P O Box 2038
235 King Street
WHAKATANE
Tel 64–7–307 1142
Fax 64–7–307 1149
Email: mark.mac@agfirst.co.nz

THE AFFECT OF FLOODING ON VARIOUS LAND-USES WITHIN THE WHAKATANE RIVER CATCHMENT

Prepared for:

Robbin Britton

Environment Bay of Plenty

Prepared by:

Mark Macintosh
AgFirst Consultants (Central) Ltd

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1.0 BRIEF

This report

i. Provides a general overview of land-use within the Whakatane river Catchment area.
ii. Provides financial returns for various land-uses within the Catchment.
iii. Provides an estimate of losses and reparation costs for the various land-uses as a result of flooding within the Whakatane River Catchment.

2.0 OVERVIEW OF LAND-USE

A land-use survey of the Whakatane-Waimana Catchment was carried out by AgFirst in September 2003. The results are shown in the table below.

Figure1: Land-use in the Whakatane-Waimana Catchment (Sept 2003)

Landuse	Area(ha)	Productive ha	% Land-use
Indigenous Forest	153,698		
Dairy farming	12,793	12,793	65.6%
Drystock farming	5,870	5,870	30.1%
Unproductive	2,160		
Small holdings	2,015		
Scrub	1,022		
Cropping	842	842	4.3%
Total	**178,400**	**19,505**	

Excluding Indigenous forest, the most common land-use is dairy farming which represents 66% of the productive land area. Drystock farming and cropping represent 30% and 4% respectively. The survey undertaken in 1958 indicated a similar use of productive land with dairying at 68% (include cropping) and drystock at 32%.

The Whakatane-Waimana River Catchment extends as far south as Ruatahuna, situated in the upper Catchment 75km from the coast. The majority of productive land (98%) is situated in the lower Catchment within 25 kilometres of the Bay of Plenty coast.

2.0 LAND-USE FINANCIAL RETURNS

The following table details the Cash Surplus financial return ($/ha) for various land-uses within the Whakatane-Waimana Catchment.

Figure2: Financial Returns for Land-uses within the Whakatane-Waimana Catchment as at November 2004

Land-use	Income/ha	Expenses/ha	Cash Surplus/ha
Dairy	$3,653	$2,208	$1,444
Drystock	$855	$371	$485
Maize for silage	$4,305	$3,030	$1,275
Kiwifruit	$33,422	$26,944	$6,498

Source: MAF Farm/Orchard Monitoring Report 2004

The above returns are derived from the MAF Farm/Orchard Monitoring Report 2004. The produce prices have been revised in the case of Dairy and Kiwifruit to better reflect long term price expectations. Refer to gross margins in appendices for details.

3.0 GENERAL FLOOD LOSS/COST ASSESSMENT

An estimate of the financial loss and cost for the main land-uses, likely to be affected by a significant flood within the Whakatane-Waimana Catchment, has been determined at various flood depths. Both July (winter) and February (summer) flood scenarios have been considered as the losses vary considerably between the two seasons.

Depth of silt also has a significant impact on production, especially with the pastoral land-uses however due to insufficient data silting effects have not been considered in this analysis. It is assumed in all scenarios 0-5cm silt is deposited.

3.1 DAIRY

3.1.1 July (winter) Flood

Figure 3: Estimated loss and cost (per hectare) for Dairy at various flood depths in winter

Water Depth(m)	Production loss/ha	Reparation costs/ha	Total Loss&Cost/ha
0-0.5	$300	$315	$615
0.5-1.0	$680	$480	$1,160
1.0-1.5	$1,820	$1,205	$3,025
1.5-2.0	$2,704	$1,380	$4,084
2.0-2.5	$2,914	$1,830	$4,744
2.5-3.0	$2,914	$1,830	$4,744

Note: Reparation costs include: re-grassing, cropping, grazing, fertiliser and repairs to drains/races/fences/water.

Production loss is based on a conversion of 12 kg pasture drymatter per kg milksolids produced at a payout of $4/kg milksolids.

Assumptions

0-0.5m depth:	Land is spelled for 30 days prior to grazing with no re-seeding. Production loss relates to the initial pasture lost and 30 days of growth. There are some costs of reparation for grazing, fertiliser and R&M.
0.5-1.0m depth:	Land is spelled for 60 days prior to grazing with no re-seeding. Reparation costs are slightly higher than above.
1.0-1.5m depth:	Land is oversown once drained and then cultivated/re-grassed in the autumn. The land is effectively out for 150 days. Reparation costs are significantly higher to cover oversowing and re-grassing costs in addition to grazing, fertiliser, and repairs.
1.5-2.0m depth	The same management as above. The production loss is higher due to pasture being unavailable for an extra 30 days. reparation cost is slightly higher.
2.0m+ depth	The land is fallowed once drained. It is then cultivated/summer cropped and cultivated/re-grassed in the autumn. The production loss is similar to the 1.5-2.0m depth due to extra production gained from the crop. The reparation cost is significantly higher due to the cost of establishing the crop combined with extra fertiliser and repairs.

