StockPlan: Decision Tools for Exploring Management Options for Drought

M.J. McPhee[a], G.P. Meaker[b], P. Graham[c], P.M. Carberry[d], B.L. Davies[e], M.B Whelan[f], A.K. Bell[g] and B. Clements[h]

[a]NSW Agriculture Beef Industry Centre, Armidale, NSW 2351, Australia (malcolm.mcphee@agric.nsw.gov.au)
[b]NSW Agriculture, Goulburn, NSW 2580, Australia (greg.meaker@agric.nsw.gov.au)
[c]NSW Agriculture, Yass, NSW 2582, Australia (phillip.graham@agric.nsw.gov.au)
[d]NSW Agriculture, Tamworth, NSW 2340, Australia (paul.carberry@agric.nsw.gov.au)
[e]NSW Agriculture, Maitland, NSW 2320, Australia (lloyd.davies@agric.nsw.gov.au)
[f]Southern Cross University, Lismore, NSW 2480 (mwhelan@scu.edu.au)
[g]NSW Agriculture, Tamworth, NSW 2340, Australia (alan.bell@agric.nsw.gov.au)
[h]NSW Agriculture, Bathurst, NSW 2795, Australia (bruce.clements@agric.nsw.gov.au)

Abstract: Management decisions in both the early stages of drought and during drought have a profound impact on the physical and financial viability of the farm both in the short term and potentially well after seasonal conditions have returned to a more normal pattern. StockPlan is a suite of decision support tools for cattle and sheep producers to explore management options relating to drought. Options are explored through three StockPlan tools: Drought Pack (Exploring Feeding Options), Im Pack (Exploring Herd or Flock Dynamics) and FSA Pack (Feed, Sell or Agist Decision); and helpful advice through StockPlan links: Introduction, Decision-making Process, Drought and Over Grazing Issues, Animal Health and Welfare, Climate, Bob's Story and "Where to get help". An option is also available to connect users to the NSW Agriculture Drought Web site. This paper describes the development of StockPlan and the decision support tools: Drought Pack, Im Pack and FSA Pack. The paper also discusses how these decision support tools play an important role in making sound management decisions before dry spells and in the early stages of drought. This decision tool has the potential to assist producers make informative and timely decisions before the onset of a full-blown drought.

Keywords: Decision support tool; Management option; Drought

1. INTRODUCTION

StockPlan is a suite of computer decision support tools that enable cattle and sheep producers explore management options in the early stages of drought and during drought. The main aim of these decision tools is to assist producers make management decisions that minimise the environmental and financial impacts of drought. Management options are explored through three StockPlan tools: Drought Pack, Im Pack and FSA Pack; and helpful advice through seven StockPlan links: Introduction, Decision-making Process, Drought and Over Grazing Issues, Animal Health and Welfare, Climate, Bob's Story and "Where to get help". An optional hot key is also available to connect users to the NSW Agriculture Drought Web site.

StockPlan is a useful tool for evaluating the following questions: How much will it cost to feed my stock for a specified time? How will my decision affect my flock or herd and financial position? Is it better to sell or agist my cattle? Is agistment an option for certain classes of animals?

A number of decision support tools such as DroughtPlan [QDPI, 2000] and GrazFeed [Freer et al., 1997 and Horizon Technology, 1998] are already available to assist managers make management decisions during drought. However, the authors believe that StockPlan will fill a niche to assist producers and advisers make (i) strategic decisions before and during drought, and (ii) assist producers monitor the financial impact of the decisions they are making.

On-farm management decisions can have repercussions that affect the environment and consequently impact the economic and social structure of rural communities. Figure 1 illustrates how a below average rainfall and low pasture growth could impact the livestock, pasture, financial and social structure of a property. Figure 1 also outlines a number of proactive steps.

