# How to Formulate a Least Cost Mineral Supplement

A producer wants to formulate one ton mineral supplement for beef cattle. The supplement must have 13% - 15% Calcium, 7% Phosphorus, and 13% - 15% Salt on the Dry Matter basis. The following instructions are written for the TAURUS program, but can be used for any of our other ration formulation programs such as PCDAIRY, ARIES, CAPRICORN, or PEGASUS.

1. Run Taurus.
2. From the main menu select the 'Least Cost Ration: Growing or Finishing Cattle':
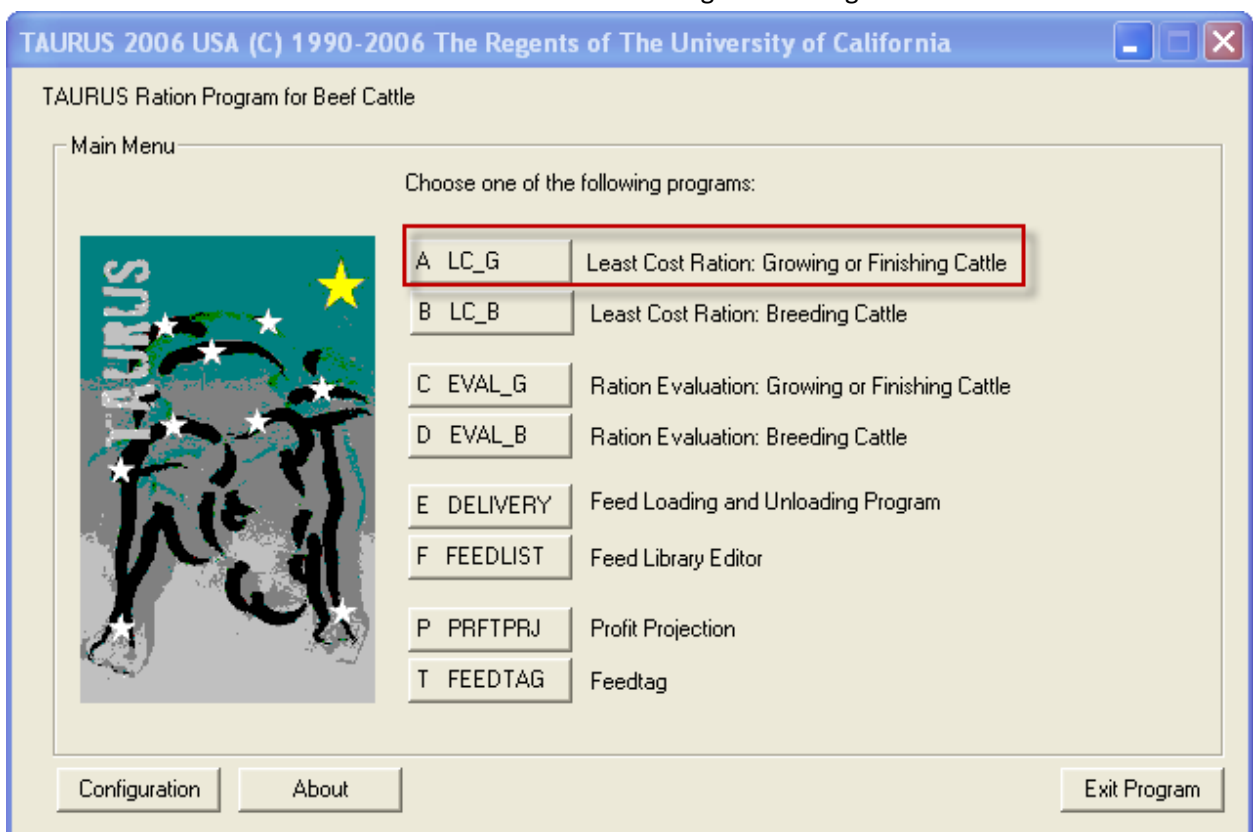
3. In the 'Animal Information' screen accepts the defaults, but make sure to select 'No' for 'Least Cost Gain'. Note that we are not using any of the animal information values. Then click the Next button (->).

4. In the 'Nutrient Constraints' screen use the 'Delete' button to delete all the existing entries that Taurus has calculated for you. Then use the 'Add' button to add three constraints:
Add DM (dry Matter) with 2000 lbs. as min and 2000 lbs as max. This will be equal to one ton.
Add CA (Calcium) with 13% as min and 15% as max.
Add P (Phosphorus) with 7% as min and 7% as max.
Then click the Next button (->).

