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StockPlan—Exploring Management Options before Dry Spells and in Drought: 2. Case Studies Using Drought Pack, FSA Pack, and ImPack

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ABSTRACT Objectives of this article were to present three case studies that were generated by producers who used decision support tools to assist them explore the financial consequences of management options before dry spells and in drought. Study 1 used Drought Pack to demonstrate the calculation of a break-even price to assist a group of sheep producers decide whether to "keep and feed" or "sell and buy back" ewes at the end of a dry-spell, which was anticipated to last 5 months. The break-even result based on the producers' estimates indicated that in this case, they would be better off with the "keep and feed" option. Study 2 used Feed Sell Agist (FSA) Pack to assist producers determine whether they should "feed," "sell," or "agist" cattle. A sensitivity analysis of the buying and selling options was performed. The results from FSA Pack assisted beef producers decide that the "sell" option had the lowest associated risk. Case study 3 used ImPack to evaluate three options: "sell 10% of stock," "keep and feed all stock," or "sell progeny as weaners and keep and feed cows" for a mixed cropping and beef enterprise. A 5-year breeding herd re-structure was performed for each of the three options. The results from the ImPack analysis based on a cash-flow analysis indicated that the "sell 10% of stock" (i.e., sell 10% of self replacing beef herd) was a better option because it reduced interest payments early in the planning period and therefore assisted in reducing the overall debt.

Impact Statement Understanding the financial consequences of management options before dry spells and in drought are important issues for producers (i.e., ranchers). The StockPlan workshop provides training in the use of Drought Pack, FSA Pack, and ImPack. Case studies generated by producers demonstrate how decision support tools helped producers explore management decisions. Risk assessment of management decisions has the potential to reduce financial and social implications when faced with dry spells or drought.

In Australia the average age of livestock producers (i.e., ranchers) is steadily increasing (Australian Bureau of Statistics, 2006). As older producers retire the knowledge base also disappears. The new generation of producers will have to manage larger properties and more animals to make a profit. There is also increasing pressure to move toward more sustainable (MLA, 2007) and ethical (AWI, 2008) agricultural practices. One means of improving management is by trial and error (Nix, 1981). However, a new generation of producers and the community has a great deal to lose when the consequences of an error far outweigh the gains of a successful trial.

Decision making based on farm modeling and the associated risks has been evaluated (Pannell et al., 2000; Murray-Prior and Wright, 2001; Malcolm, 2004). Various types of models [for example, static, dynamic, or stochastic (Baldwin, 1995)] are available to assist producers improve management decisions, but associated risks will always exist.

The StockPlan workshop (McPhee et al., 2013) run by livestock extension advisers provides the forum to discuss the needs of producers and the associated risks of making management decisions. It is strongly recommended that producers attend a StockPlan workshop before they use the software.

The objectives of this article are to present three case studies generated by producers who attended the StockPlan workshop and used decision support tools (DST).

Study 1. Drought Pack to make a management decision related to feeding ewes.

Study 2. Feed Sell Agist (FSA) Pack to determine the appropriateness to feed, sell, or agist cattle (i.e., moving stock to leased pasture at a specified cost on a weekly, monthly, or annual basis).

Study 3. ImPack to ascertain management options to mitigate seasonal conditions for a beef herd.

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Abbreviations: DSE, dry sheep equivalents; DST, decision support tools; FSA, Feed, Sell, Agist.

MATERIALS AND METHODS

Each case study uses a "representative" farm, established by a livestock extension adviser and producers, as an enterprise that broadly represents the region where the study was undertaken. The StockPlan workshop provides training for producers in the use of four DST (Drought Pack, FSA Pack, ImPack, and PlanPack) and how to utilize two resource manuals (StockPlan resource manual, and a drought management booklet). Drought Pack assesses the cost of drought feeding and determines a break-even price for classes of sheep and cattle [e.g., weaners (not suckling), dry, lactating or pregnant stock]; FSA Pack provides an economic analysis of the decision to either keep and feed, sell, or agist stock; ImPack assesses the future structure and cash-flow consequences of the herd or flock over a 5- or 10-year planning period; and PlanPack is an interactive Microsoft Word document, a paper DST, which assists producers to develop a drought plan (McPhee et al., 2013). Drought Pack, FSA Pack, and ImPack are used in case studies 1, 2, and 3, respectively.