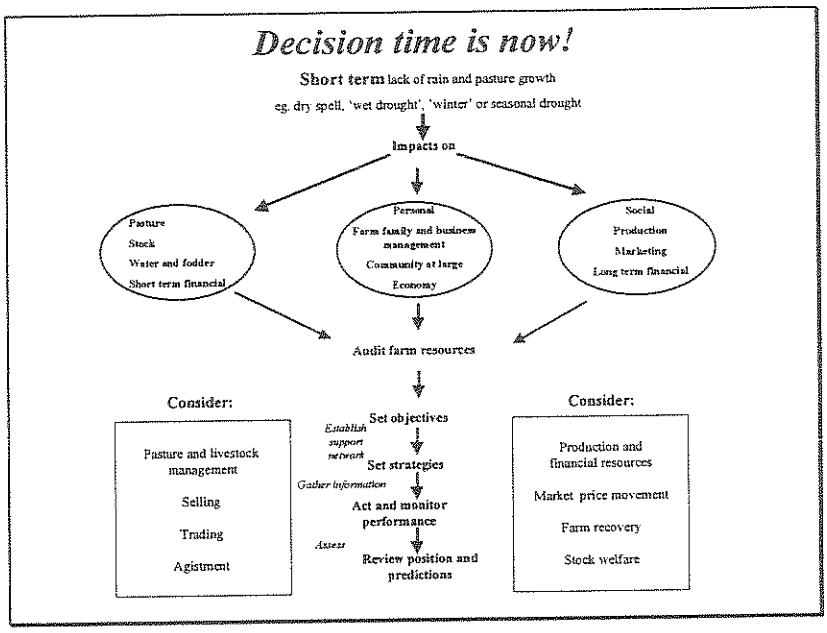

Figure 1. Environmental, economic, and social impacts of a below average rainfall and low pasture growth. Proactive steps are outlined to overcome the impacts.

The philosophy behind these decision support tools is to foster drought preparedness which has been identified by Bryceson and White [1994] and the Rural Needs and Climate Variability report [1997] as an important component in managing animal production systems before the situation on a farm is irreversible. Sound management decisions early in the drought period and during drought can prevent sever financial losses!

A workshop on drought and decision support systems [Bryceson and White 1994] was convened to examine issues of climate prediction, drought preparedness and aids to farm management. The workshop provided recommendations to the State-Commonwealth working party responsible for developing the National Drought Policy within Australia. Conclusions of the workshop indicated that (1) climate prediction, (2) land and drought monitoring, and (3) self-reliant farm and drought management were important issues that needed to be addressed.

The Rural Needs and Climate Variability study [1997] was conducted by the Rural Needs Research Unit from the University of Newcastle for NSW Agriculture on the issue of rural producers' needs in relation to climate variability. The objectives of the research were: (1) identify the issues considered, and the decision making processes used by farmers as they manage climate variability pre- and post drought; (2) recommend options to achieve increased adoption of community and government agency extension and research strategies; and (3) identify the essential triggers, information channels and agents needed to change to a more self-reliant farming community in the context of climatic variability. Three of the quantitative key findings indicated that: (1) "40% of respondents reported a one in two years feed shortage and over 80% report at least one feed shortage in every five years", (2) "70% of respondents agree that a farm business plan is required for drought" and (3) "Greater than 50% of respondents regard personal experience in previous droughts as by far the most important basis of planning for the future drought." StockPlan addresses the third issue from the Bryceson and White [1994] workshop and outcome (2) from the Rural Needs and Climate Variability report [1997].

StockPlan will be available to workshop participants comprising producers and professionals from a broad range of industries that would benefit from knowing how to use such a package. The workshops will be delivered and supported by accredited presenters. The package will assist producers to improve their drought management skills, lower the risk of degrading pastures and financial losses, encourage proactive decision making and provide a platform for producers to investigate the production and financial implications for the farm business. This paper describes the development of StockPlan and discusses how the decision support tools can play

an important role in assisting with drought management decisions.

