SOFTWARE AND COMPUTERS IN DEER MANAGEMENT

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INTRODUCTION

Computer models and computer software have considerable potential as tools for the deer farm consultant and manager but, firstly before discussing their use it is necessary to consider the context of their potential use in deer management. The particular requirement for software is the major issue in deciding whether or not a given product is appropriate. This should be obvious, but poorly defined expectations of software are a major reason for dissatisfaction with specific packages.

Computers offer farmers and their consultants two main opportunities. Firstly, to capture, retrieve, sort and summarise information (both production-related and financial) and secondly, to perform sophisticated analyses of management options. In this paper we will concentrate on management packages and will not discuss any financial software.

If computers are to be successfully used in deer management, it is important that their use results in better management decisions than would be made in the absence of a computer analysis. This again seems obvious, but the important point is that the use of a computer package does not guarantee superior information. However, computer packages usually require a more rigorous input on the part of the user than rough paper calculations. It is the formalisation of input and the ability to explore more options using computers which often result in better information for decision-making.

There are three broad types of software package which can be used in the deer farm management scene, namely data capture, farm record analysis and analysis of farm production strategies (Fig. 1).

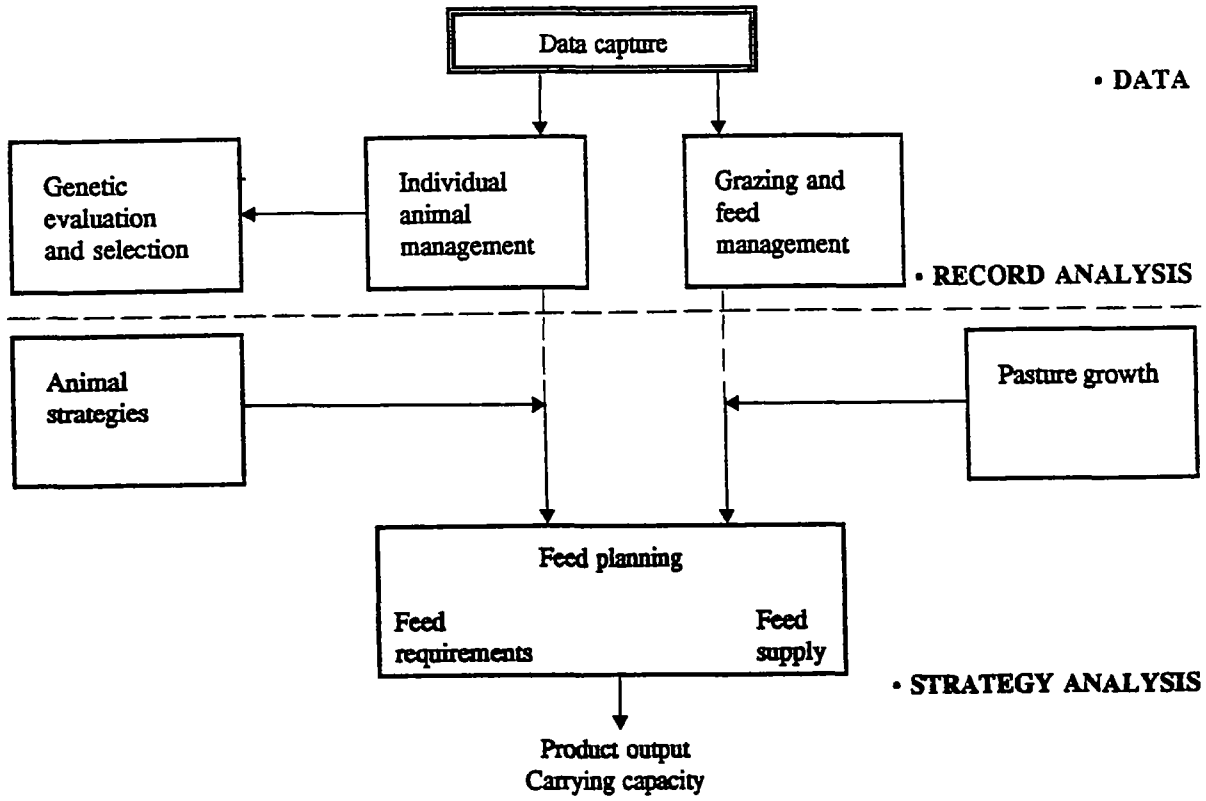

Fig. 1. Inter-relationships of the three broad types of software package in farm management

Computer models are used primarily for devising and evaluating various farm production strategies, while recording and simple analytical software packages are used for the farm record analysis. All the software we refer to in this paper is designed for IBM systems.

