WGRA.

Helpful Hint: Often this program is more readable if the user uses the zero suppression option (ALT Z).

Calculating a Ration

Rations are calculated by trial and error. Although this may seem crude, the speed of the computer makes this relatively efficient.

First, press Alt F keys to move the cursor to the top left hand corner of the screen. Next, check the nutrients in the selected

feeds. If they need to be changed to correctly represent your feeds, use the EDIT (Alt E) command. New feeds can be added by using the SELECT (ALT S) option. Be sure to enter new nutrient data for the new feed. Note that the cost of each ingredient is entered in terms of \$/hundred weight on an as fed basis, the way most feeds would be quoted from a feed store.

Next, enter your initial "guesses" for percentages of each ingredient to be used in the ration. The total does not need to add to 100 for calculation of the ration, but keeping the total at 100 may make it easier to visualize the proportions of each feed as you make your first entries. Once the ration composition is complete, the user can recheck the animal data. The user should also scroll down to the "Feeding Sheet" to view the final ration. Ingredients are listed as percentages on "as

fed" basis and as pounds for two batch sizes. An example screen output is shown below. The user can change batch sizes from the keyboard for the two batch columns to produce desired batches for mixing. If the program is running in the manual mode, the user must press "F9" each time a change is made in order to recalculate the new batches.

There are additional nutrient requirements other than those described in this program, among these are salt, vitamins, and trace minerals. **If the user does not have training in nutrition, the program's use should be limited to checking to see if proven formulas are adequate for the class of swine being fed. A ration meeting the requirements calculated by this program may not be safe to feed.**

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