5. In the 'Feed List' screen, use the 'Delete' button to delete all existing feeds and use the 'Add' button to add seven feeds with the price per ton. Note that only the Sodium Chloride (Salt) has 16% DM as min and 21% DM as max. There is no min and max for other feeds. Then click the next button (->):
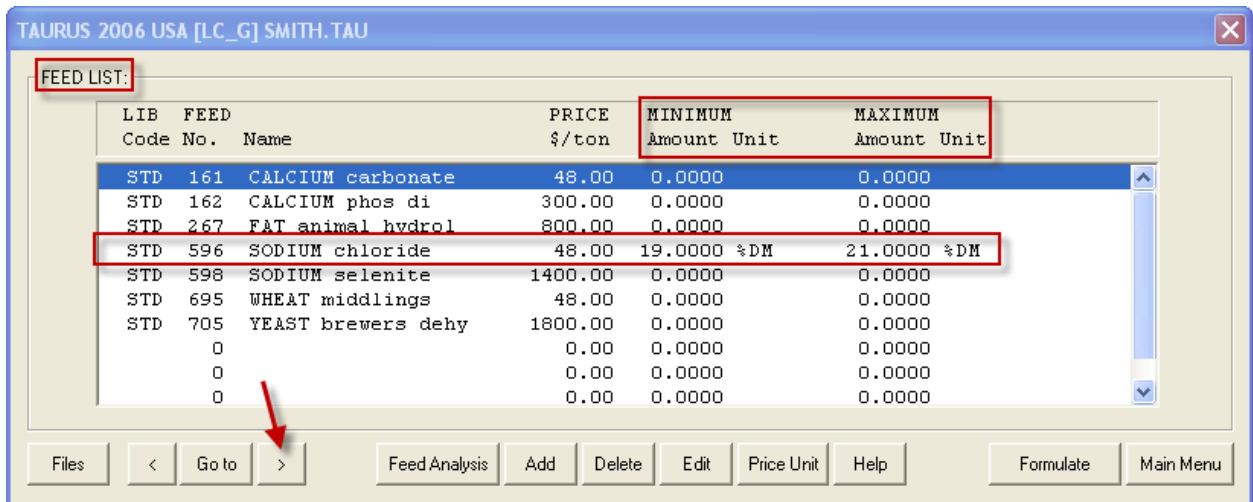
6. In the 'Feed Group List', use the 'Edit' button to set all the min and max values to zero. Then click Next (->):
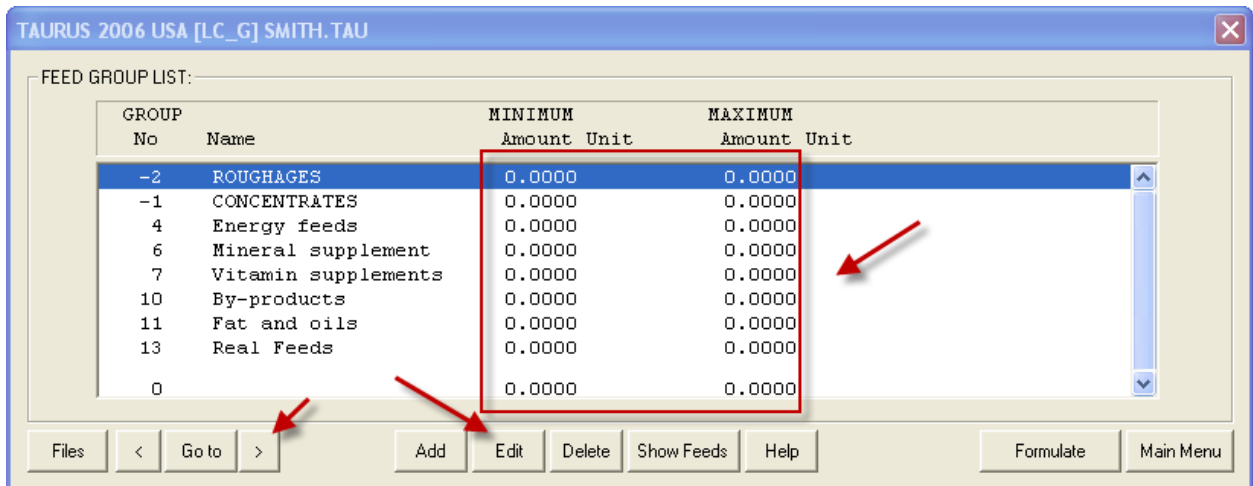
7. In the 'Ratio List' use the 'Delete' button to delete all existing entries in this screen and then click the 'Formulate' button.
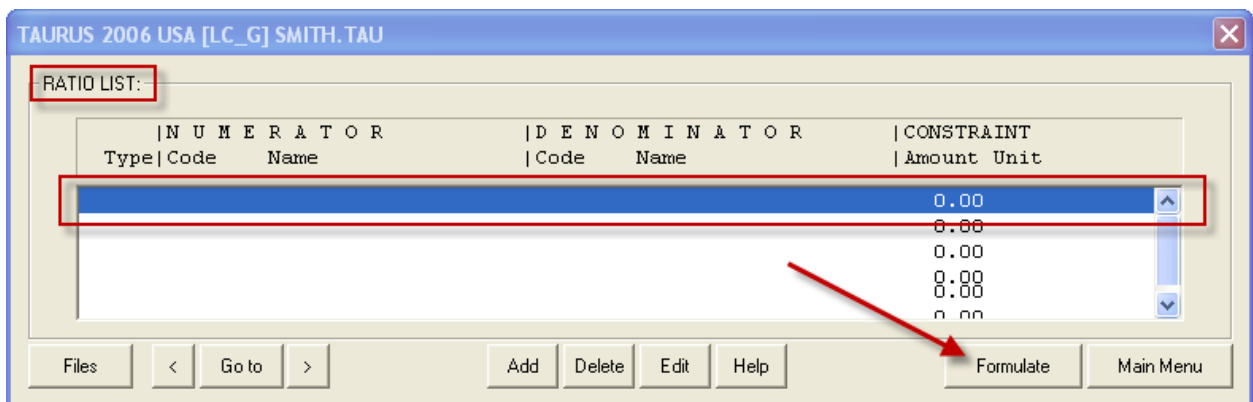
8. The Taurus program processes the information and shows the following screen, Click the OK button:

TAURUS 2006 USA [LC_G] SMITH.TAU

Processing

OK

```
Matrix SOLVED!

Solution OPTIMAL!
Solution FEASIBLE!
...


Calculating...
 9 total rows                    14 total columns
 1 objective row                  1 right hand side
 0 special rows                   0 special columns
 0 ratio constraints              7 feasible feeds
```

9. In the 'COST AND PERFORMANCE' screen ignore all values except the Feed Cost, which in our example is $133.64 per English ton As Fed. Then click Next (->):

TAURUS 2006 USA [LC_G] SMITH.TAU

OUTPUT

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                    California Beef Cattle Ranch
                  One Shields Avenue, Davis, CA 95616
        Phone:(530)752-1278 FAX:(530)752-0175 http://animalscience.ucdavis.edu


                 C O S T   A N D   P E R F O R M A N C E
         Starting Weight, lb .............     698.85
         Ending Weight, lb ..............    1102.29
         Average Weight, lb .............     900.57 (DM Intake 222.08% of Body Wt)
         Days on Feeding Phase ..........       8.91

                                   Whole Phase      Per Day      Per lb of Gain
         Gain, lb .......................     403.44        45.29        -----
         Feed Intake, DRY MATTER, lb .....  17816.87      2000.00        44.16
         Feed Intake, AS FED, lb .........  18658.20      2094.44        46.25

         Feed Cost, $....................    1246.71       139.95         3.09
         Overhead Cost, $................       1.78         0.20         0.00
         Feed & Overhead cost, $.........    1248.50       140.15         3.09