Study 1. Drought Pack

Producers at a StockPlan workshop at Yass, New South Wales (NSW) in February 2003 had experienced an extremely dry December 2002 and January 2003. The historical annual median rainfall of the region was 623 mm (from 1898 to 2008; Bureau of Meteorology, 2009). The historical median rainfall of the region for the period between October and January was 193.6 mm but the rainfall recorded from October 2002 to January 2003 was 63.8 mm (Bureau of Meteorology, 2009). Producers were faced with a limited amount of dry feed. In addition, the forecast for autumn rain in 2003 was not positive and grain prices were higher than usual. The participants of the workshop (25 producers) worked with a livestock extension adviser to develop a "representative" farm that comprised 1,000 ewes set at the district stocking density of eight dry sheep equivalents (DSE) ha^{-1}. The group discussed the inputs for a scenario and the potential amount of feed required to maintain ewes for 5 months. Their primary interest was to work out how much supplementary purchased grain was required and how much would it cost to feed their flock. The group was interested in evaluating the "worst case" scenario.

Study 2. FSA Pack

Forty producers and agribusiness leaders in the Monaro region of NSW established the Monaro Farming Systems group in 2007. There had been little rain through the winter of 2008 that had led to a very poor spring pasture growth rate. The historical annual median rainfall of the region was 484 mm (from 1858 to 1994; Bureau of Meteorology, 2009). The historical median rainfall of the region between March and October was 230.2 mm but the amount that fell in that period in 2008 was 153.0 mm (Bureau of Meteorology, 2009). The Bureau of Meteorology seasonal outlook for summer rainfall was neutral; therefore, the outlook for pasture growth in autumn was poor. In the Monaro region autumn pasture growth is limited by low temperature rather than low moisture. In November 2008 the group decided to evaluate the impact of drought decisions using FSA Pack. They considered a "representative" farm of 542 ha with 35 breeding cows, a self-replacing ewe flock of 1,000, and a wether flock of 200. The annual stocking rate averaged 5.2 DSE ha^{-1}. The group was interested to compare feed, sell, or agist strategies for their cattle.

Study 3. ImPack

Producers from the Condobolin region of NSW were interested in evaluating different management options to mitigate dry seasonal conditions. The historical annual median rainfall of the region was 424 mm (from 1954 to 2008; Bureau of Meteorology 2009). The base line for the business was established from normal management practices, assuming no drought management options were implemented. The "representative" farm, a mixed cropping and beef enterprise comprising 11,000 ha (3,000 ha arable; 6,000 ha native grassland; and 2,000 ha heavily timbered) on the western edge of the Condobolin region, was developed by the workshop participants. There were two main enterprises of the business: 400 cattle (a self replacing beef herd) and cereal cropping of 1,200 ha $year^{-1}$ for wheat (*Triticum aestivum* L.), barley (*Hordeum vulgare* L.), and oats (*Avena sativa* L.). The structure of the beef herd was modeled over 5 years (2008–2012) and the predictions of gross margins were evaluated. This case study explored three management options: sell 10% of stock (Sell 10%); keep all stock and feed (Keep All); or sell progeny as weaners and feed cows (Sell Prog). These options were developed by the workshop participants so that they could mitigate dry conditions that were expected to last 18 months.

Table 1. Drought Pack inputs and outputs required to calculate break-even price for expected replacement of pregnant ewes; generated by producers at Yass NSW based on value of stock, cost of feed, interest forgone, and husbandry costs.