SOFTWARE PACKAGES

Data capture

Some means of putting data into a computer database is required before it can be retrieved, sorted or summarised. The type of information commonly required in deer management involves the use of individual animal data such as pedigree, live weights, antler production records, reproductive performance, health status, etc. On the pasture side it may include paddock information such as fertiliser history, grazing days and pasture growth.

Information can be entered into computer databases manually, although software is becoming available for this purpose. An example is the Daisy program (Applied Identification Systems Ltd) which is being developed to record animal liveweights directly from scales into a computer database via an electronic eartag. Electronic notebooks which can be used to collect information for later transfer into computer databases are also becoming available for recording individual animal data (eg, Concept Animal Records package, Computer Concepts and Systems Ltd). However for most farmers, the expense of electronic notebook technology may well not be warranted at present, and manual data collection and entry are acceptable. On the pasture side, electronic linkups between pasture probes and databases are available but the same comment about the cost/benefit compared to manual entry mentioned above, also applies.

Farm record analysis

Individual animal management

This is the area in which there are a large number of packages already available for deer farmers. The software is sometimes referred to as electronic filing cabinet software. The features of these type of packages are the ability to retrieve information about individual animals such as pedigree, live weight on a given day, antler casting date, etc. Secondly, many can perform searches and sort into user-defined groupings (e.g. list all animals by one sire, or below a given liveweight). A third feature of some is that they can rank animals (e.g. on live weight) while another feature is that many can perform simple analyses such as giving the mean liveweight of a particular age group, or liveweight gain over a period.

A list of packages which perform some or all of these tasks is given in Table 1. Although many of these packages are marketed as "stud" or breeding packages, it is important to note that they do not perform the complex analyses required to adjust production records for environmental variables or calculate genetic rankings of animals for selection.

Paddock and grazing information

Two packages, Feedplan (Feedplan Systems) and Graze (Onstream Systems) specialise in databases for recording paddock fertiliser and grazing history (Table 2). They are both applicable to deer farmers. While there are differences in presentation style and some differences in the information collected, the packages are essentially competing products.

The feature of the database aspects of these packages is the ability to retrieve and summarise information on individual paddocks. Information regularly entered on amounts of feed in each paddock and stock grazing days are used to calculate pasture growth rates and food intakes of animals. Summaries such as the amount of feed produced in each paddock, and distribution of feed across the farm, for any point in time are produced.

Table 1. Commercially available management packages for individual animal data[1]

Daisy	Applied Identification Systems Ltd, P O Box 1866, Palmerston North
Concept Animal Records	Computer Concepts, P O Box 311, Masterton
Studfax	Onstream Systems, P O Box 867, Palmerston North
Deer Data	Computer Solutions, P O Box 1291, Taupo
Prime Soft Stock Performance/ Pedigree Recording Systems	Prime Soft Farm Plan NZ Ltd, P O Box 37680, Auckland
Livestock Recording System	Kellogg Farm Management Unit, Lincoln University, Canterbury

[1]A number of the above packages are available through Tim Brittain Computing Ltd, No. 2 RD, Otorohanga.

Table 2. Commercially available feed supply/management software

Feedplan	Feedplan Systems, P O Box 716, Cambridge
Graze (also Grow)	Onstream Systems Ltd, P O Box 867, Palmerston North
Farm Manager	Decision Software (NZ) Ltd, P O Box 1312, Hamilton

Genetic evaluation and selection

Specialised analyses are required to rank animals on their genetic worth for selection purposes. These analyses require data such as that stored in individual animal data bases. The feature of genetic selection type software is the statistical analysis it performs on these data to correct records for environmental variables, and predict the genetic value of a particular individual for a production variable such as live weight.

Two sources of software which are capable of performing these analyses for deer are Animalplan (MAF Technology) and Livestock Recording System (Kellogg). Providing the herd is sufficiently large, the environmental adjustments are calculated on a within-herd basis in Animalplan, whereas the user is required to enter their own formulae for calculating the environmental adjustments (eg, birth date, age of dam) and breeding values using Livestock Recording System. Animalplan is now available only through a bureau system.

Farm production strategies

Software for feed planning purposes and evaluation of farm production strategies differs from the software previously described in that they tend to be predictive models. That is, the packages perform "what happens if"

analyses by simulating the effect of altering some management variable on the farm. There are three main types of analysis.