         Feed Cost:    133.64 $/English ton AS FED
```
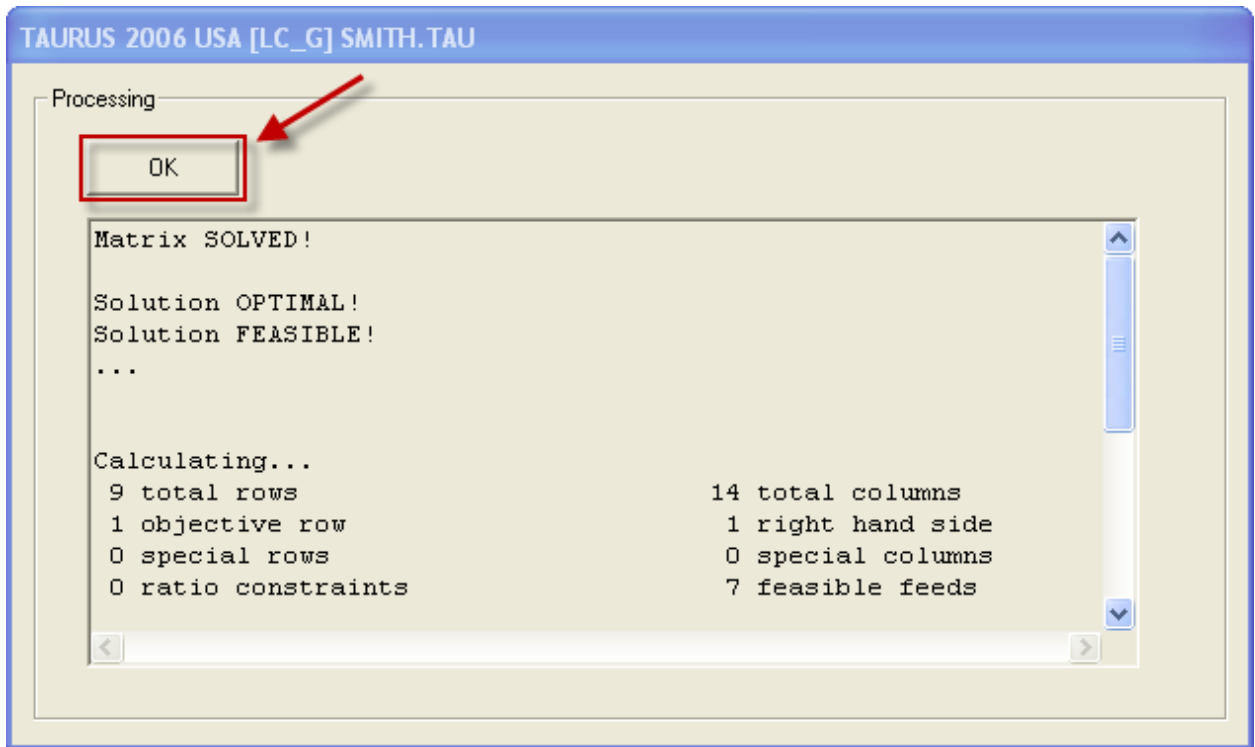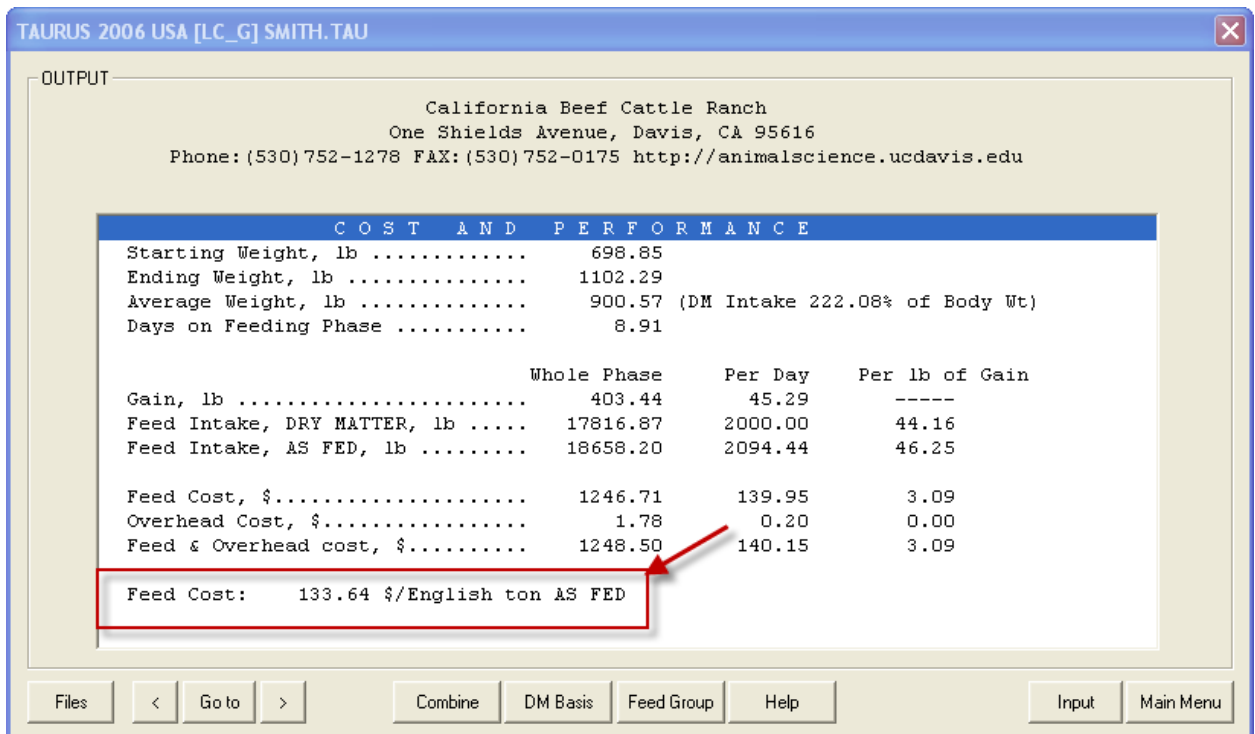
| Files | < | Go to | > | | Combine | DM Basis | Feed Group | Help | | Input | Main Menu |

10. The program shows the solution in the 'RATION COMPOSITION' screen. In our example, the program uses the four feeds from the seven feeds to formulate the least cost mineral supplement. Note that the amount of the 'Sodium Chloride (Salt)' is 19% on Dry Matter basis and the price of the mineral supplement is $133.64 per English ton on the As Fed basis. Then click Next (->):

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TAURUS 2006 USA [LC_G] SMITH.TAU                                              ☒

 ┌OUTPUT───────────────────────────────────────────────────────────────────────
                            California Beef Cattle Ranch
                         One Shields Avenue, Davis, CA 95616
              Phone:(530)752-1278 FAX:(530)752-0175 http://animalscience.ucdavis.edu


                      R A T I O N   C O M P O S I T I O N
                                 ALL FEEDS

                                                           ---Constraints----
                               AS FED         DRY MATTER       As fed   100% DM
      ALL FEEDS                 BASIS:          BASIS:        -lb/day-  -%Total-
      in the ration            lb/day    %     lb/day    %    min  max  min  max
      --------------------     ------ -------   ------ -------  ---  ---  ---  ---
      WHEAT middlings          730.895  34.897  657.806  32.890
      CALCIUM phos di          711.754  33.983  690.401  34.520
      SODIUM chloride          380.000  18.143  380.000  19.000          19.0 21.0
      CALCIUM carbonate        271.793  12.977  271.793  13.590
                               ------            ------
         Total Ration......   2094.442          2000.000

         Cost, $/day.......    139.95
         Cost, $/ton.......    133.64             139.95



   Files    <   Go to   >        Combine  DM Basis  Feed Group  Help        Input  Main Menu
```

