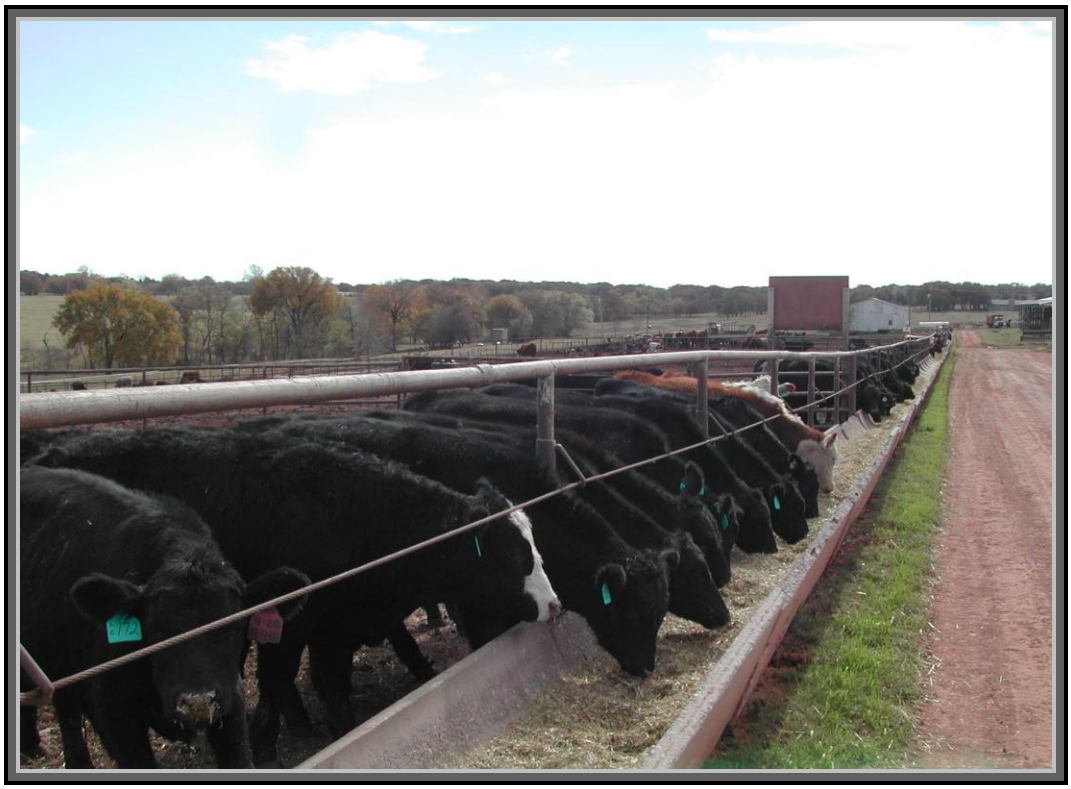
DIVISION OF AGRICULTURE
RESEARCH & EXTENSION
University of Arkansas System

Cattle Grower
Ration Balancing Spreadsheet



Cattle Grower Ration Balancing Spreadsheet Program
User Guidelines

Purpose

The GRB spreadsheet was designed for balancing rations for growing and finishing cattle. The spreadsheet program is based on equations developed by the National Research Council(NRC) and published in the 1996 and 2000 Nutrient Requirements for Beef Cattle. Users should not expect animals to always perform exactly as predicted by the spreadsheet. Various factors such as actual versus estimated quality of ingredients, intake, weather, calf genetics and health all play a role in how well an animal gains on a particular diet.

Using the Spreadsheet

A working version of Microsoft Excel or OpenOffice is required to run this spreadsheet program. OpenOffice users should turn off the gridlines under the Tools and Options menu. The lookup feature on the Ration Formulation sheet is the only menu item that does not appear cross-compatible with OpenOffice. This feature is not necessary since the feeds can be looked up by going directly to the Feed List and looking through the feeds for the feed code. When loading the program a screen or menu bar will prompt that the spreadsheet contains Macros. Macros must be ENABLED for the spreadsheet to function correctly. If macros are not enabled, visit the software help file to determine how to change macro settings.

General Layout

The GRB spreadsheet is composed of four sheets

1) **Calf Info (red tab)**
2) **Ration Formulation (orange tab)**
3) **Feed List (green tab)**
4) **Feed Blend (blue tab)**

Cells that can be modified are colored blue. All other cells are protected from modification.

Calf Info (Figure 1)

The Calf Info page provides input for producer information and inputs on calf type and desired growth rate. Weights entered into this program are assumed to be unshrunk weights; therefore, adjustments to body weight are made by the spreadsheet to estimate shrunk and empty body weight necessary to calculate requirements and estimate performance. Likewise, estimates of requirements and intake are calculated under the assumption that neither ionophores nor implants are being used. Using these management options will improve performance of cattle on a given diet.

The design of the **Calf Info** page is based on the concept that cattle producers will have an estimated start and completion date in mind for a set of cattle. Entering in the estimated mature body weight and percent of mature body weight targets become a necessity to determine the desired average daily gain. This design was chosen to compliment heifer and bull development programs where target rates of gain and periodic weighing and feed adjustment can be accommodated.

