What is the risk of increase to the area of winter grazing of forage crops if "normal dryland farming" is permitted?

Ned Norton (Technical Lead – Ecan)

Hurunui Waiau Zone Committee Workshop
7 March 2018, Amberley

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Lines of evidence?

- Multiple lines in paper (Norton 2018) discussed at SSG workshop on 29 Jan 2018.
- HDLG work (J. Brown 2018): Ten years of Beef & Lamb NZ winter forage data – see next.
- HDLG work (J. Brown 2018): Offered an "unlikely worst case" estimate – see next.
- New HDLG results (J. Brown 2018): Distribution of current WF area – see next.
- Beef & Lamb NZ material today? (7 Mar18)

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- Ten years of Beef & Lamb NZ data (J. Brown 2018) shows no long term trend in dryland winter forage area despite year to year fluctuations of 30% around the long term 1.9% average (orange dotted line).

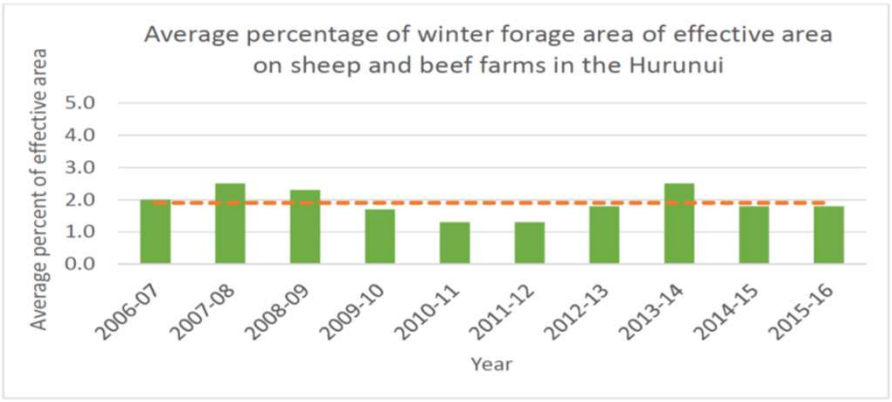

Figure 13. Average percentage of winter forage area of effective area on sheep and beef farms in the Hurunui (Beef + Lamb NZ, 2017)

- HDLG work (J. Brown 2018): Offered an unlikely "worst case" being an average increase of winter forage area of 50% across all dryland farms in the catchment (i.e. an increase from the current average 1.9% to 2.9% of property area in winter forage). The rationale for this 50% increase is that this is the 30% B&L fluctuation plus a nominal 20% buffer.

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- New HDLG results (J. Brown 2018): Distribution of current winter forage area across dryland farms.
- Skewed distribution with skinny RH tail.
- Flexibility to go up to 10% WF area is useful for dryland farmers even though unlikely all would do it.

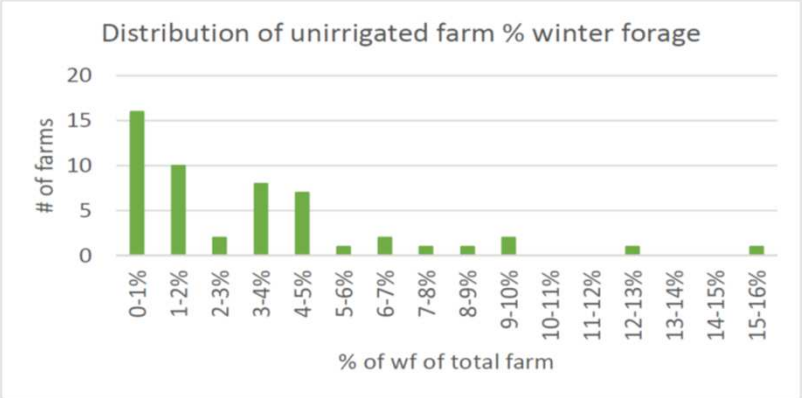

Figure 11. Distribution of unirrigated farm % winter forage of total farm area from survey.

Conclusions?

- A 50% increase on the current average winter forage area (1.9% of property) across all dryland farms in the catchment represents a **"plausible worst case"?**
- The risk of more than this appears low, particularly in the next 5 yrs?
- Keep monitoring/accounting area of winter forage annually to check and inform future review?
- For context, if all dryland farmers increased winter forage to 10% of their property this would be a 500% increase on the current average across the catchment – appears beyond plausible worst case?

What is the "plausible worst case" increase in N load from permitting "normal dryland farming" – and thus what tonnage needs offsetting to stay within the Hurunui catchment N load limit?

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Lines of evidence?

- Multiple lines of evidence in paper (Norton 2018) discussed at SSG workshop on 29 Jan 2018.
- HDLG work (J. Brown 2018): Plausible worst case estimate ~ 14% increase N loss from dryland farms group – translates to 1.3% increase N in river.
- ECan GIS work (Mojsilovic 2018): Ran several scenarios – similar plausible worst case leads to estimate of 3% increase N loss (at source/in river) – see next.
- Also P. Brown (2015) ~ similar order prediction.