11. In the 'PRICE RANGE' screen the Taurus program shows two sets of feeds: 'Feed used in the ration' and 'Feeds not used'. The program tells you why these feeds are not used by calculating their opportunity prices. For example the price of Feed number 267 'Fat Animal Hydrol' is $800.00 at formulation, but unless its price drops to $39.02 per ton, it will not be used. Then click Next (->):

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TAURUS 2006 USA [LC_G] SMITH.TAU                                                    ✕

┌ OUTPUT ───────────────────────────────────────────────────────────────────────────
                          California Beef Cattle Ranch
                       One Shields Avenue, Davis, CA 95616
            Phone:(530)752-1278 FAX:(530)752-0175 http://animalscience.ucdavis.edu


                    P R I C E   R A N G E S   $/ton   A S   F E D

       Feeds used in ration     lbs per day     Price  Lower range  Upper range
       -------------------------  -----------    -----  -----------  -----------
       STD 161 CALCIUM carbonate    271.79292    48.00        39.76       379.55
       STD 162 CALCIUM phos di      711.75388   300.00       149.28     36943.40
       STD 596 SODIUM chloride      380.00000    48.00        39.41    999999.99
       STD 695 WHEAT middlings      730.89535    48.00      -334.95        55.04

                                            ------- Price as fed, $/ton ----
       F E E D S   N O T   U S E D           At formulation       Opportunity
       -------------------------            --------------       -----------
       STD 267 FAT animal hydrol                   800.00             39.02
       STD 598 SODIUM selenite                    1400.00             38.62
       STD 705 YEAST brewers dehy                 1800.00             55.73



