Guide to developing a decision matrix

Background

Some decisions in farming are hard. This difficulty can arise because we may not know all the facts, there are lots of pros and cons to weigh against each other, getting it wrong has severe consequences or it has a strong emotional element. Yet we still need to make a decision, even if it is to do nothing.

South Australian farmer and part time consultant Barry Mudge developed a simple approach to making critical decisions – called the decision matrix. It combines the elements of what makes a good decision – past experience, values, intuition, the scientific evidence and risk. It helps focus on the critical factors, ignoring the 'noise' and provides clear decision points. Arguably it forces you to slow down your decision making, to pause, think and compare before choosing what to do.

The decision matrix approach has other benefits. It documents what you have considered in coming to a decision, making it available for others to follow. This can be particularly useful when explaining decisions to others - between generations, managers and workers or with advisors and banks.

The matrix approach is particularly good for recurring decision, as it can be refined over time as new knowledge and experience builds.

The suggested steps in building a decision matrix are outlined. A series of examples are also included to illustrate how the decision matrix can be used in a range of situations. It is important to recognise that it is OK to disagree with some of the content in the examples provided. You may want to include different critical factors and disregard others. You may want to change the relative scores of different values or you may wish to change the scores where different decisions are suggested. All of this is legitimate. *Ultimately you need to own the decisions you make and therefore the matrix needs to reflect your thinking!*

Eight steps to create a decision matrix

1. Identify an **important decision** you need to make. It could be something that occurs on a regular (annual) basis e.g. how much crop to sow or how much fodder should I conserve this year, or as once off decision e.g. should I buy this block of land?.

2. List the **big considerations** you know should influence the decisions. These become your critical success factors. Usually there are only 4 to 8 critical success factors, the rest will be 'noise'.

3. Take each big consideration (critical success factor) and ask "at what point would I think a bit differently about my decision"? This will split each critical success factor into two or more **conditions**. Repeat for each critical success factor.

4. Once all critical success factors have conditions described, **assign scores**. Tip - assign all the lowest conditions as 0. Then consider the highest described condition and give them a score relative to the other highest conditions. i.e. if you decide the highest condition in critical success factor 1 is twice as critical as the highest condition in critical success factor 2, then the first needs twice the points. Once the top and bottom are established, it is relatively easy to fill in the remaining condition scores.

5. Calculate the **maximum score** if all conditions were at their highest.

6. Describe the **key decision** you would make under the maximum possible score and the worst possible score (which should be 0). Then, if applicable, fill in a couple of possible decisions you could make in between the two extremes. Don't create too many as this can confuse the decision you need to make.

7. Think of an **extreme historic example** (usually a year, season or known scenario) calculate the score for that example *at the time the decision needed to be made.* Using hindsight, what was the appropriate response for that set of circumstances. Use this to inform a key decision score for that extreme. Repeat with another extreme, but opposite example. Then estimate the scores in between the extremes.

8. Test with a series of **more recent examples** (so you get a combined score) and fine tune the score within each big consideration if required.

Example

Scenario: Your crop has been damaged because of an overnight frost. You need to make a decision on what to do.

Step 1: Decision required: "Should I cut this crop for fodder or take it through for grain"?

Step 2: Major considerations:

- Estimated area frosted
- Grain value if harvested compared to other uses for the fodder.
- Likelihood the unfrosted parts of the crop will finish
- Can the fodder be stored
- Is there a market to sell into
- Presence of problem weeds that could be cleaned up by hay making.

Step 3: Assign conditions for each major consideration. i.e. "at what point would I think differently about my response"? So for the estimated area frosted it might be;

- < 20% of crop frosted
- 20% to 50% frosted
- 50% to 80% frosted
- >80% frosted.

Repeat with the other major considerations (table 1).

Table 1: Major considerations and conditions

Decision required: Should I cut this crop for fodder or take it through for grain?

Major considerations	**Condition when I think differently about the decision**
Estimated area frosted	>80% frosted
	50% to 80% frosted
	20% to 50% frosted
	< 20% of crop frosted
Grain value if harvested compared to other uses for the fodder	Fodder value much higher than the grain value
	Grain and fodder value about equal
	Grain value much higher than the fodder value
Likelihood the unfrosted parts of the crop will finish	Low (minimal soil moisture and unfavourable forecast)
	Moderate (combination of current soil moisture and forecast OK)
	High (good soil moisture and favourable forecast)
Fodder storage	Yes
	No
Market to sell into	Yes and immediate
	Yes but over time
	Limited
Presence of problem weeds	Yes and could be successfully controlled with cutting
	Yes, but cutting won't help
	No

Step 4: Assign scores to each condition (table 2).

Table 2: Major decisions, conditions table and scores

Decision required: Should I cut this crop for fodder or take it through for grain?