3.1.2 February (summer) Flood

Figure 4: Estimated loss and cost (per hectare) for Dairy at various flood depths in summer

Water Depth(m)	Production loss/ha	Reparation costs/ha	Total Loss&Cost/ha
0-0.5	$417	$200	$617
0.5-1.0	$800	$716	$1,516
1.0-1.5	$1,333	$866	$2,199
1.5-2.0	$1,333	$966	$2,299
2.0-2.5	$1,333	$1,066	$2,399
2.5-3.0	$1,333	$1,066	$2,399

Assumptions

0-0.5m depth: The land is spelled for 30 days with a loss similar to that experienced in a winter flood.

0.5-1.0m depth: The land is undersown once drained, effectively taking it out of grazing for 60 days. There are reparation costs of oversowing, grazing, fertiliser, and repairs.

1.0m+ depth: The land is cultivated/re-grassed once drained. This effectively takes the land out of grazing for 100 days. Reparation cost is slightly higher as the depth of water increases, due to higher repairs.

3.2 Drystock

3.2.1 July (winter) Flood

Figure 5: Estimated loss and cost (per hectare) for Drystock at various flood depths in winter

Water Depth(m)	Production loss/ha	Reparation costs/ha	Total Loss&Cost/ha
0-0.5	$50	$125	$175
0.5-1.0	$138	$175	$313
1.0-1.5	$450	$775	$1,225
1.5-2.0	$680	$775	$1,455
2.0-2.5	$658	$1,025	$1,683
2.5-3.0	$658	$1,025	$1,683

Note: Reparation costs include the same items as Dairy above.

Production loss is based on the conversion of 12.8 kg pasture dry matter per kilogram of liveweight gain at a return of $1.60 per kilogram of liveweight.

Assumptions

The reparation management for Drystock is the same as that for Dairy. The costs however are lower due to a lesser need for grazing and fertiliser in particular. The production loss is significantly lower due to lower return for Drystock compared to Dairy.

3.2.2 February (summer) Flood

Figure 6: Estimated loss and cost (per hectare) for Drystock at various flood depths in summer

Water Depth(m)	Production loss/ha	Reparation costs/ha	Total Loss&Cost/ha
0-0.5	$32	$125	$157
0.5-1.0	$226	$425	$651
1.0-1.5	$363	$525	$888
1.5-2.0	$363	$525	$888
2.0-2.5	$363	$525	$888
2.5-3.0	$363	$525	$888

Assumptions

The reparation management for Drystock is the same as that for Dairy. The loss and costs however are lower for the same reasons as outlined in 3.2.1.

3.3 Maize for Silage

3.3.1 July (winter) Flood

Figure 7: Estimated loss and cost (per hectare) for Maize grown for silage at various flood depths in winter

Water Depth(m)	Production loss/ha	Reparation costs/ha	Total Loss&Cost/ha
0-0.5	$0	$0	$0
0.5-1.0	$0	$0	$0
1.0-1.5	$0	$0	$0
1.5-2.0	$0	$0	$0
2.0-2.5	$0	$0	$0
2.5-3.0	$0	$0	$0

Assumptions

Maize grown for silage would be largely unaffected as the land is fallowed between maize crops at this time. Sometimes an intermediary crop such as triticale may be grown in which case there would be a total loss of the crop at an estimated cost of $2,000 per hectare. In some cases there may be a need to deep rip the soil post planting of the maize.

3.3.2 February (summer) Flood

Figure 8: Estimated loss and cost (per hectare) for Maize grown for silage at various flood depths in summer

Water Depth(m)	Production loss/ha	Reparation costs/ha	Total Loss&Cost/ha
0-0.5	$3,000	$1,050	$4,050
0.5-1.0	$5,000	$0	$5,000
1.0-1.5	$5,000	$0	$5,000
1.5-2.0	$5,000	$0	$5,000
2.0-2.5	$5,000	$0	$5,000
2.5-3.0	$5,000	$0	$5,000

Note: Reparation cost only includes the harvesting of the maize crop

Assumptions

Maize grown for silage would effectively be written off with a depth of water greater than 0.5m. There may be the opportunity to salvage sufficient crop to more than cover the cost of harvesting with less than 0.5m water damage.

3.4 Kiwifruit

3.4.1 July (winter) Flood

Figure 9: Estimated loss and cost (per hectare) for Kiwifruit at various flood depths in winter

Water Depth(m)	Production loss/ha	Reparation costs/ha	Total Loss&Cost/ha
0-0.5	$0	$0	$0
0.5-1.0	$0	$0	$0
1.0-1.5	$2,900	$400	$3,300
1.5-2.0	$5,800	$600	$6,400
2.0-2.5	$5,800	$800	$6,600
2.5-3.0	$5,800	$800	$6,600

Note: Reparation cost includes: repairs to structures, and aeration of soil.