Item	Value
Inputs	
Planning months†	5
Live weight‡, kg	50
Weight gain, kg d^{-1}	0
Feed available: wheat	
DM, %	89
Energy, MJ ME kg^{-1}	12.5
Cost t^{-1}, AU$	250
Feeding out cost t^{-1}, AU$	250
Supplement§, %	100
Value dry ewe on 1 March, AU$ ewe^{-1}	30.00
Value pregnant ewe on 1 July, AU$ ewe^{-1}	30.00
Bank interest forgone	
On sale¶, AU$ ewe^{-1}	1.14
On feeding¶, AU$ ewe^{-1}	1.78
Husbandry costs, AU$ ewe^{-1}	2.00
Outputs	
Dry ewe as-fed, kg d^{-1}	0.62
Pregnant ewe as-fed, kg d^{-1}	0.82
Cost of feeding#, AU$ ewe^{-1}	46.77
Animal class: pregnant ewes	
Break-even price††, AU$ ewe^{-1}	81.69

† Period of planning where the initial month was March and the last month was July.
‡ Ewe was dry from March to June and pregnant in July; live weight was set at the same weight across all months.
§ Only wheat was fed as a supplement.
¶ Interest on money invested or borrowed = 9%.
# Total cost of feeding (cost of feed + cost of feeding out) across the planning period [March to June = \$0.15 ewe^{-1} d^{-1} (0.62 × 0.25) and July = \$0.21 ewe^{-1} d^{-1} (0.82 × 0.25)]: cost of feed for ewes = 4 months × 30 days × 0.62 kg d^{-1} × \$250 $(1000\ kg)^{-1}$ × 89% DM 100^{-1} = \$16.55 ewe^{-1} + cost of feeding out for ewes = 4 months × 30 days × 0.62 kg d^{-1} × \$250 $(1000\ kg^{-1})$ = \$18.60 ewe^{-1} + cost of feed for pregnant ewes = 1 months × 30 days × 0.82 kg/d × \$250 $(1000\ kg)^{-1}$ × 89% DM 100^{-1} = \$5.47 ewe^{-1} + cost of feeding out pregnant ewes = 1 months × 30 days × 0.82 kg d^{-1} × \$250 $(1000\ kg^{-1})$ = \$6.15 ewe^{-1} based on cost of feed and cost of feeding out.
†† Break-even price = value + costs/head + interest forgone on sale + interest on feeding + cost of feeding. Note: differences between Drought Pack output and actual calculations in a spreadsheet program exist due to rounding errors.

Table 2. Inputs of the dry spell time periods (short, medium, long and "worst case") scenarios generated by producers in the Monaro region NSW, for the FSA Pack case study in AU$.

	Dry spell time periods			
Item	**Short**	**Medium**	**Long**	**Worst**
Length of dry spell	12 weeks	24 weeks	36 weeks	44 weeks
Value of stock†	$1,050	$1,050	$650	$950
Income from sale of calf‡	–	–	$390	–
Purchase price of stock†	$900	$850	$880	$850
Value of agisted stock†§	$1,100	$1,250	$950	$1,040
Income agisted calf¶	–	–	$500	–
Cost of agistment#	$7.50 week^{-1}	$8.50 week^{-1}	$8.50 week^{-1}	$8.50 week^{-1}

† Value of stock at time of workshop was $950.
‡ Calf was sold in Week 36.
§ The higher value of agisted stock is based on better performance, i.e., higher pasture growths increased live weight gain.
¶ The selling price of the agisted calf was considered to be greater than the calf raised at home.
# Cost of transport = $71.50 and the cost of travel and supervision of stock = $65 week^{-1}. Feeding costs: $3.93 cattle^{-1} day^{-1} and labor costs of $105 week^{-1}.

RESULTS

Study 1. Drought Pack

The sheep producers at the StockPlan workshop in Yass developed a 5-month planning period from March to July 2003. The participants evaluated how much grain was required and how much it would cost to feed their 1,000 dry ewes from March to June and 1,000 pregnant ewes in July. The cost of wheat to feed the ewes was estimated at AU$250 tonne^{-1}. Drought Pack was used to calculate the daily cost of feeding dry and pregnant ewes. All participants were concerned by the amount they needed to feed (99 tonne) and the cost of feeding ($24.75 ewe^{-1}). Some participants indicated that they would think seriously about selling. Selling was a strategy that had rarely been used in the region.