Major consideration	**Condition when I think differently about the decision**	**Score**
Estimated area frosted	>80% frosted	10
	50% to 80% frosted	7
	20% to 50% frosted	4
	< 20% of crop frosted	0

Grain value if harvested compared to other uses for the fodder	Fodder value much higher than the grain value	10
	Grain and fodder value about equal	5
	Grain value much higher than the fodder value	0
Likelihood the unfrosted parts of the crop will finish	Low (minimal soil moisture and unfavourable forecast)	6
	Moderate (combination of current soil moisture and forecast OK)	3
	High (good soil moisture and favourable forecast)	0
Fodder storage	Yes	2
	No	0
Market to sell into	Yes and immediate	6
	Yes but over time	3
	Limited	0
Presence of problem weeds	Yes and could be successfully controlled with cutting	4
	Yes, but cutting won't help	0
	No	0

Step 5: Add up the maximum score if all conditions were at their highest (maximum is 38) and describe the answer to the decision. Repeat for the worst possible score (which will be zero) and assign some preliminary scores (table 3).

Table 3: Description of decision and cumulative score for a frosted crop

Decision	**Score**
Definitely cut the crop	>28
Hedge my bets and cut some (ideally the worst affected areas)	20-28
Don't cut the crop, take though to grain	<20

Step 6: Think of an extreme historic example when, in hindsight, it was the 'right' decision to cut for fodder. Repeat with another extreme, but opposite example.

Step 7: Test with a series of hypothetical examples (so you get a score) and fine tune the decision score if required.

Step 8: Test with a more recent example.

Other examples

Southern Australia low rainfall cropping
Decision: How much crop do I sow?

Critical success factors	Condition	Score
Stored soil moisture	80 mm	4
	60 mm	3
	40 mm	2
	20 mm	1
	< 10 mm	0
Timing of seeding rains	Optimum	3
	Within 2 wks	2
	Within 4 wks	1
	Within 6 wks	0
Amount of seeding rains	More than 30 mm	2
	15 - 30 mm	1
	< 15 mm	0
Agronomic considerations (nutrition, weeds, disease)	No constraints	3
	Limited constraints	2
	Significant constraints	1
	Poor	0
Seasonal Outlook Forecast	Decile ranking minus 1	up to 8
	Maximum score	**20**

>15 Points	Sow maximum crop area with increased fertiliser inputs
10-15 Points	Sow with normal inputs but possibly drop off poorer performing paddocks
7-11 Points	Sow better performing paddocks only, then reassess
< 7 Points	Significantly reduce crop area.

Southern Australia cropping example
Decision: Should I put late season nitrogen on this crop?

Critical success factors	Conditions	Points
Current soil mositure	Full profile	8
	75%	6
	50%	4
	<25%	0
Crop yield potential	High	6
	Average	3
	Low	0
Current soil N status	Low	10
	Medium	5
	High	0
Rain forecast to end of season	Decile forecast	Decile -3
	Maximum score	**31**

Points	Decision
>26	Apply max N to optimise yield potential
20 - 26	Apply 66% of N needed under optimal conditions
15-19	Apply 33% of N needed under optimal conditions
<15	Don't apply extra N

Southern Australia cropping example
Decision: Should I graze this crop?

Critical factors	Conditions	Points
Plant not well anchored (pull out)	No plant loss	3
	10% plant loss	2
	> 10% plant loss	0
Crop has reached GS 30	Before GS 30	3
	At GS30 - GS32	2
	>GS32	0
Residual drymatter after grazing	Clip graze	3
	50% biomass removed	2
	None, grazed to white line	0
Soil moisture at grazing	Full profile	4
	1/2 profile	2
	<25% profile	0
Agronomic conditions	No constraints	3
	Minor constraints	2
	Major constraints	0
Next 3 month forecast	Decile ranking minus 1	Up to 8
	Maximum score	**24**

>17	Definitely graze crop (minimal or no expected loss of grain yield)
17 to 8	Will only graze crop if the livestock benefits are greater than anticipated crop losses
<8	Will not graze the crop (significant expected loss of grain yield)

Southern Australia cropping example

Decision: Should I cut this crop for hay or take it through to grain?

Major consideration	Condition when I think differently about the decision	Score
Estimated area frosted	>80% frosted	10
	50% to 80% frosted	7
	20% to 50% frosted	4
	< 20% of crop frosted	0
Grain value if harvested compared to other uses for the fodder	Fodder value much higher than the grain value	10
	Grain and fodder value about equal	5
	Grain value much higher than the fodder value	0
Likelihood the unfrosted parts of the crop will finish	Low (minimal soil moisture and unfavourable forecast)	6
	Moderate (combination of current soil moisture and forecast OK)	3
	High (good soil moisture and favourable forecast)	0
Fodder storage	Yes	2
	No	0
Market to sell into	Yes and immediate	6
	Yes but over time	3
	Limited	0
Presence of problem weeds	Yes and could be successfully controlled with cutting	4
	Yes, but cutting won't help	0
	No	0
	Maximum score	**38**

Decision	Score
Definitely cut the crop	>28
Hedge my bets and cut some (ideally the worst affected areas)	20-28
Don't cut the crop, take though to grain	<20

Southern Australia cropping example
Decision: How much should a pay for a lease?