Assumptions

0-1.0m depth: No significant effect on production due to plants (assumed to be mature) being relatively dormant and under low stress at this time.

1.0m+ depth: The roots are affected to some extent causing a 10-20% lower return the following season due to a lower bud set.

3.4.2 February (summer) Flood

Figure 10: Estimated loss and cost (per hectare) for Kiwifruit at various flood depths in summer

Water Depth(m)	Production loss/ha	Reparation costs/ha	Total Loss&Cost/ha
0-0.5	$0	$0	$0
0.5-1.0	$2,900	$0	$2,900
1.0-1.5	$2,9000	-$11,017	$17,983
1.5-2.0	$29,000	-$10,817	$18,183
2.0-2.5	$29,000	-$10617	$18,383
2.5-3.0	$29,000	-$10,617	$18,383

Note: Reparation cost includes: the saving in harvesting cost in addition to repairs to structures and aeration of soil (a negative figure indicates a saving in cost).

Assumptions

0-0.5m depth: No significant effect on production.

0.5-1.0m depth: 10% loss of fruit.

1.0m+ depth: Kiwifruit would be severely affected. The plants are at the early stage of fruit set and under high stress. Any significant water-logging at this stage would cause the fruit to stop setting and weaken the vines. Under this scenario the grower is likely to strip and discard the fruit to relieve the stress on the plants and assist recovery. The crop would effectively be a write-off. The only compensation would be a saving in harvest/storage/selling costs as indicated by the negative figures under reparation costs above.

4.0 APPENDICES

4.1 Gross Margins - Dairy, Drystock, Maize, Kiwifruit

4.2 Flood loss charts - Dairy, Drystock, Maize, Kiwifruit

Please direct any enquiries regarding this report to the author:

Mark Macintosh (B.Ag.Sc.) MNZIPIM(Reg.)
Farm Management Consultant
AgFirst Consultants Ltd.

10m grid "are completely within"

Category

	Dairy summer $/ha											
Depth		5yr		10year		20yr		50yr		100year		200 year	
		ha	Loss	ha	Loss	ha	Loss	ha	Loss	ha	Loss	ha	Loss
0-0.5	617	66.23	$40,864	110.45	$68,148	106.36	$65,624	101.69	$62,743	101.21	$62,447	99.44	$61,354
0.5-1	1516	21.46	$32,533	55.12	$83,562	82.63	$125,267	118.67	$179,904	118.18	$179,161	108.62	$164,668
1-1.5	2199	5.89	$12,952	13.45	$29,577	23.07	$50,731	52.27	$114,942	87.47	$192,347	104.29	$229,334
1.5-2	2299	1.07	$2,460	4.16	$9,564	7.59	$17,449	14.63	$33,634	22.04	$50,670	35.79	$82,281
2-2.5	2399	0.38	$912	0.69	$1,655	1.28	$3,071	3.9	$9,356	7.22	$17,321	11.06	$26,533
2.5-3	2399	0	$0	0.36	$864	0.55	$1,319	0.84	$2,015	1.18	$2,831	2.1	$5,038
>3	2399	0	$0	0.29	$696	0.76	$1,823	1.25	$2,999	1.62	$3,886	1.88	$4,510
TOTAL		95.03	$89,721	184.52	$194,065	222.24	$265,285	293.25	$405,593	338.92	$508,662	363.18	$573,718

	Dairy winter $/ha											
Depth		5yr		10year		20yr		50yr		100year		200 year	
		ha	Loss	ha	Loss	ha	Loss	ha	Loss	ha	Loss	ha	Loss
0-0.5	615	66.23	$40,731	110.45	$67,927	106.36	$65,411	101.69	$62,539	101.21	$62,244	99.44	$61,156
0.5-1	1160	21.46	$24,894	55.12	$63,939	82.63	$95,851	118.67	$137,657	118.18	$137,089	108.62	$125,999
1-1.5	3025	5.89	$17,817	13.45	$40,686	23.07	$69,787	52.27	$158,117	87.47	$264,597	104.29	$315,477
1.5-2	4084	1.07	$4,370	4.16	$16,989	7.59	$30,998	14.63	$59,749	22.04	$90,011	35.79	$146,166
2-2.5	4744	0.38	$1,803	0.69	$3,273	1.28	$6,072	3.9	$18,502	7.22	$34,252	11.06	$52,469
2.5-3	4744	0	$0	0.36	$1,708	0.55	$2,609	0.84	$3,985	1.18	$5,598	2.1	$9,962
>3	2399	0	$0	0.29	$696	0.76	$1,823	1.25	$2,999	1.62	$3,886	1.88	$4,510
TOTAL		95.03	$89,615	184.52	$195,219	222.24	$272,551	293.25	$443,548	338.92	$597,677	363.18	$715,740

sheep/beef	*Assume that losses are as per "Dry Stock"*					
	5yr	10year	20yr	50yr	100year	200 year
0-0.5	0	0.04	0.06	0.09	0.18	0.23
0.5-1				0.03	0.06	0.09
1-1.5						0.02
1.5-2						
2-2.5						
2.5-3						