2. DEVELOPMENT OF STOCKPLAN

2.1 Identification of the Need for a Decision Support Tool

The need to develop decision support tools for drought management decisions was first identified in 1999 by NSW Agriculture through their development of a drought web site. The first decision tool identified was the revamping of an existing program called Drought Pack [Whelan, 1982]. Drought Pack was originally written for NSW Agriculture for an Apricot computer and was subsequently converted to an IBM DOS program [Sangsari pers. comm].

At the same time two existing packages were evaluated: DroughtPlan [QDPI, 2000], a CD-ROM containing a number of decision tools that focus on managing climate variability, and GrazFeed [Freer et al., 1997 and Horizon Technology, 1998], an animal/pasture biology model, that predicts pasture intake by cattle or sheep and the impact of supplementation over a 24-hour period. While recognising these as valuable tools for undertaking specific tasks relating to drought, it was decided that Drought Pack was significantly different, particularly in relation to assessing strategic feeding strategies to warrant its further development. The decision was based on the ability of Drought Pack to assess the cash flow of a farm when supplementary feeding and calculate a break-even price for specific animal classes across a specified planning period (e.g. January to March).

Climate variability was also discussed and was considered an important topic that would need to be addressed within the proposed farmer workshops.

The meeting concluded with 5 significant outcomes: (i) Provide additional decision tools e.g. Im Pack model to assess the change in structure of the flock or herd if breeding stock were sold off and a FSA Pack (feed, sell or agist) model to assess the economic impact of making such management decisions. (ii) Include a session on climate variability with examples of weather patterns for the location where the course is held using Rainman [Clewett et al., 1999]. (iii) Form a StockPlan steering committee comprising livestock and agronomy officers, economist, research officer, and technical specialists in grazing management and climatology. (iv) Hold a pilot workshop using a prototype version with a group of producers. (v) After the package has been developed conduct workshops by accredited workshop leaders.

2.2 Feasibility Analysis

Two pilot workshops were held in New South Wales. The purpose of the first workshop, held in Orange NSW, was to evaluate Drought Pack and present the conceptual ideas of StockPlan (i.e. the integration of two additional decision tools to assist in the decision-making process).

The purpose of the second workshop, held in Armidale NSW, was similar to the first workshop with an additional task of evaluating the suite of StockPlan decision tools in a summer rainfall environment where producers are often faced with different weather conditions (e.g. feed gaps in late autumn or winter) as opposed to producers in a winter rainfall environment (e.g. dry spells during summer and autumn). There were 8 participants in each workshop.

Feedback from the producers who attended these pilot workshops was positive. The interaction between climatology, livestock and agronomy advisers, a research officer, economist and producers provided a constructive forum for discussing and evaluating the StockPlan decision support tools. This interaction and the adoption of a number of recommendations have assisted in developing a package that will be user-friendly and useful in making management decisions both in the early stages of drought and during drought.

2.3 Delivery of StockPlan

The method and delivery of StockPlan to producers was considered an important aspect of the packaging of StockPlan. A significant feedback from the pilot workshops indicated that producers would benefit from a StockPlan workshop to fully come to terms with each of the decision support tools. Such workshops would encourage producers to learn from one another and assist them in the interpretation of the results. Future workshops would also include sessions on climate, techniques for accessing information from the Internet and a segment on tactical and strategic decision making during the early stages of a drought and before the onset of a full-blown drought.

3. STOCKPLAN

3.1 Introduction

The conceptual idea of integrating three decision tools (Figure 2) into one package to assist in making management decisions is an important concept that has evolved throughout the development phase. The integration of three decision tools has evolved because no program on

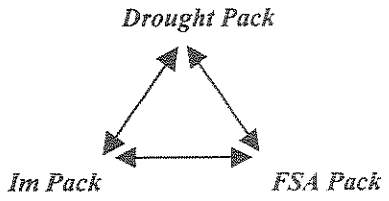

Figure 2. Three decision tools integrated to assist producers improve management decisions before their pasture systems become unproductive and damage the environment.

its own can assist in answering the complexities of proactive decision making for a drought. The decision to use only one or all of the decision tools will depend on the individual circumstance of a producer and thus provides them with a choice.