Critical success factors	Condition	Points
Length of lease	5 yrs + 5 yr option	10
	5 yrs	8
	3 yrs	4
	1 yr	0
Proximity to home	< 10 km	5
	10 -30 km	2
	> 30 km	0
Soil condition (fertility & pH)	< maint req'd	8
	Main only req'd	5
	Some capital inputs req'd	2
	heaps of capital inputs	0
Weed control	All weeds under control	4
	Some weed control required	2
	Weeds a disaster	0
Infrastructure to graze livestock	Yes	4
	No	0
Paddock sizes	> 80 ha	5
	15 ha to 50 ha	3
	< 15 ha & obstacles	0
	MAX POINTS	**36**

Decision description	
> 28 points out of 36	Great option (willing to pay > $140/acre)
20 - 28 points	Good option (willing to pay $120 - $140/acre)
16 - 20 points	Fair option (willing to pay $100 - $119/acre)
< 16 points	Not worth pursuing

Southern Australia pasture example
Decision: Should I manipulate or resow my pasture? (winter assessment)

Critical success factor	Condition	Score
% of desirable grasses (ryegrass, phalaris, cocksfoot, tall fescue)	> 30%	4
	30% to 15%	3
	15% to 10%	1
	<10%	0
% of desirable legumes (sub clover, white clover, lucerne, balansa etc)	> 45%	4
	45% to 25%	3
	25% to 10%	1
	<10%	0
Amount of bare ground	< 10%	2
	10 to 30%	1
	>30%	0
Desirable plants have the capacity to spread	Yes	4
	No	0
Type of weeds present	Adds to feed supply, reasonable quality	3
	Low productivity, less palatable	1
	Highly competitive with desirable species, cause animal health problems	0
	Max score	**17**

Decision	Score
No need to intervene, maintain current management	**>14**
Consider intervention if the season is favourable	**14 to 11**
Apply appropriate manipulation	**10 to 6**
Consider resowing	**<6**

Southern Australia pasture example
Decision: Should I consider applying fertiliser or lime to this paddock (based on a soil test result)?

Critical factor	Condition	Score
Desirable species present (perennial grasses, legume)	> 80% desirable species	6
	50% to 80% desirable species	4
	20% to 50% desirable species	2
	< 20% desirable species	0
Species present are responsive to fertiliser / lime	> 60% responsive species	6
	20% to 60% responsive species	3
	< 20% responsive species	0
Grazing method	Short periods of intense grazing followed by spelling	5
	Long periods of grazing followed by limited spelling	2
	Continuous grazing	0
Stocking rate	>80% of district potential	6
	61% to 80% of district potential	4
	40% to 60% of district potential	2
	<40% of district potential	0
	Maximum score	**23**

Decisions	Score
Yes, stocking rate, species and grazing method present should not limit fertiliser or lime response	>18
Possibly, but may require changes to grazing and / or pasture composition to optimise returns from fertiliser or lime	12 to 18
No, changes to pasture composition and/or grazing method would be required to get a return from fertiliser or lime	<12

Northern Australia cattle example
Decision: Do I sell cattle at the next sale?

Critical success factors	Condition	Allocated points
Likely price	Good	4
	Fair	2
	Poor	0
Condition of stock	Good	4
	Fair	2
	Poor	0
Feed demand (next 3 mths)	High	4
	Medium	2
	Low	0
Feed available	Poor	4
	Fair	2
	High	0
Rainfall forecast (next 3 months)	Below ave	2
	Ave	1
	Above Ave	0
	Maximum score	**18**

Decision
>14, Sell, Sell, Sell
9-14, Aggressively sell on class
4-8, Conservatively sell on class
<4, Keep, don't sell

Northern Australia cattle example
Decision: Should I reduce stocking rate for winter?

(Assume current SR is suitable for long term average)

Critical success factors	Condition	Allocated points
Available feed at end of growing season	< 1500 kg/ha	10
	1500 - 3000 kg/ha	5
	> 3000 kg/ha	0
Seasonal forecast	-ve SOI	6
	Neutral SOI	3
	+ve SOI	0
Expected first frost	April	4
	May	2
	June	0
Current sale price	High	6
	Fair	3
	Poor	0
	Maximum score	**26**

Decision
>19, Yes reduce stock numbers
11-19, Some reduction, based on forage budget
<11, No don't reduce stock numbers