Calf Info - Features

Input	Cell(s)	Description
Producer Information	**C2..C7**	Name, Address, City, State, Zip, Phone
Number of Head	**D9**	Enter 1 or Actual number of head
Sex	**D10**	Required to adjust requirements for sex of calf.
Start Date	**D11**	Necessary to calculate desired rate of gain
Calf age (months)	**D12**	Necessary for intake prediction
Start Weight	**D13**	Necessary to calculate desired rate of gain
Start Body Condition	**D14**	Necessary to adjust maintenance requirements. This cell contains an attached note with the condition score values and a description of the scores.
Calf Breed Type	**D16**	Necessary to adjust maintenance requirements for breed type. Brahman influenced breeds energy maintenance requirements are adjusted downward and maternal breeds are adjusted upward.
Estimated Mature Weight	**D18**	Required for calculating target ending weight
Estimated feeding days	**D20**	Required for calculated daily gain
Desired rate of gain	**D21**	Required for calculating target ending weight
Target Ending Weight	**D22**	This value is calculated.
Management – growth implant	**D25**	Adjusts gain response through intake adjustment
Management – ionophore	**D26**	Adjusts gain response through intake and ME adjustment

Note: Cells in blue are modified by the user.

Ration Formulation (Figure 2)

The **Ration Formulation** sheet is where feedstuffs are entered and adjusted to balance the ration. Rations are formulated on an As-Fed Basis. The user may choose to balance rations using a variety of methods including entering feeds on a percent of intake or percent of diet, pounds per cwt or pounds per ton, or as pounds of intake. These methods of ration balancing will be addressed later. The **Ration Formulation** sheet is composed of 5 components:

Feed Reference Lookup	This feature allows the user to lookup feed codes without switching between the Feed Formulation and Feeds List sheets.
Feedstuff Entry Cells	This section is where you enter feed reference codes, feed percentages or amounts, and price of selected ingredients
Dry Matter Intake	These cells show the NRC predicted dry matter intake and allow the user to adjust the predicted intake if necessary.
Nutrient Profile	These cells present the estimated dry matter nutrient profile based on the entered feed ingredients and amounts.
Performance Indicators	These cells present the desired and estimated rates of gain, estimates of feed conversion, and cost of gain.

Ration Formulation - Feedstuff Entry

Feed No	**A7..A21**	Enter the Feed ID number. Up to 15 feeds may be entered from the feed list.
Feed Ingredient	**B7..B21**	Corresponding name for the Feed Id
As-Fed Diet Composition	**C7..C21**	Enter the Composition of each ingredient. (see notes below on methods of entry)
$/cwt As-Fed	**D7..D21**	Enter the $/cwt of each feed ingredient if prices are available. Adjusting feed ingredients based on price may help select the ingredient that results in a more economical cost of gain (Performance Indicator cell C35)
As-Fed Total	**C22**	Cumulative total of As-Fed Diet Composition
Dry Matter Total	**C23**	Cumulative total of diet dry matter.

Note: Cells in blue are modified by the user.

Ration Formulation - Methods of Entering As-Fed Diet Composition

Percent	Enter each ingredient as a percentage of the total. For accurate ration balancing, the As-fed total (C22) must add up to 100.
Pounds in ration	Enter each ingredient as a function of weight. For example if formulating for a 2000 pound complete ration, the As-Fed total (C22) must add up to 2000
Pound of intake	Enter each ingredient as a function of intake. For accurate ration balancing, the Dry Matter Total (C23) must be equivalent to the Estimated DMI lbs/hd/d (C26).

Dry Matter Intake: Estimated performance is based on expected dry matter intake. Dry matter intake is predicted for the user based on NRC equations. The user may adjust the Dry matter intake by changing the DM adjuster cell (C27). When set at 100%, the estimated dry matter intake is equal to the NRC predicted dry matter intake. For example, if DM adjuster is changed to 105%, the estimated dry matter intake will be 5% higher than the predicted dry matter intake. Dry matter intake is also shown as a percentage of body weight (D25 and D26). Equations to calculate dry matter intake differ for weanling and yearling age cattle; therefore, it is important that an accurate age estimate be entered in the **Calf Info** sheet cell D39.

Nutrient Profile: The nutrient profile shows the profile of the combined ingredients entered based on their relative proportion. The values are only as accurate as the values entered into the **Feed List** sheet. For example, if mineral compositions are missing from select feeds within the **Feed List**, then the mineral estimates will not be accurate. Therefore, double check and make sure all values are accounted for in the **Feed List** before drawing conclusions about the nutrient profile. **The percent of requirement met appears in Red.**

Ration Formulation - Performance Indicators

Calf Weight	This shows the weight of the calf that the ration is being balanced. This weight is equivalent to the weight found in cell D42 of the **Calf Info** sheet.
Desired Rate of Gain	This shows the desired rate of gain that is being formulated. This rate of gain is equivalent to the gain found in cell D23 of the **Calf Info** sheet.
Energy Predicted Rate of Gain	This is the Estimated Rate of Gain based on the energy content of the diet. The Estimated Rate of Gain will not be accurate if the CP required (I12) is not equal to or less than the CP provided (H12). The diet composition must be adjusted until Energy Predicted Rate of Gain is close to the Desired Rate of Gain. Note: The CP required is based on the Desired Rate of Gain.
As-Fed Feed Cost Per Lb Gain	Calculated cost per lb gain.
Dry Matter Feed Conversion	Dry matter feed intake required to put on one pound of gain.

