# TAKE-AWAY : A RUMINANT NUTRITION SOFTWARE PACKAGE

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## SUMMARY

**TAKE-AWAY is a decision support software program that calculates least cost supplementary *or* fully supplied rations for sheep and beef cattle. Rations can be formulated for drought, maintenance, growth, pregnancy, or lactation feeding situations. Supplementary rations can be added to dry summer/autumn pasture or cereal stubble paddocks while fully supplied rations are for lot fed or drought fed animals.**

**TAKE-AWAY can also be used for budgeting fodder reserves, both in terms of the quantities of feedstuffs to put in store and when determining alternative feed purchasing *or* selling strategies.**

**TAKE-AWAY produces balanced rations for ruminant animals on a least cost basis. The software is intended for use when the cost of feeding is an important consideration and where a range of feedstuffs is potentially available from which to select.**


## INTRODUCTION

**The need for ruminant ration calculating software able to be run on a personal computer was indentified by livestock officers of the South Australian Department of Agriculture. Extension staff were seeking a simple, fast and flexible method of determining rations and fodder reserve budgets in consultations with grazier clients and for use in district extension activities. The TAKE-AWAY programming project has built on and further developed the initial work of A.L. Pullman and A.D. Hughes (RUMNUT software) conducted at Turretfield Research Centre.**

## MATERIALS AND METHODS

**The TAKE-AWAY software consists of five main elements, the user interface to collect operator inputs, a database of common southern Australian feedstuffs, a set of minimum daily animal nutritional requirement equations, a linear programming algorithm and a report generator. The software is written in Microsoft QuickBasic V4.0 and runs on computers using the MSDOS operating system.**

### User *interface*

**The operator is required to define the animals to be fed and their production status by selecting choices at a series of menus e.g. sheep *or* cattle, maintenance or growth, and in response to prompt questions where the input data is of a continuous nature e.g. live weight or growth rate. An expert system routine automatically suggests the most suitable energy density M/D for each run based on the animals to be fed, the feedstuffs on offer and the type of ration, supplementary or fully supplied. Where default values are used to set production variables e.g. milk protein concentration, they can be over ridden by operator entered data if necessary. All inputs are guarded by range checking to prevent entry of invalid responses.**

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### *Database of feedstuff files*

TAKE-AWAY maintains a feedstuffs database. Each feed file contains values for metabolisable energy MJ/kg DM, rumen degradable protein g/kg DM, undegradable protein g/kg DM, calcium g/kg DM, phosphorus g/kg DM, sodium g/kg DM and dry matter percentage. Mineral supplement files are also included e.g. salt, stocklime, dicalcium phosphate. New feed files can be added to the database and existing files modified when local feed test data is available. Two default files, dry pasture or cereal stubble, can be used when calculating summer/autumn supplementary rations. These files can also be modified if actual energy and protein values of the dry paddock residue are known.

### *Daily animal nutritional requirements*

Minimum daily animal nutrient requirements for metabolisable energy, rumen degradable protein, undegradable protein, fibre, calcium, phosphorus, sodium and predicted maximum dry matter intake are calculated by a set of equations drawn or adapted from the Agricultural Research Council (1980). These equations were originally programmed into computer code by Pullman and Hughes (1986) in the RUMNUT software.

### *Linear programming routine*

Before calling the linear programming algorithm to calculate a ration the operator is required *to* nominate a set of feedstuffs available on-farm or able to be purchased, the feedstuff prices and any maximum limits on individual feeds allowed in the final ration e.g. restricting say, wheat to 50% or less. Minimum percentage limits can also be applied to force particular feedstuffs into the ration regardless of their cost.

Using the input data provided, that is, daily nutrient requirements for the specified animals, feedstuff nutrient composition, feedstuff prices, feedstuff limits and ration energy density, TAKE-AWAY then calculates a least cost ration selected from among the feedstuffs on offer to satisfy the animals minimum daily needs within the limits applied. This is done by solving the matrix by a two phase linear programming method (Swanson 1980).