StockPlan not only provides access to the three decision tools but also a link to the NSW Agriculture drought web page and several information pages to educate producers about seasonal dry spells and drought and provide helpful advice.

The user needs to provide: farm details, starting month and duration, details of their financial situation, stock numbers, and feeds available and nutrition. The essential inputs for the nutrition screen (Figure 3) are weight (kg), desired weight gain (kg/day) and supplement fed (%).

If supplementary feeding (%) is entered then a feed type needs to be selected from a drop down list (the feeds available in this screen are connected with the feeds available from an earlier input screen). If 100% is entered at Supplement %, it assumes a full drought ration (Feed 1 and or Feed 2) is being fed. Alternatively, if 75% is entered then the calculations are based on the assumption that 75% of the energy requirements come from the ration and the remaining 25% is coming from the pasture.

In addition, the ratio of the ration fed needs to be entered. If only one feed type is fed then Feed 1 % would be 100%. Alternatively a percentage of Feed 1 entered will then determine the percentage fed of Feed 2, i.e. if Feed 1 % was 30 then the Feed 2 % will be calculated as 70. After the inputs have been entered and the <Tab> key is pressed a series of calculations are performed that are based around several empirical equations published in AG bulletin 3 [Oddy, 1978]. The cost ($/day) is also calculated.

The outputs from the nutrition screen can then be viewed in the feed summary, cash flow and break-

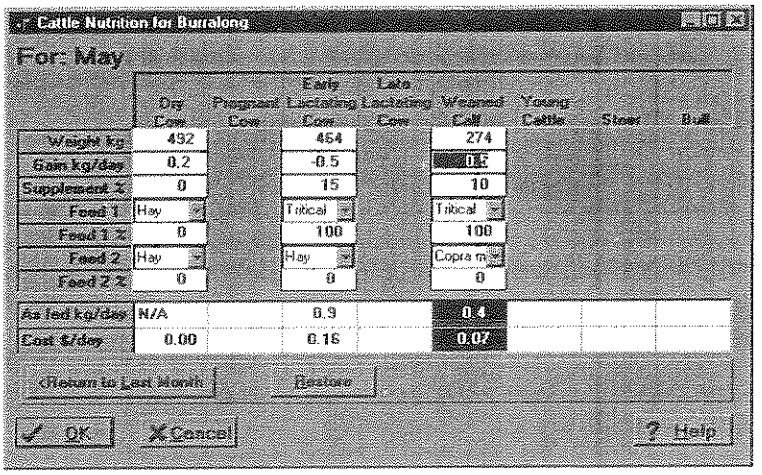

Figure 3. Drought Pack beef nutrition screen

3.2 Drought Pack

Drought Pack, an energy-based model (MJ ME/kg fed), assesses the cost of feeding and determines the break-even price for specific animal classes. even reports In particular the cashflow report includes an opening and closing livestock valuation that highlights the changes in livestock values, thereby providing the opportunity to compare different drought management strategies.

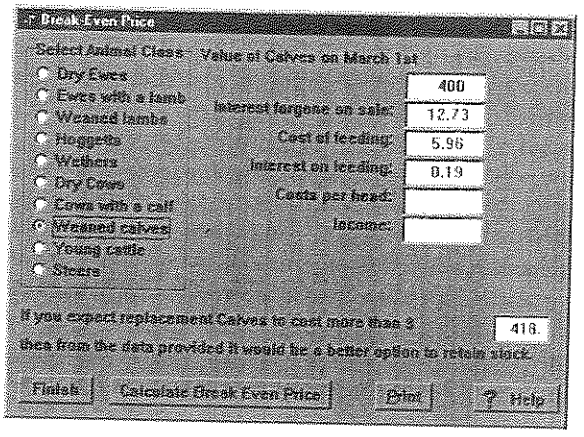

Figure 4. Drought Pack Break-Even price screen

The break-even price report (Figure 4) performs a further calculation after additional inputs have been made. This report assists a producer to determine whether or not to retain stock based on the inputs supplied to the package.

