

A photograph of a bulldozer working on a dirt field. The bulldozer is in the foreground, facing right, with its blade lowered. The ground is dry and dusty. In the background, there are rolling hills or mountains under a blue sky with some clouds. The image has a slightly grainy, vintage quality.

# **Matching extra benefits with expected fines: the case of rangeland improvement and regulations**

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**585**

**2006**

# Objective

Analyze how, different combinations of fines and inspections, could influence the economic behavior of ranchers, in the case of buffelgrass rangeland improvement projects, in the North of México (Sonora)



# Introduction

There has been known that the Buffelgrass may cause major habitat change because modifications in wildfire regimes and out competing native species (Jackson (2005), Williams and Baruch (2000)), its fast growth characteristics and rapid recovery following rainfall promotes its ability to predominate or invade (Gonzalez and Dodd (1979)).

Nevertheless this process seems to take up some time (Peter et al., 2005).

# Introduction

Franklin et al. 2006 mentioned that “Desmonte”, the process by which native desert vegetation is removed in preparation for buffelgrass seeding, alters the land surface such that buffelgrass plots are easily detectable from aerial and Landsat satellite images. Williams and Baruch (2000) mention that direct effects of African grasses on ecosystem processes are likely to be subtle compared to disturbance and land clearing that often precedes their invasion.

# Problem

Environmental agency in Mexico issue grants to seed buffelgrass, based on a Mexican Official Standard, this standard impose severe constraints, no trees and cacti can be removed, no riparian areas can be affected, endangered plant species must be left untouched.

In the practice, Ranchers are getting the permit just to obtain a subside. But they are not meeting the regulations on the field. Actually there are not inspections for the permits issued.



## Meeting the Regulations





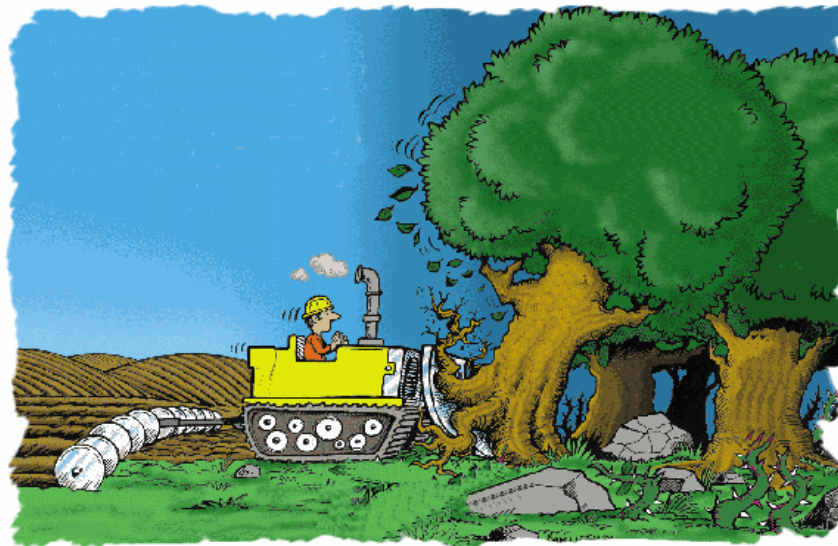
## Not meeting the Regulations



# Reasons for these behavior?

- No law enforcement (no inspections)
- More forage production per area
- Maximize bulldozer use, so lower seeding costs

so ranchers have a rational behavior...





# Model

The complete list of permits (397) granted in Sonora in 2004, projects were sorted by size and were analyzed to get its NPV, the options were:

1. Not to seed buffelgrass
2. Seed buffelgrass meeting the regulations
3. Seed buffelgrass not meeting the regulations

A LPM was made in order to compare these three options. The third option included the negative expected value of a fine.