	Dry stock winter $/ha											
Depth		5yr		10year		20yr		50yr		100year		200 year	
		ha	Loss	ha	Loss	ha	Loss	ha	Loss	ha	Loss	ha	Loss
0-0.5	175	0	$0	0.04	$7	0.06	$11	0.09	$16	0.18	$32	0.23	$40
0.5-1	313	0	$0	0	$0	0	$0	0.03	$9	0.06	$19	0.09	$28
1-1.5	1225	0	$0	0	$0	0	$0	0	$0	0	$0	0.02	$25
1.5-2	1455	0	$0	0	$0	0	$0	0	$0	0	$0	0	$0
2-2.5	1683	0	$0	0	$0	0	$0	0	$0	0	$0	0	$0
2.5-3	1683	0	$0	0	$0	0	$0	0	$0	0	$0	0	$0
TOTAL		0	$0	0.04	$7	0.06	$11	0.12	$25	0.24	$50	0.34	$93

	Dry stock summer $/ha											
Depth		5yr		10year		20yr		50yr		100year		200 year	
		ha	Loss	ha	Loss	ha	Loss	ha	Loss	ha	Loss	ha	Loss
0-0.5	157	0	$0	0.04	$6	0.06	$9	0.09	$14	0.18	$28	0.23	$36
0.5-1	651	0	$0	0	$0	0	$0	0.03	$20	0.06	$39	0.09	$59
1-1.5	888	0	$0	0	$0	0	$0	0	$0	0	$0	0.02	$18
1.5-2	888	0	$0	0	$0	0	$0	0	$0	0	$0	0	$0
2-2.5	888	0	$0	0	$0	0	$0	0	$0	0	$0	0	$0
2.5-3	888	0	$0	0	$0	0	$0	0	$0	0	$0	0	$0
TOTAL		0	$0	0.04	$6	0.06	$9	0.12	$34	0.24	$67	0.34	$112

Exotic Forest	5yr	10year	20yr	50yr	100year	200 year
0-1.23m		0.81				
0-1.347m			0.74			
0-1.537m				0.95		
0-1.043m	0.41				1.13	
0-1.66m						1.28
0-1.78m						

Lifestyle block	200 year
0.05-0.25	0.05

	maize silage summer	
Depth		No areas flooded in Waimana
0-0.5	4050	
0.5-1	5000	
1-1.5	5000	
1.5-2	5000	
2-2.5	5000	
2.5-3	5000	

	maize silage winter
no losses	

	kiwifruit winter	
Depth		No areas flooded in Waimana
0-0.5	0	
0.5-1	0	
1-1.5	3300	
1.5-2	6400	
2-2.5	6600	
2.5-3	6600	

	kiwifruit summer	No areas flooded in Waimana
Depth		
0-0.5	0	
0.5-1	2900	
1-1.5	17938	
1.5-2	18183	
2-2.5	18183	
2.5-3	18183	

$ Loss from flooding per hectare for Dairy

JULY FLOOD

Water Assumptions:

Date of Flood: 1-Jul

Water depth m	Silt depth cm	Days to drain	Action	Date back in rotation	Days out of grazing during season	average growth DM/ha/day	Initial Pasture lost DM/ha	Pasture Growth lost DM/ha	Crop gain DM/ha	Production loss kgMS/ha	Loss: Production loss $/ha	Reparation cost: Oversowing cost $/ha	Crop cost $/ha	Regrass cost $/ha	Jul/Aug Graze cost $/ha	Capital Fert cost $/ha	R&M cost $/ha	Total Loss and cost $/ha
0-0.5	0	0-2	Do nothing	1-Jul	0	0	100	0	0	10	$40	$0	$0	$0	$0	$0	$0	$40
	0-5	0-2	Do nothing	1-Aug	30	15	300	450	0	75	$300	$0	$0	$0	$190	$75	$50	$615
	5-10	0-2	Oversow, regrass	1-Oct	150	25	1000	3750	0	475	$1,900	$250	$0	$300	$230	$400	$100	$3,180
0.5-1.0	0	2-4	Do nothing	1-Aug	30	15	300	450	0	75	$300	$0	$0	$0	$190	$75	$50	$615
	0-5	2-4	Do nothing	1-Sep	60	20	500	1200	0	170	$680	$0	$0	$0	$230	$150	$100	$1,160
	5-10	2-4	Fallow, crop, regrass	1-May	305	37	1000	11285	5000	729	$2,914	$0	$500	$300	$230	$400	$200	$4,544
1.0-1.5	0	4-6	Oversow	1-Sep	60	20	500	1200	0	170	$680	$250	$0	$0	$230	$150	$100	$1,410
	0-5	4-6	Oversow, regrass	1-Oct	150	25	800	3750	0	455	$1,820	$250	$0	$300	$230	$225	$200	$3,025
	5-10	4-6	Fallow, crop, regrass	1-May	305	37	1000	11285	5000	729	$2,914	$0	$500	$300	$230	$400	$300	$4,644
1.5-2.0	0	6-8	Oversow, regrass	1-Oct	150	25	1000	3750	0	475	$1,900	$250	$0	$300	$230	$225	$200	$3,105
	0-5	6-8	Oversow, regrass	1-Nov	180	32	1000	5760	0	676	$2,704	$250	$0	$300	$230	$300	$300	$4,084
	5-10	6-8	Fallow, crop, regrass	1-May	305	37	1000	11285	5000	729	$2,914	$0	$500	$300	$230	$400	$400	$4,744
2.0-2.5	0	8-10	Fallow, crop, regrass	1-May	305	37	1000	11285	5000	729	$2,914	$0	$500	$300	$230	$400	$400	$4,744
	0-5	8-10	Fallow, crop, regrass	1-May	305	37	1000	11285	5000	729	$2,914	$0	$500	$300	$230	$400	$400	$4,744
	5-10	8-10	Fallow, crop, regrass	1-May	305	37	1000	11285	5000	729	$2,914	$0	$500	$300	$230	$400	$400	$4,744
2.5-3.0	0	10-12	Fallow, crop, regrass	1-May	305	37	1000	11285	5000	729	$2,914	$0	$500	$300	$230	$400	$400	$4,744
	0-5	10-12	Fallow, crop, regrass	1-May	305	37	1000	11285	5000	729	$2,914	$0	$500	$300	$230	$400	$400	$4,744
	5-10	10-12	Fallow, crop, regrass	1-May	305	37	1000	11285	5000	729	$2,914	$0	$500	$300	$230	$400	$400	$4,744