3.3 Im Pack

This decision tool uses a static modelling approach that provides a producer with the opportunity to assess the structure of the herd or flock over a 10-year period. The model structure is based around an age and herd structure model for beef breeding enterprises [Dobos et al., 1997].

The model has been developed as an Excel spreadsheet and the inputs include: maximum age at joining, number mated, weaning rate, adult death rate, and calf to weaning death rate, level of culling and number of stock and price. The numbers in each age class are then calculated but the user can override these values. The results can be viewed either as a table or in a graphical form.

The Im Pack decision tool allows the user to explore a wide range of options e.g. selling off parts of the herd or flock and recovering stock numbers over the following years. The calculations would generate details of the herd or flock structure, sale numbers and cash flow.

3.4 FSA Pack

FSA Pack (feed, sell or agist decision) is designed to evaluate the cost of the various options for a specific group of livestock rather than a whole farm analysis. FSA allows for the user to specify up to four different drought lengths, and provides cash cost estimates and "bottom line" estimates.

The package was initially developed using Excel and then rewritten in Java Script.

Features of the FSA Pack are:

- It is an interactive, stand-alone program that operates using a web browser.
- It allows the analysis of agistment as an option.
- Data entry is straightforward and limited.
- It allows the specification of four drought lengths. Drought lengths of up to 80 weeks can be specified.
- It estimates cash costs and a "bottom line" for the four periods specified.
- The "bottom line" includes an allowance for:-
  - Pasture re-establishment costs.
  - The value of pasture that may be available for other enterprises when an agistment option or a sell option is chosen.
  - Changes in stock values projected over the duration of the drought.
- The user has the option to calculate an *expected value* for cash costs and the "bottom line" by specifying their subjective probability estimates for the four drought lengths.
- A graphical presentation of the cash costs and "bottom line" can be examined. (This is still to be added to the Java version but is available in Excel).

4. DISCUSSION

Poor management during a drought can lead to stock losses, excessive feed costs and irreparable damage to pastures, the environment and the community. Sound management decisions early in a drought can reduce the risks of these losses. StockPlan can provide managers with the information and confidence to assist with drought decisions.

The integrated packages of Drought Pack, Im Pack and FSA Pack within StockPlan could be used in the following way: Drought Pack, for example, might indicate that the whole farm consequence of feeding a specific class of stock is a risky option. The FSA Pack could then be used to see if it were more profitable to feed, sell or agist. If the FSA Pack recommended selling as a strategic option, then the Im Pack model could be used to examine the long-term cash flow consequences of re-stocking strategies. The integration of these three decision tools into one package will assist producers improve their decisions when faced with either a financial, physical or social issue.

However, producers need to be aware of the limitations of the StockPlan decision tools. For example, Drought Pack is a metabolizable energy based model therefore it may not be able to handle high protein supplements. The model also assumes that after the dry spell, the land is equally productive regardless of the strategy used.

The equations within Drought Pack have been evaluated and the team concluded that the output from the equations in their current form were adequate in evaluating the big picture, i.e. a tool to make informative and timely decisions before the onset of a full-blown drought. If a higher degree of precision is required then a more detailed model such as GrazFeed, Freer et al. [1997], could be used.

In particular, the strength of Drought Pack lies with its ability to assess the cost of feeding and calculate a break-even price for specific animal classes across a specified planning period.

5. CONCLUSIONS

StockPlan has been developed with a strong team approach, which crosses a number of disciplines. The integration of three decision tools into one package assists producers to address a number of issues in the early stages of drought. Fostering drought preparedness is critical! StockPlan has the potential to assist producers to make informative and timely decisions before the onset of a full-blown drought. Its development is consistent with the objectives of the National Drought Policy.

6. ACKNOWLEDGEMENTS

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