Balancing Issues

When balancing the diet, "common issues" that may appear in this window in red print. Issue no. 1, Make sure enough fiber is in the diet for rumen health, occurs when effective NDF (eNDF) fiber falls below 10. Visit with a nutritionist before feeding free choice diets with a low 'roughage' content. Issue no. 2, Warning Ca:P imbalance, can be corrected by adding calcium carbonate or feed grade limestone to the diet until the warning is no longer visible. Issue no. 3, High sulfur warning, can be corrected by reducing the amounts of high sulfur ingredients in the diet and knowing the recommended 'maximums' for different ingredients. Issue no. 4, High fat warning, can

be corrected by reducing the amounts of high fat ingredients in the diet and knowing the recommended 'maximums' for different ingredients.

Feed List (Figure 3)

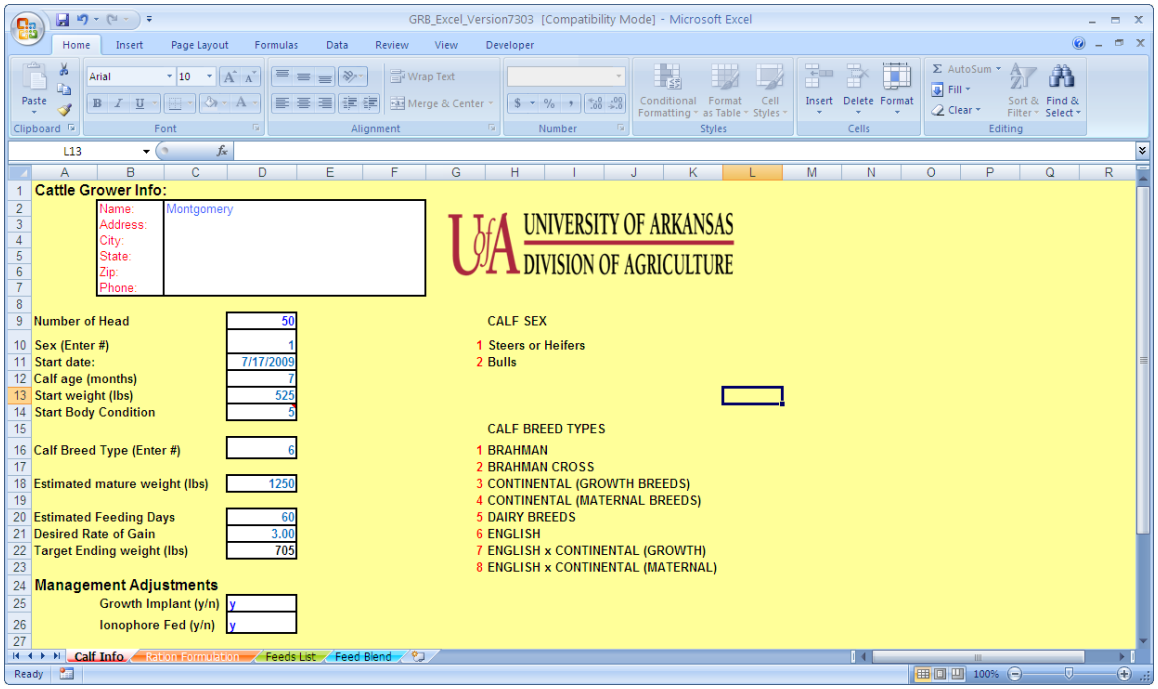
Feed List contains the nutrient composition of various feed ingredients. Feed values are entered on a Dry Matter basis. Nutrients in **black** are NRC values and cannot be modified. Net Energy values in the spreadsheet are calculated from TDN. Nutrients in **red** are average values for hays from the Arkansas hay database. Values in **blue** may be completed by the user, such as adding results from current hay tests or analysis of feedstuffs. The nutrient profile portion of the **Feed Formulation** sheet is only as accurate as the values placed in the **Feed List**. If some of the ingredients used are missing values for minerals, the calculated nutrient profile will be inaccurate. If entering a feedstuff analysis such as a hay test and values are missing, such as mineral content, consider using mineral values based on averages from similar hays reported in the spreadsheet.

Feed Blend (Figure 4)

The **Feed Blend** Sheet allows the user to select the ingredients that will be blended together to make up the mixed feed portion of the diet. To accomplish this, choose enter **Y** (yes) or **N** (no) in the Items to keep column. For example, if hay, corn, and cottonseed meal are all a part of the feed formulation, the corn and cottonseed meal can be selected from the feed blend to determine how many pounds must be added for blending. In addition, the feed blend sheet will also show how many pounds to feed. This is helpful if feed formulation is based on a percent of intake. Batch size can be adjusted to accommodate desired batch size. If formulating a salt limited ration, enter Y (yes) at the bottom of the items to keep column. Salt limiting is based on a salt limit of 0.1 lb salt per hundred pounds body weight. The body weight used for salt limiting is the average value calculated in **Calf Info** cell D42. The maximum salt intake is added in addition to the remaining ingredients selected in the Items to Keep column.

Mixing batches can be based on weight of the total mix (lbs) or if a producer is using a tub-mixer, batches can be based on the weight of round bales and number of round bales added per batch. Days Feed Per Batch and Batches Required for 1 day feeding can be used to determine if formulations that included batched bales feasible. For example, if a producer is adding wet ingredients to a round bale hay, there needs to be a sufficient number of animals being fed so a batch of feed is mixed, fed, and consumed in ample time to prevent spoilage.