The first is the whole farm production strategy including analyses which allow estimates of the number of deer that can be run on a block and the effect of the type of deer (eg, velveting stags, hinds, finishing stags) on the estimated annual carrying capacity. They also allow for the effects of altering feed supply (eg, by pasture improvement, phosphate or nitrogen fertiliser, conservation, growing a crop), altering performance targets (eg, live weight by date) or manipulating calving/fawning date.

Secondly, the same models are capable of being used for short term feed budgeting purposes to predict feed surplus and deficits at the whole farm level and for analysing options to prevent them occurring.

The third type of task which is possible using feed planning models is the development of detailed rotational grazing plans for deer. There is only one model capable of this for deer at present (Farm Manager, Decision Software Ltd). In this model, the user enters information on paddocks to be allocated to a mob (including the paddock area and pasture cover at a point in time). The expected food intakes for the animals are predicted from the target liveweight data which the user enters. The expected pasture growth rates and planned rotation lengths are also entered. The software then predicts the number of days grazing in each paddock for the specified rotation length and predicts actual intakes for comparison with targets. The user can adjust rotation length, supplementary feeding or number of paddocks in the rotation to achieve the target food intakes, and hence the targets for animal performance.

Animal system strategies

There are no models currently available commercially which estimate the effect of major changes in animal production strategies, such as wapiti X red hybridisation or twinning, on product output. However they are being developed and some examples of their use have been published (Fennessy and Thompson 1989). The integration of such models with feed supply models as described above will enable numerous different farm production systems to be evaluated.

USING THE MODELS

Feed planning

In this section we consider some examples of feed planning using a simple model which is available through MAF Technology consultants. The model uses the standard feed requirement data for deer (Fennessy et al 1981; Fennessy and Milligan 1987).

A case study analysis is presented where the clients have fenced 40 hectares of their sheep and beef farm for red deer. The pasture production pattern in the district is given in Table 3. The clients want to know the likely eventual carrying capacity of hinds and progeny, where stags are slaughtered after velveting at two years of age and cull hinds are sold at 16 months of age.

The initial analysis showed that it was possible to carry 135 hinds and their progeny and achieve acceptable minimum average pasture covers on the block of about 1000 kg DM/ha in winter (Table 3-A). The analysis showed problems of high pasture covers through November to January which would be of low quality and hence would need to be removed to avoid poor stock performance in late summer/autumn. Two options were explored to handle this, namely conserving surplus spring pasture as hay or grazing some cattle from the rest of the farm on the deer block during spring.

Table 3-B shows the output using the option of conserving 900 bales in late November. This maintains average pasture mass at reasonable levels in order to maintain pasture quality. It also means that at least 130 bales of hay will be required to be fed back in winter to maintain acceptable pasture covers during winter.

The second option looked at grazing beef cattle from the rest of the farm on the deer block between mid September and late November. This option showed that 60 yearling beef animals would need to be carried to maintain pasture cover at acceptable levels and some hay would also need to be fed in winter (Table 3-C).

Table 3: Calculation of feed flow derived from the farm strategy model with 135 hinds and progeny on 40 hectares

Month	Feed requirement (kg DM/ha/day)	Pasture growth (kg DM/ha/day)	A Pasture cover (kg DM/ha)	B Pasture cover (kg DM/ha)	B Hay conserved/fed (bales)	C Pasture cover (kg DM/ha)	C Hay conserved/fed (bales)
July	14.5	12	1006	1000	-130	1002	-150
August	14.4	20	1139	1134	0	1136	0
September	16.7	30	1440	1436	0	1312	0
October	16.7	45	2097	2094	0	1669	0
November	18.2	55	2820	2188	900	2128	0
December	20.4	35	2876	2354	0	2304	0
January	21.7	25	2681	2225	0	2182	0
February	22.4	15	2272	1863	0	1824	0
March	21.9	18	1651	1394	0	1370	0
April	15.3	20	1334	1219	0	1208	0
May	15.6	18	1304	1214	0	1206	0
June	15.5	12	1124	1054	0	1047	0

Table 4: Feed budget results for farmer running 250 velveting stags on 40 ha with 1600 kg DM/ha cover at start of May

Month	Feed requirement (kg DM/ha/day)	Pasture growth (kg DM/ha/day)	Cover (kg DM/ha)	Hay conserved/fed (bales)
May	18.4	18	1511	-200
June	20.2	12	1233	-200
July	20.2	12	1025	-250
August	18.6	20	1029	0
September	20.0	30	1263	0

Clearly these analyses could be extended further to look at options of putting on more deer by feeding more hay in winter or by looking at implications for the remainder of the sheep/beef farm of grazing cattle on the deer block in late spring. The examples serve to show the sort of analyses possible using a simple model.