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- Results from Mojsilovic (2018)

Scenario involves an increase from 1.8% to 2.5% (~40% increase) of property area in winter forage

Farm Catchment	Farm Sub-catchment[1]	Farm irrigation class[2]	Current N load (t N yr^{-1})	Winter Forage development scenarios (% of farm area)								
				Scenario N load (t N yr^{-1})			Absolute Change in N Load (t N yr^{-1})			Increase to the Sub-Catchment load (%)		
				2.5%	5.0%	10.0%	2.5%	5.0%	10.0%	2.5%	5.0%	10.0%
Hurunui	Mandamus	Dryland	395	420	420	425	25	25	30	5%	5%	6%
		Dryland farms (within irrigation user areas)	50	55	60	60	5	10	10	1%	2%	2%
		Irrigated farms (>50 ha irrigation)	40	40	40	40	0	0	0	0%	0%	0%
		All	485	515	520	530	30	35	45	6%	7%	9%
	SH1	Dryland	745	815	845	880	70	100	135	3%	4%	5%
		Dryland farms (within irrigation user areas)	695	750	805	880	55	110	185	2%	4%	7%
		Irrigated farms (>50 ha irrigation)	1,125	1,125	1,125	1,125	0	0	0	0%	0%	0%
		All	2,570	2,695	2,775	2,885	125	210	320	5%	8%	12%
	Mouth	Dryland	840	915	950	1,000	75	115	165	3%	4%	6%
		Dryland farms (within irrigation user areas)	790	850	910	1,005	60	120	215	2%	4%	8%
		Irrigated farms (>50 ha irrigation)	1,185	1,185	1,185	1,185	0	0	0	0%	0%	0%
		All	2,815	2,950	3,050	3,190	135	230	375	5%	8%	13%
Waiau	Leslie Hills	Dryland	260	305	325							4%
		Dryland farms (within irrigation user areas)	20	25	25							1%
		Irrigated farms (>50 ha irrigation)	365	365	365							0%
		All	640	695	715							5%
	Mouth	Dryland	840	940	1,020	1,110	100	185	275	3%	6%	10%
		Dryland farms (within irrigation user areas)	570	615	675	740	45	105	170	2%	4%	6%
		Irrigated farms (>50 ha irrigation)	1,465	1,465	1,465	1,465	0	0	0	0%	0%	0%
		All	2,875	3,020	3,160	3,315	145	290	440	5%	10%	15%

Note that this additional 2% increase could occur from permitted normal dryland farming in the HWP area if HWP did not go ahead

Conclusion 1: on plausible worst case N increase from permitting "normal dryland farming"?

- In combination, all the lines of evidence suggest that future increases in N loss from dryland farming properties as a whole catchment group are likely to be small (in the order of 0-3%) relative to total N load in the Waiau (and Hurunui) catchments, and relative to increases from irrigated development.
- "**Plausible worst case**" is represented by the 3% increase in catchment load.

Now, what is this as a tonnage? – see next…

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Method 1: Use Mojsilovic (2018)

Scenario involves an increase from 1.8% to 2.5% (~40% increase) of property area in winter forage

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		All	2,875	3,020	3,160	3,315	145	290	440	5%	10%	15%

Note that this additional increase could occur from permitted normal dryland farming in the HWP area if HWP did not go ahead

Method 1 results:

To cover for the "plausible worst case" N increase from permitting "normal dryland farming" we need approximately:

- **70** to 125 t N/yr as source load (lost from root zone)
- **35** to 60 t N/yr as in-river load (approx. 50% attenuation)

[The left (bold) tonnages are needed to cover permitted normal dryland development outside of irrigation scheme areas. The right hand tonnages would be needed if HWP did not go ahead – in that case the HWP load may be available to offset the permitted dryland increase? Something in between would provide buffer to cover for some dryland development inside scheme areas]

Method 2: Use P. Brown calculator (2018)

Hurunui River in-river load (t-N/y)

Row	Zone	2013-15 baseline		With consented increase		Scenario exploring		
		SH1	Mouth	SH1	Mouth	% change	SH1	Mouth
1	Upstream Mandamus	51	51	51	51	**14%**	58	58
2	AIC	448	448	448	448	**-5%**	428	428
3	HWP & NTP (excl. AIC overlap)	169	169	362	362	**0%**	362	362
4	Lower Hurunui irrigators (below SH1)	0	34	0	34	**0%**	0	34
5	Other irrigation	11	17	11	17	**0%**	11	17
6	Dryland	91	106	91	106	**14%**	104	121
7	**Total**	**770**	**825**	**963**	**1018**		**963**	**1020**
8	**Change from HWRRP Schedule 1 limit**						**0**	
9	**% change (from consented baseline)**						**100.0%**	**100.2%**

- Under the orange scenario AIC would need to reduce by **4.5%** - which is about **20 tonnes of in-river load**
- This is equivalent to **43 tonnes of AIC source load** (i.e., 4.5% of AIC's allocated 956 tonnes/yr)

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Conclusion 2: on what tonnage needs offsetting to stay within the Hurunui SH1 catchment N load limit, while permitting normal dryland farming?

To cover for the "plausible worst case" N increase from permitting "normal dryland farming" we need approximately:

- Method 1 = 70 tonnes (source load)
- Method 2 = 43 tonnes (source load)

Both could be justified as achieving a "zero sum game" (staying within SH1 in-river load limit) using their respective methods.

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