Figure 1. Calf Info Screen Example



GROWER RATION BALANCER FLOWCHART

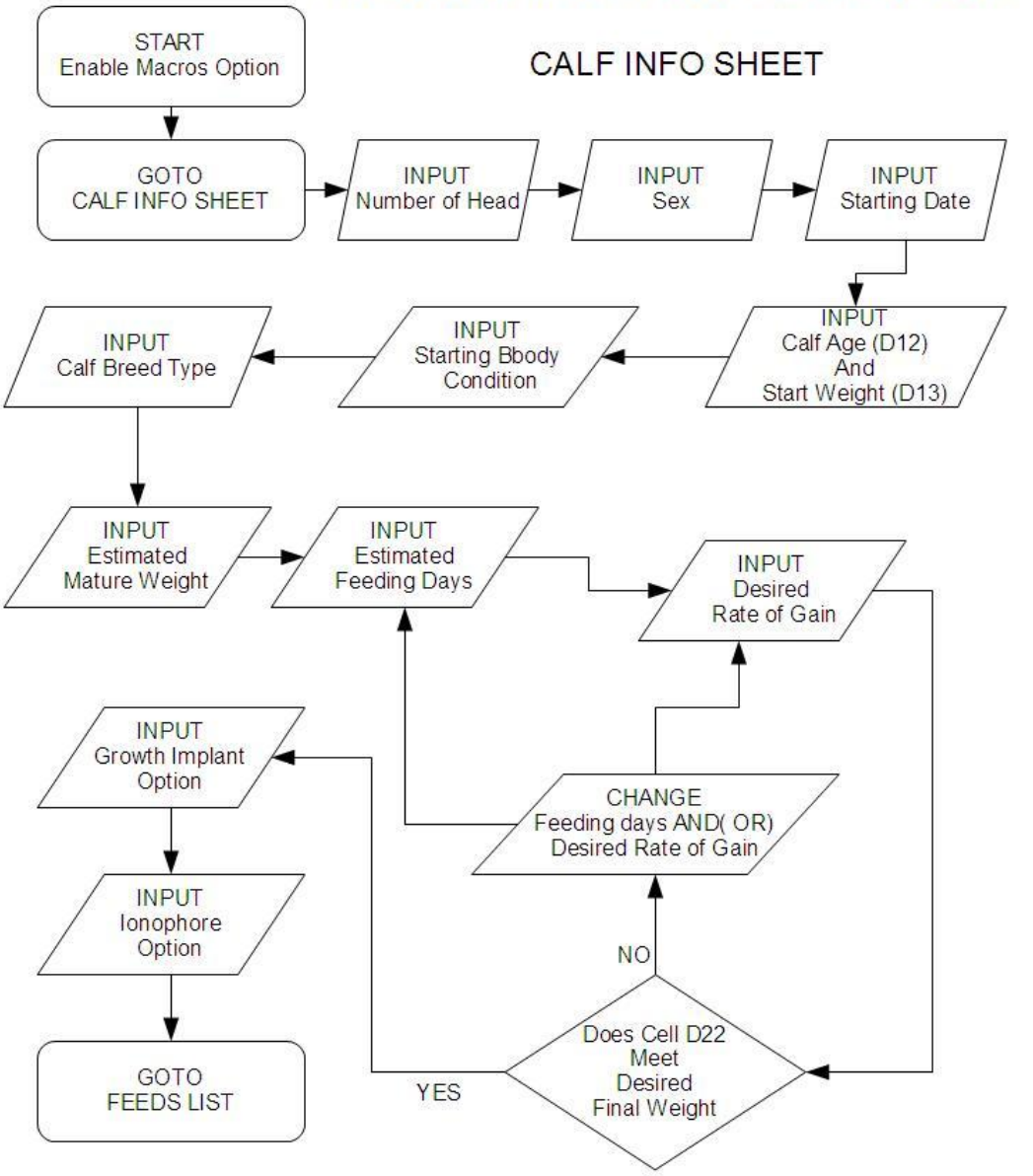