Assumes cows are grazed off at no cost from September onwards

Action Key: Oversow — Broadcast seed in July once water has resided; Fallow — Do nothing prior to the sowing of a crop in Oct/Nov; Regrass — Cultivate and sow down into permanent pasture in the autumn

potential of 12600DM/ha

10DM/MS in spring 12DM/MS for season

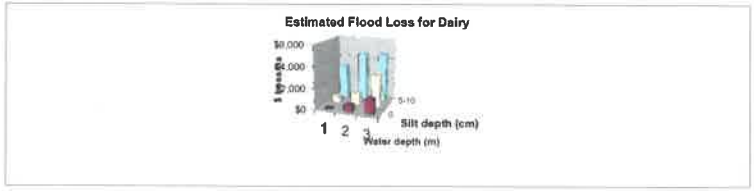
$4/kgMS

60% cows for 8 weeks 3 cows/ha $16/hd/wk

damage to fences races water

Total Loss and Cost/ha

		Silting (cm)		
		0	0-5	5-10
Water (m)	0-1	$40	$615	$3,180
	1-2	$615	$1,160	$4,544
	2-3	$1,410	$3,025	$4,644



FEBRUARY FLOOD

Water Assumptions:

Date of Flood: 1-Feb

Water depth m	Silt depth cm	Days to drain	Action	Date back in rotation	Days out Lactation during season	average growth DM/ha/day	Initial Pasture lost DM/ha	Milking Pasture loss DM/ha	Production loss kgMS/ha	Loss: Production loss $/ha	Reparation cost: Regrass cost $/ha	R&M Cost $/ha	Grazing Cost $/ha	Capital Fert cost $/ha	Total Loss and cost $/ha
0-0.5m	0	0-2	Do nothing	1-Feb	0	0	0	0	0	$0	$0	$0	$0	$0	$0
	0-5	0-2	Do nothing	1-Mar	30	35	200	1050	104	$417	$0	$50	$0	$150	$617
	5-10	0-2	Regrass	1-May	100	35	500	3500	333	$1,333	$300	$100	$216	$400	$2,349
0.5-1.0	0	2-4	Do nothing	1-Mar	30	35	0	1050	88	$350	$0	$50	$0	$0	$400
	0-5	2-4	Undersow	1-Apr	60	35	300	2100	200	$800	$250	$100	$216	$150	$1,516
	5-10	2-4	Regrass	1-May	100	35	500	3500	333	$1,333	$300	$200	$216	$400	$2,449
1.0-1.5	0	4-6	Regrass	1-May	100	35	500	3500	333	$1,333	$300	$100	$216	$0	$1,949
	0-5	4-6	Regrass	1-May	100	35	500	3500	333	$1,333	$300	$200	$216	$150	$2,199
	5-10	4-6	Regrass	1-May	100	35	500	3500	333	$1,333	$300	$300	$216	$400	$2,549
1.5-2.0	0	6-8	Regrass	1-May	100	35	500	3500	333	$1,333	$300	$200	$216	$0	$2,049
	0-5	6-8	Regrass	1-May	100	35	500	3500	333	$1,333	$300	$300	$216	$150	$2,299
	5-10	6-8	Regrass	1-May	100	35	500	3500	333	$1,333	$300	$400	$216	$400	$2,649
2.0-2.5	0	8-10	Regrass	1-May	100	35	500	3500	333	$1,333	$300	$400	$216	$0	$2,249
	0-5	8-10	Regrass	1-May	100	35	500	3500	333	$1,333	$300	$400	$216	$150	$2,399
	5-10	8-10	Regrass	1-May	100	35	500	3500	333	$1,333	$300	$400	$216	$400	$2,649
2.5-3.0	0	10-12	Regrass	1-May	100	35	500	3500	333	$1,333	$300	$400	$216	$0	$2,249
	0-5	10-12	Regrass	1-May	100	35	500	3500	333	$1,333	$300	$400	$216	$150	$2,399
	5-10	10-12	Regrass	1-May	100	35	500	3500	333	$1,333	$300	$400	$216	$400	$2,649