Models of the type mentioned can also be used to perform short term feed budgets. For example, the model has been used to predict supplementary feed requirements of 250 velveting stags on a 40 ha property. The results are shown in Table 4 and indicate that where measured pasture cover on the block was 1600 kg DM/ha at the start of May, the hay required to maintain cover above 1000 kg DM/ha in winter was 650 bales, fed in May, June and July.

Management, genetic improvement and hybridisation

Models are now being developed which will enable the impact of various management options such as genetic improvement, hybridisation between strains, twinning and changes in the calving date to be evaluated for their impact on the efficiency of venison production (Fennessy and Thompson, 1989). In the longer term, these models will probably be extended to allow economic evaluation of such options. In addition, at the current stage of development, the Fennessy and Thompson (1989) model does not incorporate a feed supply model, but

rather operates on animals fed ad libitum throughout. Thus it has major limitations in a practical farming sense, but in terms of evaluating various options for their impact on total output or efficiency of a farm system, the model is very useful.

AVAILABILITY OF SOFTWARE

There are three main sources of software which can be used in analysing farm production strategies for deer. Two are commercially available namely, Graze (Onstream Systems) and Farm Manager (Decision Software NZ Ltd). The third is a simple model used by MAF Technology consultants. A fourth package, Feedplan (Feedplan Systems), can be used for carrying out short-term feed budgets but it is not intended for use in setting long-term strategies involving decisions, such as strategic selling policies or stocking rates.

Apart from interface differences, the packages differ mainly in the level of biological complexity. For example, in using Feedplan for feed budgeting the user enters all information on stock requirements. Because of this flexibility, analyses involving any species of deer can be carried out, so long as feed requirements are known. With Graze and Farm Manager, the feed requirements are calculated based on a target liveweight profile set out by the user; both of these cover only red deer. The MAF Technology model uses set feed requirements for red and fallow deer, already present in the software.

Pasture growth is treated as an input to all of the above software although a separate software package such as Grow (Onstream Systems) could be used; this system simulates pasture growth throughout New Zealand using information on rainfall, soil temperature, latitude and pasture type (in essence a description of soil fertility as browntop or ryegrass/white clover pasture). It is essential that, in using this software, that one first makes sure it accurately predicts pasture growth in the region of interest.

There is no constraint on pasture intake with respect to pasture cover in any of the currently available models. The implication of this for the user is that one needs to ensure pasture cover levels remain "acceptable", particularly in winter. The Farm Manager and MAF Technology models do, however, allow for pasture losses through death and decay, a feature which is not present in other models. The absence of this from other models could cause the user problems where the objective is to investigate options, particularly from late spring through autumn. Farm Manager is the only package which predicts intake of deer in individual paddocks with different grazing durations. However, all packages allow production strategies or feed budgets which include species other than deer.

The appropriate choice of software obviously should be determined by specific needs. Available packages differ in the ease of use and some individuals may relate better to a given interface than others. All packages will require an investment of time to learn. It is important in choosing a package to be aware of the biological assumptions that it makes. None of the packages mentioned here is biologically robust and results from all need to be interpreted; for example, reasonable constraints on maximum and minimum pasture covers must be based on experience. Interpretation of results also needs to be tempered by the users' confidence in the accuracy of input information. Riskiness of recommendations can be assessed by a sensitivity analysis on the input information in question; eg, what happens given pasture growth is 10% higher or lower than assumed?

For some, the time investment required to use software and become confident in interpreting results may make it more cost effective to link with farm consultants to analyse farm production and feed planning options. In the breeding/genetic evaluation area, working with a well-qualified consultant will usually result in a good return on the investment, particularly in the early stages of a breeding programme.

REFERENCES

Fennessy, P.F. and Milligan, K.E. 1987. Grazing management of deer. In: Feeding Livestock on Pasture. Edited by A.M. Nicol. NZ Society of Animal Production Occasional Publication 10: 111-118.

Fennessy, P.F. and Thompson, J.M. 1989. Biological efficiency for venison production in red deer. Proceedings of the New Zealand Society of Animal Production 49:5-10.

Fennessy, P.F.; Moore, G.H. and Corson, I.D. 1981. Energy requirements of red deer. Proceedings of the New Zealand Society of Animal Production 41:167-173.