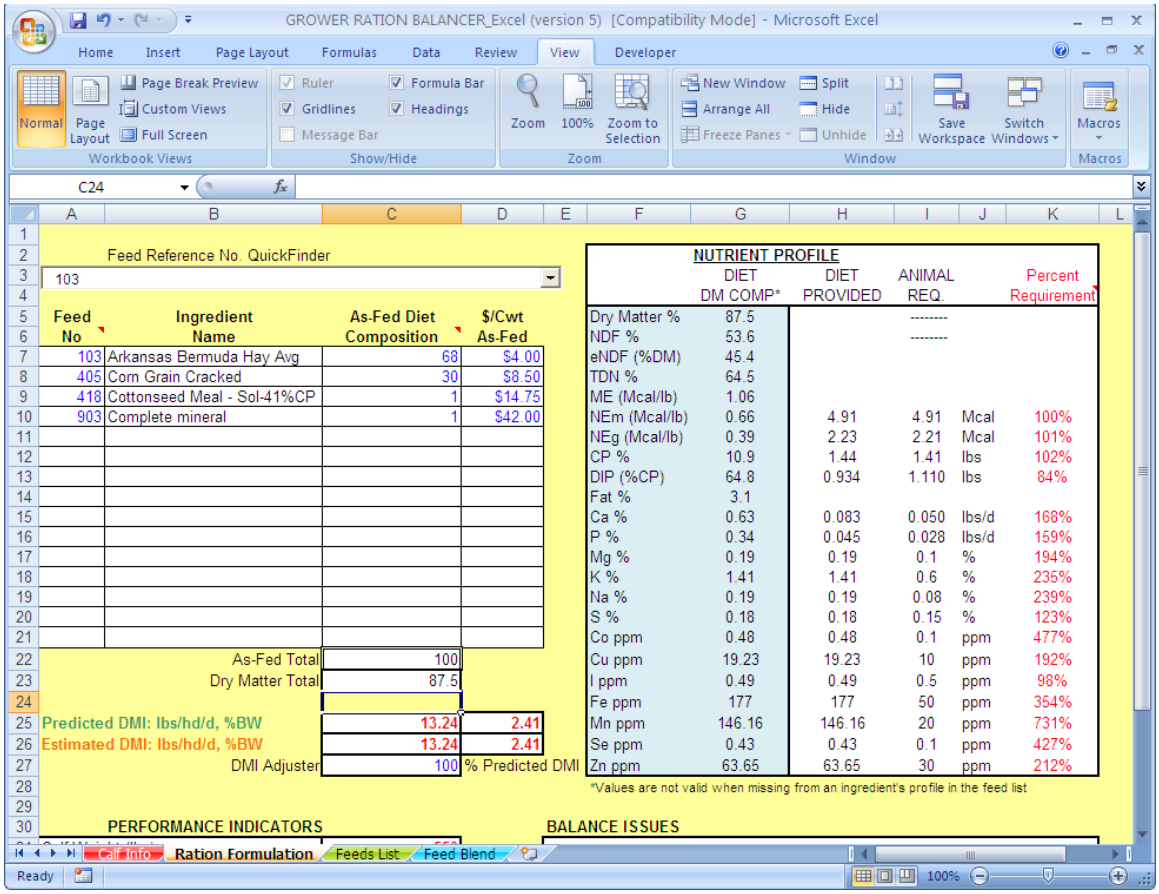
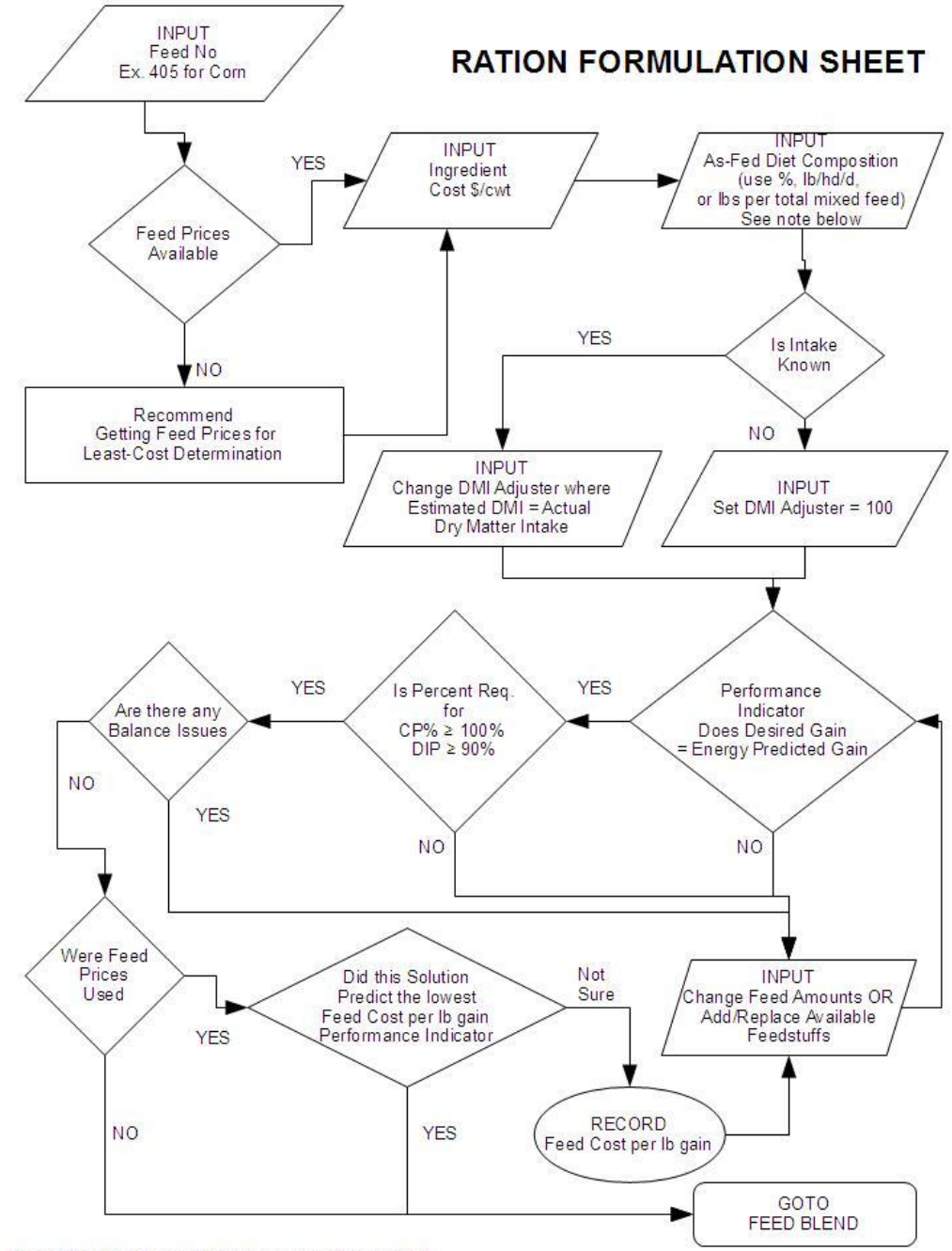