Action Key: Regrass — Cultivate and sow down into permanent pasture in the autumn

Based on a potential of 12600DM/ha

Based on 12DM/MS

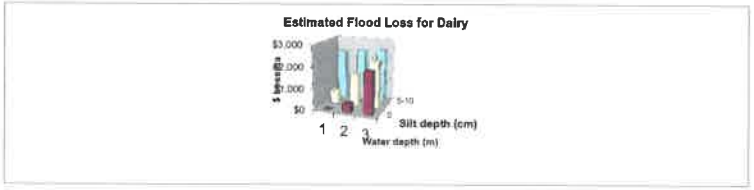
Based on $4/kgMS

Based on 3 cows/ha at $6/hd/wk for 12 wks

Based on damage to fences races water

Total Loss and Cost/ha

		Silting (cm)		
		0	0-5	5-10
Water (m)	0-1	$0	$617	$2,349
	1-2	$400	$1,516	$2,449
	2-3	$1,949	$2,199	$2,549



$ Loss from flooding per hectare for Drystock

JULY FLOOD

Water Assumptions:

Date of Flood: 1-Jul

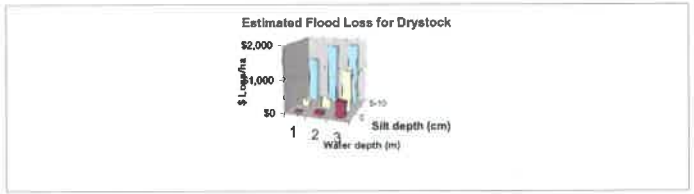
Water depth m	Silt depth cm	Days to drain	Action	Date back in rotation	Days out of grazing during season	average growth DM/ha/day	Initial Pasture loss DM/ha	Pasture Growth loss DM/ha	Crop gain DM/ha	Production loss kgIwt/ha	Loss: Production loss $/ha	Reparation cost: Oversowing cost $/ha	Crop cost $/ha	Regrass cost $/ha	Capital Fert cost $/ha	R&M cost $/ha	Total Loss and cost $/ha
0-0.5m	0	0-2	Do nothing	1-Jul	0	0	0	0	0	0	$0	$0	$0	$0	$0	$0	$0
	0-5	0-2	Do nothing	1-Aug	30	10	100	300	0	31	$50	$0	$0	$0	$75	$50	$175
	5-10	0-2	Oversow, regrass	1-Oct	150	22	500	3300	0	297	$475	$250	$0	$300	$200	$100	$1,325
0.5-1.0	0	2-4	Do nothing	1-Aug	30	10	0	300	0	23	$38	$0	$0	$0	$0	$50	$88
	0-5	2-4	Do nothing	1-Sep	60	15	200	900	0	86	$138	$0	$0	$0	$75	$100	$313
	5-10	2-4	Fallow, crop, regrass	1-May	305	32	500	9760	5000	411	$658	$0	$500	$300	$200	$150	$1,808
1.0-1.5	0	4-6	Oversow	1-Sep	60	15	100	900	0	78	$125	$250	$0	$0	$0	$100	$475
	0-5	4-6	Oversow, regrass	1-Oct	150	22	300	3300	0	281	$450	$250	$0	$300	$75	$150	$1,225
	5-10	4-6	Fallow, crop, regrass	1-May	305	32	500	9760	5000	411	$658	$0	$500	$300	$200	$200	$1,858
1.5-2.0	0	6-8	Oversow, regrass	1-Oct	150	22	200	3300	0	273	$438	$250	$0	$300	$0	$100	$1,088
	0-5	6-8	Oversow, regrass	1-Nov	180	28	400	5040	0	425	$680	$250	$0	$300	$75	$150	$1,455
	5-10	6-8	Fallow, crop, regrass	1-May	305	32	500	9760	5000	411	$658	$0	$500	$300	$200	$200	$1,858
2.0-2.5	0	8-10	Fallow, crop, regrass	1-May	305	32	500	9760	5000	411	$658	$0	$500	$300	$0	$100	$1,558
	0-5	8-10	Fallow, crop, regrass	1-May	305	32	500	9760	5000	411	$658	$0	$500	$300	$75	$150	$1,683
	5-10	8-10	Fallow, crop, regrass	1-May	305	32	500	9760	5000	411	$658	$0	$500	$300	$200	$200	$1,858
2.5-3.0	0	10-12	Fallow, crop, regrass	1-May	305	32	500	9760	5000	411	$658	$0	$500	$300	$0	$100	$1,558
	0-5	10-12	Fallow, crop, regrass	1-May	305	32	500	9760	5000	411	$658	$0	$500	$300	$75	$150	$1,683
	5-10	10-12	Fallow, crop, regrass	1-May	305	32	500	9760	5000	411	$658	$0	$500	$300	$200	$200	$1,858
								Based on a potential of 10800DM/ha		Based on 12.8kgDM per kg lwt	Based on $1.6/kgIwt						