Discussion moved to the cost and availability of replacing fine wool ewes. The value of the ewe on 1 Mar. 2003 was $30; the cost of feeding ($47.77): $0.15 ewe^{-1} day^{-1} for dry ewes (March–June) and $0.21 ewe^{-1} day^{-1} for pregnant ewes in July. The StockPlan workshop participants decided to weigh up the cost of replacing stock later in the year because the prospect of paying at least $0.15 ewe^{-1} day^{-1} for feed was daunting. However, the participants estimated that it would cost at least $90 ewe^{-1} to replace with a similar animal based on age, wool value and stage of pregnancy and therefore decided that it was wiser to keep and feed the ewes rather than try to buy ewes at the end of the dry spell.

The break-even feature of Drought Pack was then used to evaluate the scenario of either feeding or selling ewes. The data were entered and the results examined in a 1.5-hour session. The inputs and results (Table 1) indicated that if the producer expected replacement pregnant ewes to cost less than $81.69 after the 5-month dry spell then it would be a better option to sell the stock. The results confirmed the conclusions of the producers that feeding was the better option given they expected to have to pay $90 for replacements once seasonal conditions improved. This region also had a high incidence of Ovine Johne's disease (OJD) so the only sale option was direct to the abattoir (slaughter house). The supply of available fine wool ewes at the time of the workshop was also tight and stock could only be bought in small numbers. As a consequence, re-stocking would require the purchase of ewes from a number of sources and, therefore, an increased risk of buying other disease problems (e.g., footrot, lice, and OJD).

The 2003 season did not turn out to be as bad as the producers had predicted. Most of the producers in the region were able to stop feeding supplemental feed in June. However, the cost of replacement ewes in 2003 was around $100. Drought Pack became a valuable tool for more than 90 producers in the region who either participated in a StockPlan workshop or used Drought Pack to evaluate options on their own properties. A telephone survey of 195 properties indicated that 75% of respondents received at least one benefit from the StockPlan workshop: 63% improved ground cover, 25% reduced stress, 24% increased productivity, and 15% maintained or increased stocking capacity (McPhee et al., 2011). The information from Drought Pack was used to improve the ability of producers in the region to make decisions based on realistic estimates rather than using heuristic decision making processes.

Table 3. Outputs from FSA Pack: total loss or gains for the feed, sell, or agist options.†

Time period	Feed	Sell	Agist
weeks		AU$	
Short (12)	–9,451	8,353	4,972
Medium (24)	–22,703	10,493	6,098
Long (36)	–33,115	9,837	4,148
"Worst case" (44)	–31,566	11,153	1,079

† Results include the value of stock at the end of the planning period.

This case study illustrates that Drought Pack helped producers assess the outcomes of different strategies and gain confidence in the decision they had made. Results from using this DST revealed that feeding stock for a 5-month period rather than selling and re-purchasing stock was most likely the best option. The possibility of having to feed for a longer period in the Yass district is quite low because generally a spring growth rate will occur.

Study 2. FSA Pack

The Monaro Farming Systems group considered drought strategies in blocks of 3 months from November 2008. Initially the cost of feeding was calculated for sheep and cattle using Drought Pack. The output from Drought Pack revealed that the cattle enterprise had the highest feeding cost. Therefore, FSA Pack was used to compare the options of feeding, selling, or agisting cattle. Inputs (Table 2) including all dry stock (wethers and dry cows) to be sold and all breeding stock to be retained and fed were entered into FSA Pack. The results of the analysis are presented in Table 3.

The cash-flow comparison indicated that feeding was the least desirable option and that selling was the best option for each of the dry spell time periods (short, medium, long, and "worst case"). However, the agist and selling options were sensitive to the sale price of calves. For example, if calves could be sold for $500 and cows returned in good condition, and if the cost of replacement stock were high (Table 2), then the agistment option was marginally better than selling (Table 4).

Table 4. Outputs from FSA Pack: total loss or gains for sell or agist options if calves could be sold at AU$500 and the cost of replacement stock (i.e., calves) was high.