    Files    <   Go to   >        Combine   DM Basis   Feed Group   Help        Input   Main Menu
```

12. In the 'NURIENT ANALYSIS' check the amount for DM (Dry Matter), CA (Calcium), and P (Phosphorus). DM is 2000 lbs., CA is 13%, and P is 7%. This screen shows that the program has formulated a least cost mineral supplement with the constraints specified by you.

13. Click on the 'Files' button and then select the 'Print' option to print the 'Ration Composition' and 'Nutrient Analysis' sections.
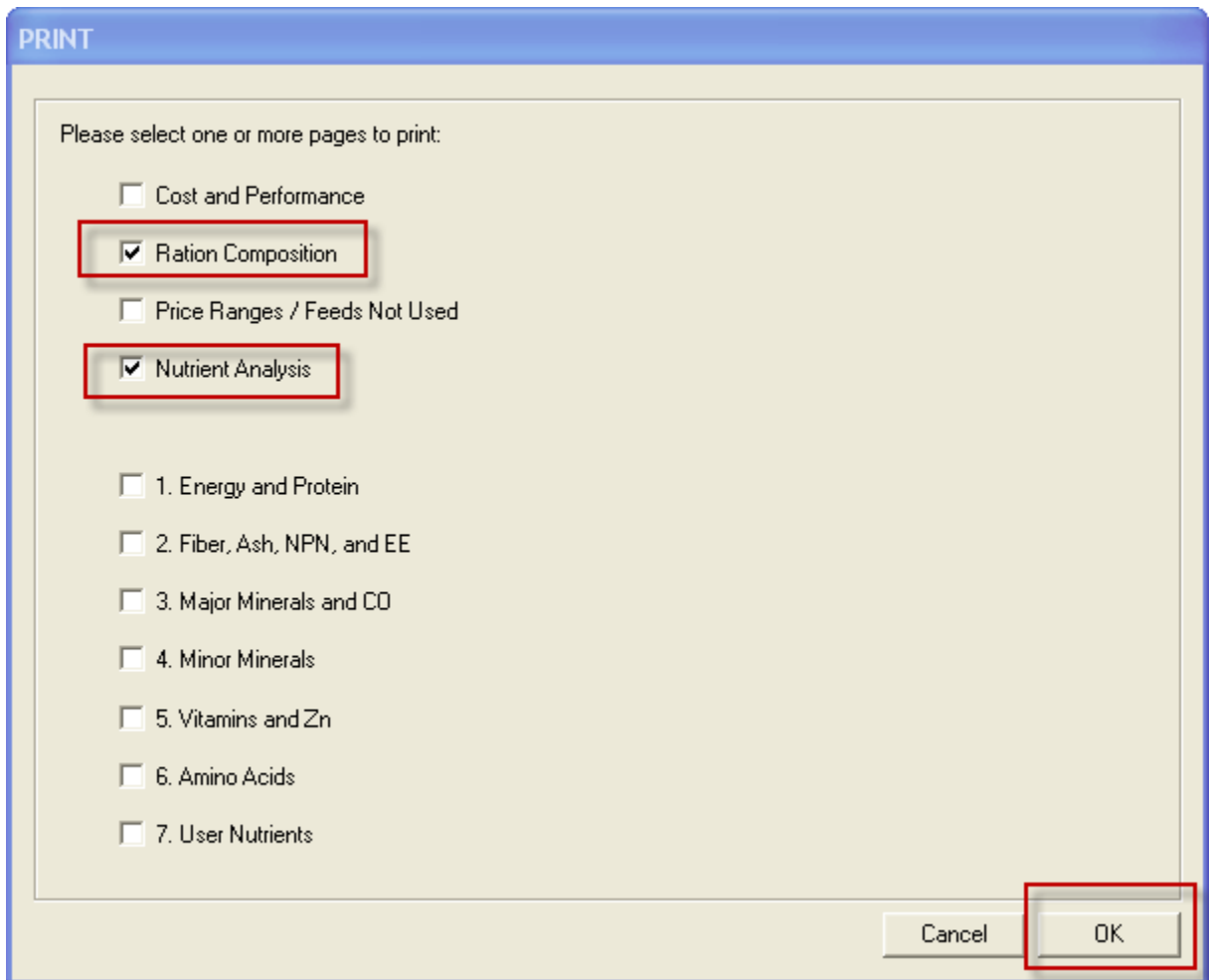
14. Use the printed output to enter the supplement mix as a new feed in your alternate feed library. To add a new feed, go to the main menu and select the 'Feed Library Editor' option.

Summary: In this document we have shown how to formulate a least cost mineral supplement using the Taurus program.