Minimum Fine: **\$13,474.28**; Max Fine: **\$231,761.90**

Risk neutral ranchers

No loopholes



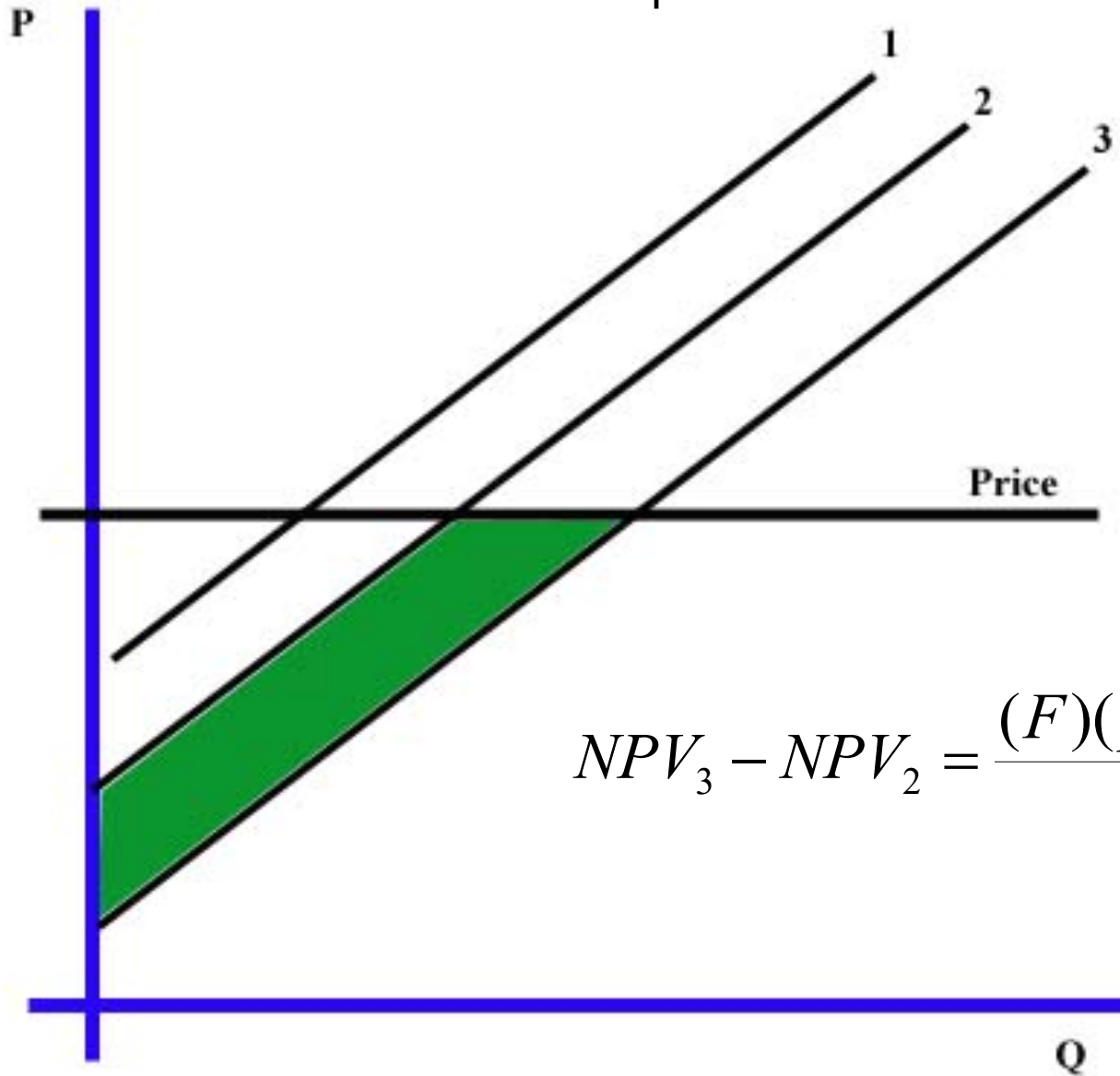
# Quasi-profits

Microsoft Excel ribbon: Archivo, Edición, Ver, Insertar, Formato, Herramientas, Datos, Ventana, Web, Adobe PDF. Search bar: "Escriba una pregunta".