Time period	Sell	Agist
weeks	AU$	
Short (12)	1,353	4,972
Medium (24)	–3,507	6,098
Long (36)	7,387	4,148
"Worst case" (44)	4,153	1,079

After evaluating the various options, the group decided that selling was the best choice because there was a significant risk associated with agisting cattle (e.g., infecting the herd with disease prevalent in the area they were agisted). Nevertheless, selling all of the cattle would not be an easy decision to make, because selling is a high risk option that requires a great deal of information (e.g., the cost of feeding, the selling price now, the value of progeny, and the cost of replacing stock at the end of the dry spell). FSA Pack assisted the producers to juggle all of this information and test "what if" scenarios. Several options were evaluated and assisted the producers to gain confidence that selling was the best option within the parameters of the current simulation.

Study 3. ImPack

The ImPack options (Sell 10%, Feed All, or Sell Prog) and inputs developed by the Condobolin producers are presented in Table 5 and Table 8 of the Appendix. All supplementary feeding was barley at AU$200 tonne^{-1} and fed in autumn for each option. Gross margin predictions (Table 6) are presented for the three options. The "Sell 10%" option showed an increase in the gross margin from the base year during 2008. Generally gross margins take a considerable amount of time to recover from the sale of stock but gross margins for "Feed All" and "Sell Prog" returned to "normal" levels in 2010 because breeding stock had been retained. The cash-flow analysis (Table 7) of the options indicates that the "Sell 10%" option was the best for maintaining and improving cash-flow. This occurred because the "Sell 10%" option reduced interest payment early in the planning period and therefore reduced the overall debt.

ImPack has the ability to predict management strategies based on the herd or flock structure over a 5- or 10-year planning period. Exploring the effect of a management decision on the whole-farm is important and therefore necessary to analyze the cash-flow options. Additional information and results of this case study can be found in the Appendix (Tables 8 to 11).

DISCUSSION

The StockPlan workshop and the three DST (Drought Pack, FSA Pack, and ImPack) have helped producers understand the financial implications and risks of various strategies. Producers who have used the StockPlan DST can explore options and choose those that suit their risk profile. The independent survey of StockPlan found that producers who have used the software have improved ground cover, reduced stress, increased productivity, and maintained or increased stocking capacity (McPhee et al., 2013).

Drought is a regular occurrence in Australia and significantly impacts grazing industries (Crowder, 2000; Penm et al., 2003). Predictions are that the length, severity, extent, and frequency of drought may increase as climate change impacts Australian weather patterns (IPCC, 2007). There is an opportunity for producers of the future to use computer-based trial-and-error techniques for testing consequences of drought management tactics and culling those that are likely to lead to financial ruin or irreparable environmental damage. Risk management is recognized as an important aspect of future farm management and software packages are an effective tool to improve management decisions (ABARE and MAF, 2006).

Table 5. Input values for ImPack analysis generated by producers at Condobolin NSW, of 3 drought management strategies: sell 10% of stock (Sell 10%); keep all stock and feed (Keep All); and sell progeny as weaners (not suckling) and feed cows (Sell Prog).

	Inputs							
Options	Destock cows, calves in 2008	Selling price			Feeding period	Cost of feeding		Total cost
		Cows	Calves	Weaners		Cow	Weaner	
		$/cow	$/calf	$/weaner	weeks	$/cow	$/weaner	(AU$)
Sell 10%	yes	720	280	–	8	2.00	1.00	11,749
Keep All	no	–	–		12	3.00	1.60	29,729
Sell Prog	no	–	–	405	12	3.00	–	20,160

Table 6. Gross margin predictions from ImPack of drought management strategies: sell 10% of stock (Sell 10%); keep all stock and feed (Keep All); and sell progeny as weaners (not suckling) and feed cows (Sell Prog.) when compared with non-drought conditions (Base).