Action Key

Oversow	Broadcast seed in July once water has resided
Fallow	Do nothing prior to the sowing of a crop in Oct/Nov
Regrass	Cultivate and sow down into permanent pasture in the autumn

Total Loss and Cost/ha

	Silting (cm)			
		0	0-5	5-10
Water (m)	0-1	$0	$175	$1,325
	1-2	$88	$313	$1,808
	2-3	$475	$1,225	$1,858



FEBRUARY FLOOD

Water Assumptions:

Date of Flood: 1-Feb

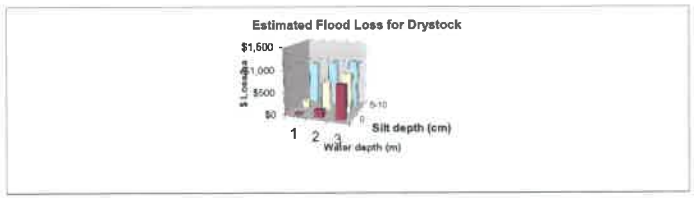
Water depth m	Silt depth cm	Days to drain	Action	Date back in rotation	Days out of grazing during season	average growth DM/ha/day	Initial Pasture loss DM/ha	Pasture Growth loss DM/ha	Production loss kgIwt/ha	Loss: Production loss $/ha	Reparation cost: Regrass cost $/ha	Capital Fert cost $/ha	R&M cost $/ha	Total Loss and cost $/ha
0-0.5m	0	0-2	Do nothing	1-Feb	0	0	0	0	0	$0	$0	$0	$0	$0
	0-5	0-2	Do nothing	1-Mar	0	0	300	0	20	$32	$0	$75	$50	$157
	5-10	0-2	Regrass	1-May	90	30	700	2700	227	$363	$300	$200	$100	$963
0.5-1.0	0	2-4	Do nothing	1-Mar	30	25	200	750	63	$101	$0	$0	$50	$151
	0-5	2-4	Undersow	1-Apr	60	27	500	1620	141	$226	$250	$75	$100	$651
	5-10	2-4	Regrass	1-May	90	30	700	2700	227	$363	$300	$200	$150	$1,013
1.0-1.5	0	4-6	Regrass	1-May	90	30	700	2700	227	$363	$300	$0	$100	$763
	0-5	4-6	Regrass	1-May	90	30	700	2700	227	$363	$300	$75	$150	$888
	5-10	4-6	Regrass	1-May	90	30	700	2700	227	$363	$300	$200	$200	$1,063
1.5-2.0	0	6-8	Regrass	1-May	90	30	700	2700	227	$363	$300	$0	$100	$763
	0-5	6-8	Regrass	1-May	90	30	700	2700	227	$363	$300	$75	$150	$888
	5-10	6-8	Regrass	1-May	90	30	700	2700	227	$363	$300	$200	$200	$1,063
2.0-2.5	0	8-10	Regrass	1-May	90	30	700	2700	227	$363	$300	$0	$100	$763
	0-5	8-10	Regrass	1-May	90	30	700	2700	227	$363	$300	$75	$150	$888
	5-10	8-10	Regrass	1-May	90	30	700	2700	227	$363	$300	$200	$200	$1,063
2.5-3.0	0	10-12	Regrass	1-May	90	30	700	2700	227	$363	$300	$0	$100	$763
	0-5	10-12	Regrass	1-May	90	30	700	2700	227	$363	$300	$75	$150	$888
	5-10	10-12	Regrass	1-May	90	30	700	2700	227	$363	$300	$200	$200	$1,063
								Based on a potential of 10000DM/ha	Based on 15kgDM per kg lwt	Based on $1.6/kgIwt				

Action Key

Regrass	Cultivate and sow down into permanent pasture in the autumn

Total Loss and Cost/ha

	Silting (cm)			
		0	0-5	5-10
Water (m)	0-1	$0	$157	$963
	1-2	$151	$651	$1,013
	2-3	$763	$888	$1,063



$ Loss from flooding per hectare for Maize Silage

JULY FLOOD

Water Assumptions:

Date of Flood: 1-Jul

Water depth m	Silt depth cm	Days to drain	Action	Yield Expected DM/ha	Yield loss DM/ha	Production loss $/ha
0-0.5m	0	0-2	Do nothing	25000	0	$0
	0-5	0-2	Do nothing	25000	0	$0
	5-10	0-2	Do nothing	25000	0	$0
0.5-1.0	0	2-4	Do nothing	25000	0	$0
	0-5	2-4	Do nothing	25000	0	$0
	5-10	2-4	Do nothing	25000	0	$0
1.0-1.5	0	4-6	Do nothing	25000	0	$0
	0-5	4-6	Do nothing	25000	0	$0
	5-10	4-6	Do nothing	25000	0	$0
1.5-2.0	0	6-8	Do nothing	25000	0	$0
	0-5	6-8	Do nothing	25000	0	$0
	5-10	6-8	Do nothing	25000	0	$0
2.0-2.5	0	8-10	Do nothing	25000	0	$0
	0-5	8-10	Do nothing	25000	0	$0
	5-10	8-10	Do nothing	25000	0	$0
2.5-3.0	0	10-12	Do nothing	25000	0	$0
	0-5	10-12	Do nothing	25000	0	$0
	5-10	10-12	Do nothing	25000	0	$0
				Based on a potential of 25000 kgDM/ha		

FEBRUARY FLOOD

Water Assumptions:

Date of Flood: 1-Feb

Water depth m	Silt depth cm	Days to drain	Action	Yield Expected DM/ha	Yield loss DM/ha	Production Loss $/ha	Harvest Cost $/ha	Total Loss/Cost $/ha
0-0.5m	0	0-2	Harvest	22500	2500	$500	$1,050	$1,550
	0-5	0-2	Harvest	10000	15000	$3,000	$1,050	$4,050
	5-10	0-2	Writeoff	0	25000	$5,000	$0	$5,000
0.5-1.0	0	2-4	Writeoff	0	25000	$5,000	$0	$5,000
	0-5	2-4	Writeoff	0	25000	$5,000	$0	$5,000
	5-10	2-4	Writeoff	0	25000	$5,000	$0	$5,000
1.0-1.5	0	4-6	Writeoff	0	25000	$5,000	$0	$5,000
	0-5	4-6	Writeoff	0	25000	$5,000	$0	$5,000
	5-10	4-6	Writeoff	0	25000	$5,000	$0	$5,000
1.5-2.0	0	6-8	Writeoff	0	25000	$5,000	$0	$5,000
	0-5	6-8	Writeoff	0	25000	$5,000	$0	$5,000
	5-10	6-8	Writeoff	0	25000	$5,000	$0	$5,000
2.0-2.5	0	8-10	Writeoff	0	25000	$5,000	$0	$5,000
	0-5	8-10	Writeoff	0	25000	$5,000	$0	$5,000
	5-10	8-10	Writeoff	0	25000	$5,000	$0	$5,000
2.5-3.0	0	10-12	Writeoff	0	25000	$5,000	$0	$5,000
	0-5	10-12	Writeoff	0	25000	$5,000	$0	$5,000
	5-10	10-12	Writeoff	0	25000	$5,000	$0	$5,000
				Based on a potential of 25000 kgDM/ha		Based on 20c/kgDM		

Most crops written off
Only harvest if return exceeds harvest cost
Worse situation if debris in water
Silt has an adverse affect on silage making

$ Loss from flooding per hectare for Kiwifruit

JULY FLOOD

Water Assumptions:

1-Jul			Loss	Reparation cost		
Water depth m	Days to drain	Action	Production loss $/ha	Aeration cost $/ha	Damage to Structures $/ha	Total Loss and cost $/ha
0-0.5	0-2	Do nothing	$0	$0	$0	$0
0.5-1.0	2-4	Do nothing	$0	$0	$0	$0
1.0-1.5	4-6	Do nothing	$2,900	$200	$200	$3,300
1.5-2.0	6-8	Do nothing	$5,800	$200	$400	$6,400
2.0-2.5	8-10	Do nothing	$5,800	$200	$600	$6,600
2.5-3.0	10-12	Do nothing	$5,800	$200	$600	$6,600

FEBRUARY FLOOD

Water Assumptions:

1-Feb			Loss		Reparation cost			
Water depth m	Days to drain	Action	Production loss $/ha	Saving in Costs $/ha	Damage to Structures $/ha	Aeration cost $/ha	Total Loss and cost $/ha	
0-0.5	0-2	Do nothing	$0	$0	$0	$0	$0	
0.5-1.0	2-4	Strip fruit and writeoff	$2,900	$0	$0	$0	$2,900	Based on 10% loss
1.0-1.5	4-6	Strip fruit and writeoff	$29,000	$11,417	$200	$200	$17,983	Based on 100% loss
1.5-2.0	6-8	Strip fruit and writeoff	$29,000	$11,417	$400	$200	$18,183	Based on 100% loss
2.0-2.5	8-10	Strip fruit and writeoff	$29,000	$11,417	$600	$200	$18,383	Based on 100% loss
2.5-3.0	10-12	Strip fruit and writeoff	$29,000	$11,417	$600	$200	$18,383	Based on 100% loss