### *Report generator*

At the end of the calculation process, a bar graph is shown on screen of the relative feedstuff balances for the ration along with a list of the daily quantities of the selected feeds. A printout can also be obtained that details ration components, quantities and costs for the defined group of animals over the nominated feeding period, Information is also output on the shadow prices of feedstuffs offered but not selected into the ration.

TAKE-AWAY V1 C South Australian Department of Agriculture
FODDER BUDGET FOR: Adrian Barber

ANIMALS TO BE FED: BEEF CROSS, STEERS, GROWTH

CURRENT LIVEWEIGHT = 400 KGS
TARGET LIVEWEIGHT = 425 KGS
EXPECTED GROWTH RATE = 1.5 KG/DAY
PLANNED DAYS ON FEED = 17 DAYS
NUMBER IN MOB = 30 HEAD
MINIMUM RATION M/D = 11.5 MJ ME/KG DM

| FEEDSTUFF FED | $/T | % IN RATION | KGS PER HEAD PER DAY | KGS PER HEAD PER WEEK | KGS PER MOB PER WEEK | KGS PER MOB |
|---|---|---|---|---|---|---|
| LUPINS | 220.00 | 11.93 | 1.285 | 8.99 | 269.8 | 642.3 |
| PEASTRAW | 50.00 | 27.92 | 3.007 | 21.05 | 632.5 | 1503.5 |
| OATS | 130.00 | 4.97 | 0.536 | 3.75 | 112.5 | 267.8 |
| LIMESTONE | 180.00 | 0.12 | 0.013 | 0.09 | 2.7 | 6.4 |
| BARLEY | 140.00 | 55.01 | 5.925 | 41.48 | 1244.3 | 2962.7 |
| ROCKPHOSPHATE | 240.00 | 0.05 | 0.006 | 0.04 | 1.2 | 2.9 |
| FEED QUANTITY [KGS] | | | 10.771 | 75.40 | 2262.0 | 5385.6 |
| FEED COST | | | PER HEAD PER DAY $1.34 | PER HEAD PER WEEK $9.35 | PER MOB PER WEEK $280.53 | PER MOB FED $667.93 |

**Fig. 1. Example of a TAKE-AWAY printout (Page 1 only)**

## DISCUSSION

The TAKE-AWAY software is being used by staff of the South Australian Department of Agriculture in practical ration formulation for clients flocks and herds along with preparing general animal feeding recommendations for mass media and farmer group extension projects.

In its current stage of development, TAKE-AWAY does not apply substitution factors when determining supplementary rations. Rather, the operator is asked to enter two estimates. Firstly the proportion of the daily diet contributed by dry paddock feed and secondly, the availability of that paddock feed. TAKE-AWAY is not intended for use in calculating supplementary rations against a background of green pasture.

As a decision support tool the program provides a quick means of evaluating feeding strategies. Examining autumn supplement costs has lead to re-assessment and changes in management on individual properties e.g. a move to later lambing. The program has also been used to determine optimum least cost cereal grain, grain legume and hay reserves to be put aside while allowing farm produce sales to be maximised. The software is being used on feedlot operations for both cattle and lambs. A further aspect of the program is its capacity to check an existing farm ration for deficiencies and then allow corrections to be made and the ration rebalanced.

The software package consists of a master program disk, a users manual containing extensive tutorials and a set of information sheets outlining aspects of practical feeding of ruminant animals and how to determine the economics of alternative feeding strategies.

## REFERENCES

Agricultural Research Council (1980). "The Nutrient Requirements of Ruminant Livestock". (Commonwealth Agricultural Bureau: Slough).

PULLMAN, A.L. and HUGHES, A.D. (1986). "RUMNUT Users Guide". (S.A. Department of Agriculture: Adelaide).

SWANSON, L.W. (1980). "Linear Programming. Basic theory and applications". (McGraw-Hill: New York).