Option	2008	2009	2010	2011	2012
	AU$				
Base	146,931	146,931	146,931	146,931	146,931
Sell 10%	192,026	114,704	127,928	131,203	132,758
Keep All	146,786	117,753	146,786	145,945	146,641
Sell Prog	146,786	77,797	146,786	145,945	146,641

Table 7. Cashflow comparisons from ImPack of drought management strategies: sell 10% of stock (Sell 10%); keep all stock and feed (Keep All); and sell progeny as weaners (not suckling) and feed cows (Sell Prog.) when compared with non-drought conditions (Base).

Option	2008	2009	2010	2011	2012
	AU$				
Base	–144,609	–28,638	34,585	99,658	167,660
Sell 10%	–97,484	–10,950	33,884	83,164	136,220
Keep All	–144,760	–59,294	1,333	63,922	130,024
Sell Prog	–144,760	–101,048	–44,061	17,010	81,002

Assessing the needs of the producers is a critical skill required of all livestock extension advisers. The StockPlan workshop run by extension advisers provides the forum to discuss the needs of the producers and it is strongly recommended that producers attend a StockPlan workshop before they use the software.

Producers need to make the best possible decisions because their livelihood and the environment are dependent on the outcome of their decisions. However, when complex decisions are required, people generally tend to use heuristics (rules of thumb) (Simon, 1955) or imitate others (Bikhchandani et al., 1998; Velez et al., 2009). In a recent study, Reeson and Dunstall (2009) found that when people are making complex decisions they are not seeking the "best" solution but one that is "good enough." In the farming community the choices of neighbors has a strong influence on decision making (Rogers, 1983). Bikhchandani et al. (1998) discuss the cascade effect where a few individuals make a decision and those who have not made a decision yet will follow the trend regardless of whether the original decision was the best. Kahn and Baron (1995) found that training helped people consider a more comprehensive decision making process. Ghadim et al. (2005) also found that learning encompasses improvements in skills and reduces uncertainty. Providing producers with training and the ability to test scenarios in a virtual environment may lead to better management and avoid a heuristic approach to decision making during drought. Murray-Prior and Wright (2001) illustrated that wool producers on the Northern Tablelands of Australia provided insight into the impact of major price changes through hierarchical decision models.

The case studies presented in this article outline different scenarios that producers could investigate and gain confidence in the decisions that they would be making. As the system becomes more complex, the decision making process tends to become simpler (Simon, 1955; Reeson and Dunstall, 2009). As more options are presented, the easier solution is often selected; for example, doing what the neighbor is doing. However, each DST can address different issues that producers may face, providing a means of dealing with the complexity and simplifying the decision making process.

The StockPlan DST help producers move away from heuristic decision making toward optimized decisions. Combining a large number of variables—such as length of feeding period, amount of feed required, cost of feed, cost of feeding, returns from sale of progeny, and interest costs—into a single value, for example, break-even price calculation in Drought Pack, simplifies the decision making process. Drought Pack does not reduce the risk the producer faces during a dry spell or in drought, but it does enable a producer to incorporate a number of factors into the decision making process. In the Drought Pack case study (Study 1), wool producers were deciding whether or not to keep their stock. Drought Pack provided them with an opportunity to see the consequences of selling, namely buying back stock at the end of the dry spell. This led them to ask the questions: "How much will I have to pay for replacements?" and "How good will those replacements be?" These types of questions need to be answered to optimize decision making. The StockPlan software does help producers optimize their decision making, but discussion about the results is a very valuable exercise.

Making the decision to feed, sell, or agist is one that producers face in dry spells and drought. FSA Pack can provide the best option over different dry spell scenarios (i.e., short, medium, long, and "worst case") where the user has the flexibility to define the length and probability. The FSA Pack case study (Study 2) illustrates the potential to optimize decision making. The Monaro Farming Systems group weighed up many options. They were able to manipulate the length of the dry spell time periods and change the probabilities of the different scenarios. They were then able to determine the sensitivity of their decision based on the changes they were making. Their final decision was based on the significant risk associated with agisting cattle. FSA Pack was not able to predict the value of the calves, but it did highlight that the calves' economic value was an important factor in the decision making process. Similar findings were found when using PRO Plus, a whole-farm fodder budgeting DST, for beef and sheep enterprises (McPhee et al., 2000).