Figure 2. Ration Formulation Screen Example

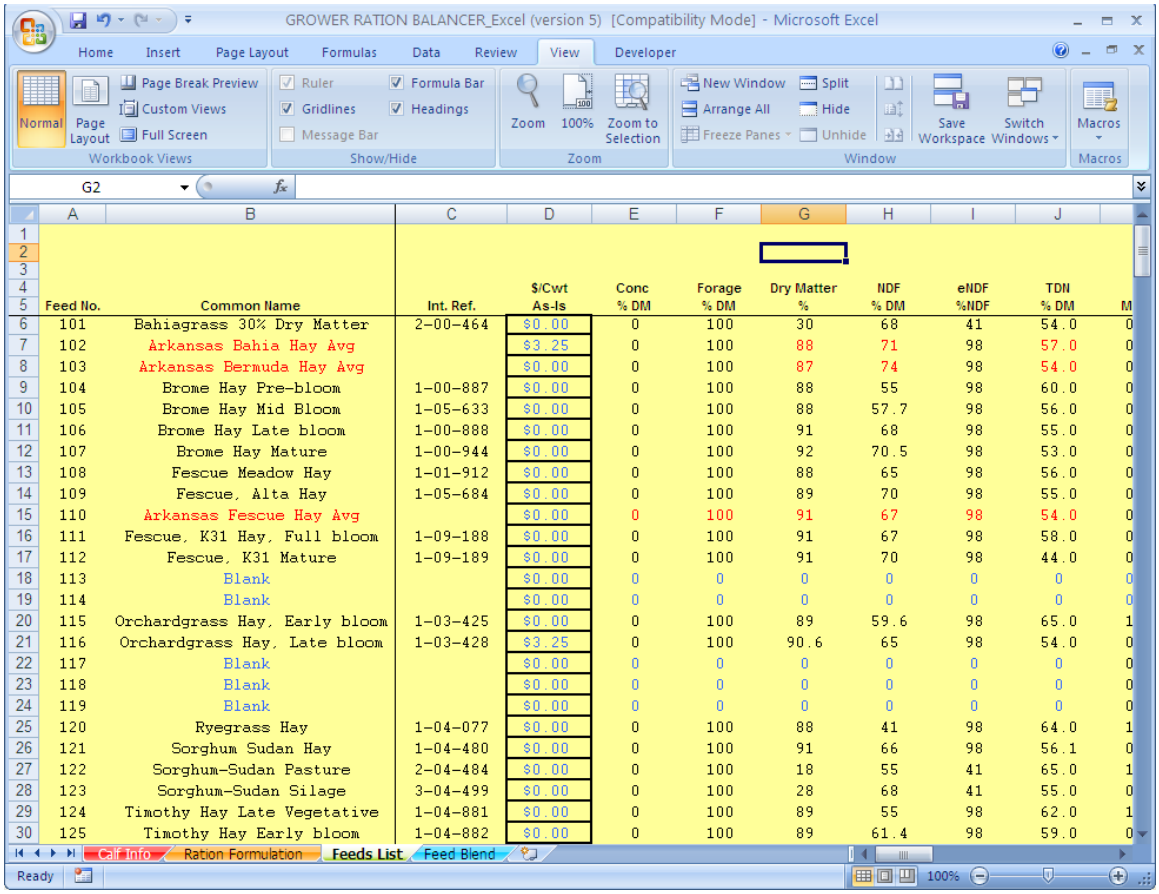


RATION FORMULATION SHEET



If using lbs/hd/d, dry matter total must = estimated DMI

Figure 3. **Feed List** Screen Example



Feed No.	Common Name	Int. Ref.	$/Cwt As-Is	Conc % DM	Forage % DM	Dry Matter %	NDF % DM	eNDF %NDF	TDN % DM	M
101	Bahiagrass 30% Dry Matter	2-00-464	$0.00	0	100	30	68	41	54.0	0
102	Arkansas Bahia Hay Avg		$3.25	0	100	88	71	98	57.0	0
103	Arkansas Bermuda Hay Avg		$0.00	0	100	87	74	98	54.0	0
104	Brome Hay Pre-bloom	1-00-887	$0.00	0	100	88	55	98	60.0	0
105	Brome Hay Mid Bloom	1-05-633	$0.00	0	100	88	57.7	98	56.0	0
106	Brome Hay Late bloom	1-00-888	$0.00	0	100	91	68	98	55.0	0
107	Brome Hay Mature	1-00-944	$0.00	0	100	92	70.5	98	53.0	0
108	Fescue Meadow Hay	1-01-912	$0.00	0	100	88	65	98	56.0	0
109	Fescue, Alta Hay	1-05-684	$0.00	0	100	89	70	98	55.0	0
110	Arkansas Fescue Hay Avg		$0.00	0	100	91	67	98	54.0	0
111	Fescue, K31 Hay, Full bloom	1-09-188	$0.00	0	100	91	67	98	58.0	0
112	Fescue, K31 Mature	1-09-189	$0.00	0	100	91	70	98	44.0	0
113	Blank		$0.00	0	0	0	0	0	0	0
114	Blank		$0.00	0	0	0	0	0	0	0
115	Orchardgrass Hay, Early bloom	1-03-425	$0.00	0	100	89	59.6	98	65.0	1
116	Orchardgrass Hay, Late bloom	1-03-428	$3.25	0	100	90.6	65	98	54.0	0
117	Blank		$0.00	0	0	0	0	0	0	0
118	Blank		$0.00	0	0	0	0	0	0	0
119	Blank		$0.00	0	0	0	0	0	0	0
120	Ryegrass Hay	1-04-077	$0.00	0	100	88	41	98	64.0	1
121	Sorghum Sudan Hay	1-04-480	$0.00	0	100	91	66	98	56.1	0
122	Sorghum-Sudan Pasture	2-04-484	$0.00	0	100	18	55	41	65.0	1
123	Sorghum-Sudan Silage	3-04-499	$0.00	0	100	28	68	41	55.0	0
124	Timothy Hay Late Vegetative	1-04-881	$0.00	0	100	89	55	98	62.0	1
125	Timothy Hay Early bloom	1-04-882	$0.00	0	100	89	61.4	98	59.0	0

FEEDS LIST SHEET

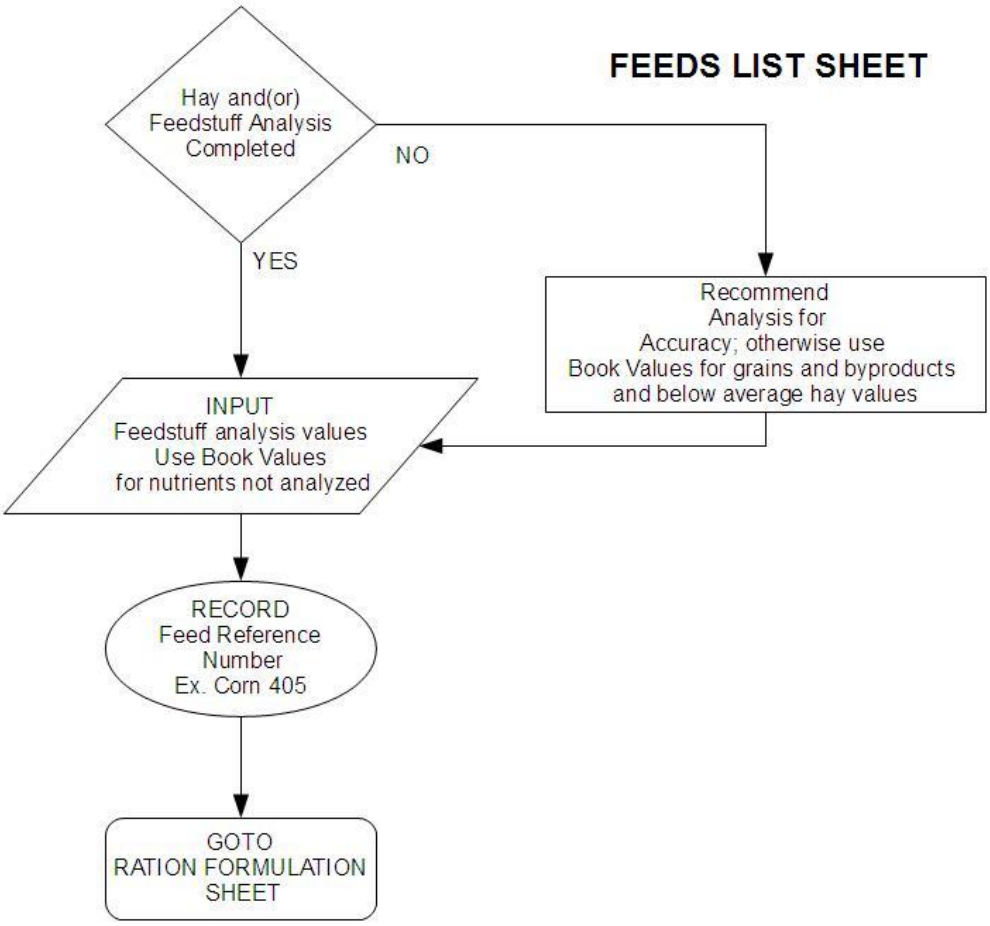
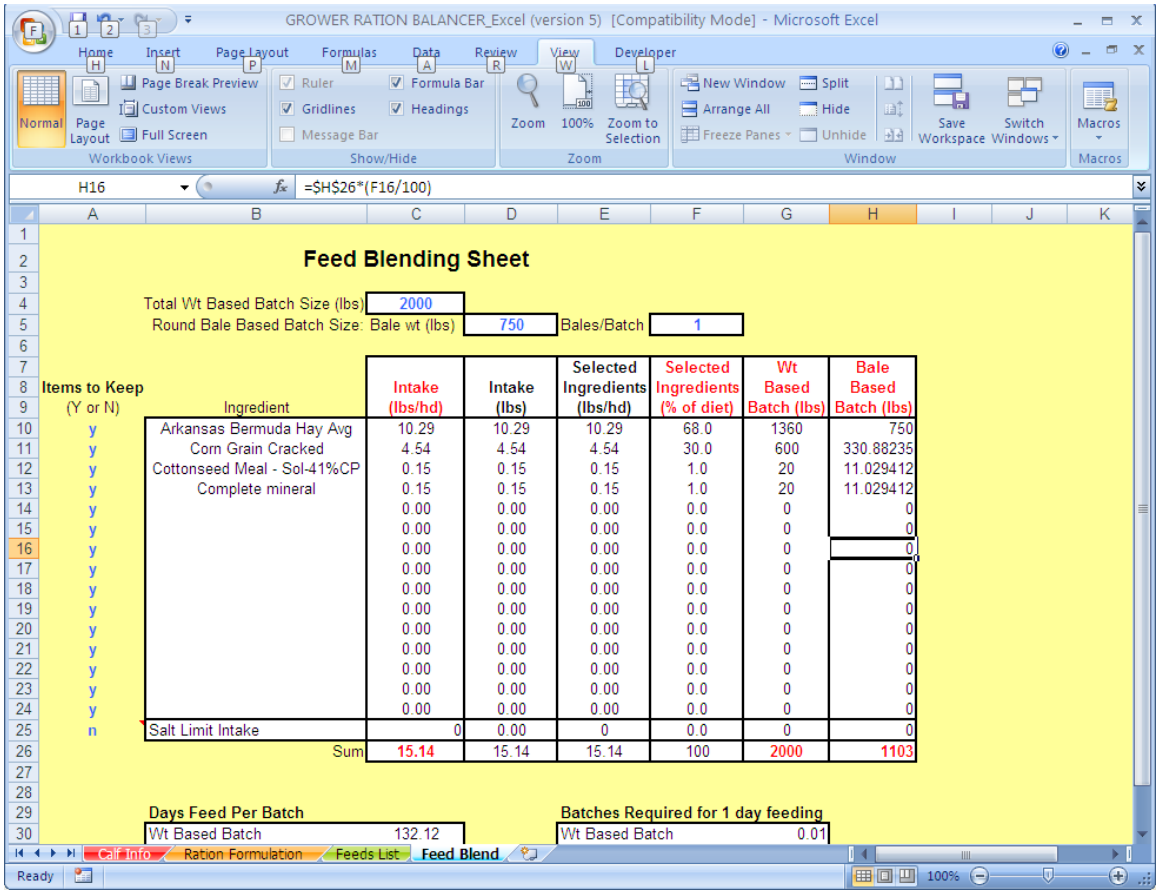
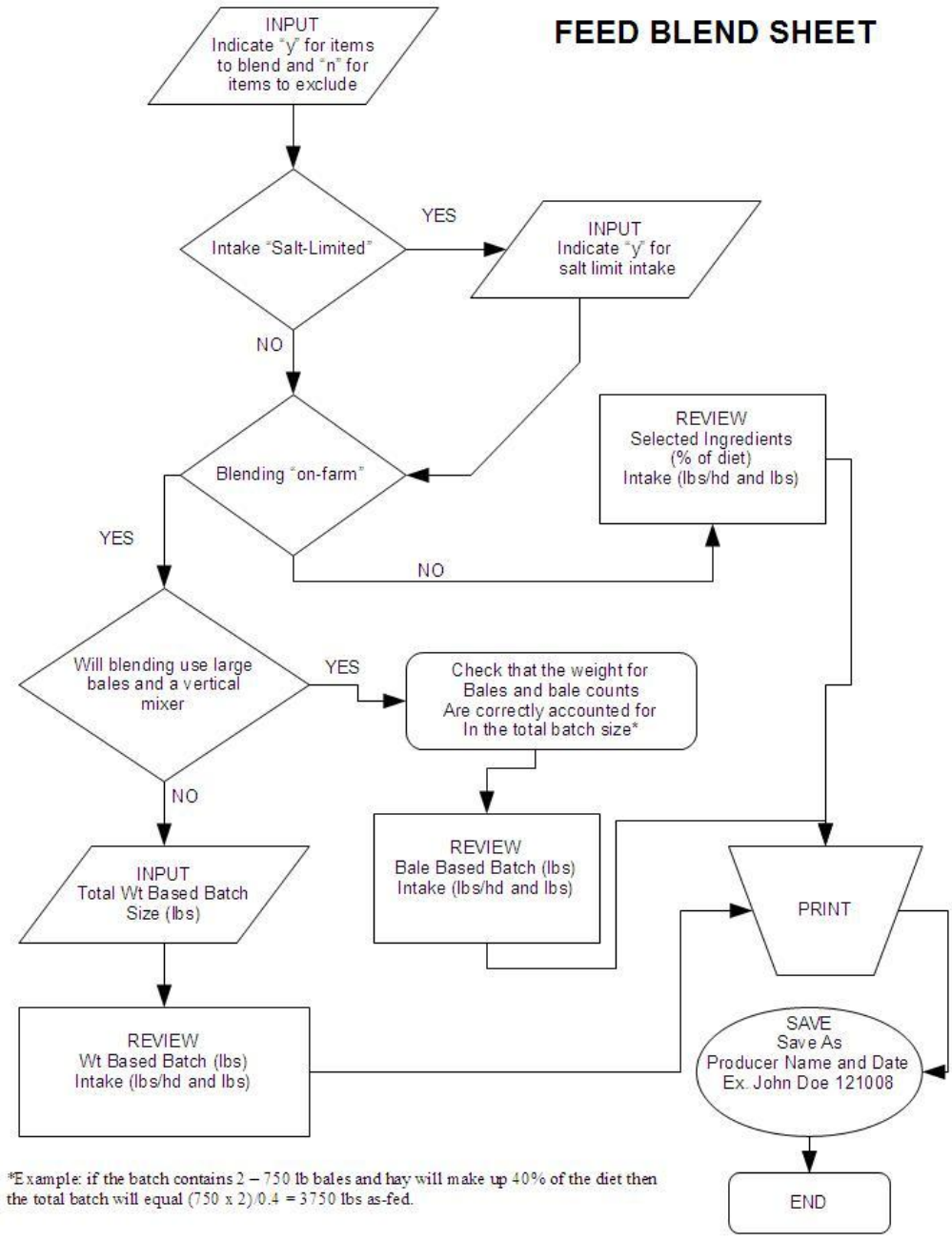


Figure 4. **Feed Blend** Screen Example





The spreadsheet and user's guide were developed by Dr. Shane Gadberry, Assistant Professor, University of Arkansas, Cooperative Extension Service.

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