Whole-farm budgets and cash-flow analysis has been implemented in the latest version of ImPack. This move to a cash-flow analysis is powerful and places the consequences of past decisions, goals, and the roles of expectations at the heart of their analysis (Malcolm 2004). The debt/equity ratio is only 1 of the financial indicators a producer needs to examine. Both the debt/equity ratio and other key ratios need to be discussed with a financial adviser. Analyzing the herd or flock during a 5- or 10-year planning period is a powerful tool that enables a producer to evaluate their whole farm. ImPack enables producers to look at the short, medium, and long-term impacts of management decisions made during drought. A producer can compare three management options simultaneously and, thus, optimize decision making.

Economics is very much an integrated component of StockPlan. Whole-farm analysis is fundamentally important to improving on-farm profitability. Malcolm (2004) clearly articulates that economics needs to be a core discipline of farm-management analysis. The StockPlan workshop provides an excellent forum for producers to ask questions and the DST to help producers improve their management decisions that impact the environment. Each of the DST places a dollar value on the decision that a producer needs to make.

An important function of a StockPlan workshop is that they bring groups of producers together to share their knowledge, skills, and experience. Facilitated by livestock extension advisers, it is possible to focus on factors that are important to the consequences of a decision. These factors may be ignored if a more heuristic approach is taken to decision making. Ignoring these factors may have significant consequences for a single producer who makes the wrong decision, but as there is a tendency to "follow the leader" (Bikhchandani et al., 1998), the consequences for the wider community and the environment may be substantial.

With an increase in the complexity of enterprises and the external environment, there exists an increasing need to assess various management strategies at the whole-farm level and optimize decision making. The StockPlan workshop provides training in the use of Drought Pack, FSA Pack, and ImPack that can help producers test different scenarios and make better management decisions that will reduce the repercussions of a dry spell or drought.

IMPLICATIONS

StockPlan, an accredited PROfarm course (NSW Department of Primary Industries), integrates four decision support tools (Drought Pack, FSA Pack, ImPack, and PlanPack) that help managers address a number of issues in the early stages of a dry spell or during drought. The interaction between workshop leaders and participants is a critical process in achieving benefits from the StockPlan workshop. Risk assessment of management decisions has the potential to reduce financial and social implications when faced with dry

spells or drought. Drought Pack can assist producers to decide whether or not to keep and feed stock. FSA Pack can help producers assess associated risks over short, medium, long, and "worst case" scenarios. ImPack can help producers decide if herd or flock restructuring is a viable option when faced with paying off debt.

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APPENDIX

Tables 8 to 11. ImPack input variables and outputs. Scenario generated by producers at Condobolin, NSW.

Table 8. Inputs for beef breeding enterprise.

Item	Value
Maximum cow age at joining	10
Total number of cows mated	399
Calves weaned	90
Adult death rate	2
Weaner death rate	2
Other culls	5
Cows sold that failed to rear	80
Heifers first calve at	2 years
Heifers sold at	1 year
Steers sold at	1 year

Table 9. Herd structure† outputs.

	Age									
Item	1	2	3	4	5	6	7	8	9	10
Number	59	54	49	44	40	37	33	30	28	25

† Approximate whole farm base year dry sheep equivalents (DSE) = 7,850 DSE.

Table 10. Selling price (AU$) of stock and total value per stock type.

Stock type	Number	Price ($ stock^{-1})	Total ($)
Steers	176	590	103,840
Heifers	117	550	64,350
CFA† cows‡	23	696	16,008
Cull cows‡	20	725	14,500
Dry cows‡	8	761	6,088

† Cull for age.
‡ Variable costs per cow $145.00.

Table 11. Whole farm income (AU$), costs, gross margin, and dry sheep equivalents (DSE) for base year.

Item	Value
Income	$204,786
Costs	$57,855
Gross margin	$146,931
DSE	7,850
Gross margin DSE^{-1}	$18.72

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