	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W
1																
2																
3																
4	<b>Calculation</b>	<b>Year 1</b>	<b>Year 2</b>	<b>Year 3</b>	<b>Year 4</b>	<b>Year 5</b>	<b>Year 6</b>	<b>Year 7</b>	<b>Year 8</b>	<b>Year 9</b>	<b>Year 10</b>	<b>Year 11</b>	<b>Year 12</b>	<b>Year 13</b>	<b>Year 14</b>	<b>Year 15</b>
5	Total Revenues	\$57,655.50	\$64,982.22	\$69,251.20	\$73,520.18	\$77,789.17	\$82,058.15	\$86,327.13	\$90,596.12	\$94,865.10	\$99,134.08	\$103,403.07	\$107,672.05	\$111,941.03	\$116,210.02	\$120,479.00
6	Quantity produced (kg)	\$22,610.00	\$22,610.00	\$22,610.00	\$22,610.00	\$22,610.00	\$22,610.00	\$22,610.00	\$22,610.00	\$22,610.00	\$22,610.00	\$22,610.00	\$22,610.00	\$22,610.00	\$22,610.00	\$22,610.00
7	Cost (USD/kg)	\$1.53	\$1.57	\$1.65	\$1.73	\$1.80	\$1.88	\$1.95	\$2.03	\$2.10	\$2.18	\$2.26	\$2.33	\$2.41	\$2.48	\$2.56
8	Subside	\$5,666.67														
9	Total Costs	\$34,638.68	\$35,606.73	\$37,317.53	\$39,028.34	\$40,739.15	\$42,449.96	\$44,160.77	\$45,871.58	\$47,582.39	\$49,293.20	\$51,004.01	\$52,714.82	\$54,425.62	\$56,136.43	\$57,847.24
10	Project Cost	\$316,885.71														
11	Profit	-\$288,202.23	\$29,375.49	\$31,933.67	\$34,491.84	\$37,050.01	\$39,608.19	\$42,166.36	\$44,724.54	\$47,282.71	\$49,840.89	\$52,399.06	\$54,957.23	\$57,515.41	\$60,073.58	\$62,631.76
12																
13	NPV (owned money)	\$237,404.13														
14	NPV (borrowed money)	\$76,627.83														
15	No time preference	\$355,848.51														
16	<b>Data Extrapolated</b>	<b>Year 1</b>	<b>Year 2</b>	<b>Year 3</b>	<b>Year 4</b>	<b>Year 5</b>	<b>Year 6</b>	<b>Year 7</b>	<b>Year 8</b>	<b>Year 9</b>	<b>Year 10</b>	<b>Year 11</b>	<b>Year 12</b>	<b>Year 13</b>	<b>Year 14</b>	<b>Year 15</b>
17																
18	Fuel	\$0.64	\$0.64	\$0.67	\$0.70	\$0.73	\$0.75	\$0.78	\$0.81	\$0.84	\$0.87	\$0.90	\$0.92	\$0.95	\$0.98	\$1.01
19	Male calf price	\$2.90	\$3.27	\$3.49	\$3.70	\$3.92	\$4.13	\$4.35	\$4.57	\$4.78	\$5.00	\$5.21	\$5.43	\$5.64	\$5.86	\$6.07
20	Female calf price	\$2.20	\$2.48	\$2.64	\$2.80	\$2.96	\$3.12	\$3.29	\$3.45	\$3.61	\$3.77	\$3.93	\$4.10	\$4.26	\$4.42	\$4.58
21	Supplement	\$0.29	\$0.29	\$0.31	\$0.32	\$0.34	\$0.35	\$0.37	\$0.38	\$0.40	\$0.42	\$0.43	\$0.45	\$0.46	\$0.48	\$0.49
22	Sire	\$1,142.86	\$1,158.69	\$1,221.75	\$1,284.81	\$1,347.86	\$1,410.92	\$1,473.98	\$1,537.03	\$1,600.09	\$1,663.15	\$1,726.21	\$1,789.26	\$1,852.32	\$1,915.38	\$1,978.43
23	Veterinary expenses	\$114.29	\$115.87	\$122.17	\$128.48	\$134.79	\$141.09	\$147.40	\$153.70	\$160.01	\$166.31	\$172.62	\$178.93	\$185.23	\$191.54	\$197.84
24	Rancher Wage	\$9.52	\$10.26	\$10.76	\$11.27	\$11.77	\$12.27	\$12.77	\$13.27	\$13.78	\$14.28	\$14.78	\$15.28	\$15.79	\$16.29	\$16.79
25	Forest & Agr. PPI	\$132.56	\$134.40	\$141.71	\$149.03	\$156.34	\$163.66	\$170.97	\$178.28	\$185.60	\$192.91	\$200.23	\$207.54	\$214.85	\$222.17	\$229.48
26	Cow	\$653.03	\$718.27	\$752.09	\$785.91	\$819.73	\$853.55	\$887.38	\$921.20	\$955.02	\$988.84	\$1,022.66	\$1,056.48	\$1,090.30	\$1,124.12	\$1,157.94
27	Cow salvage value (375 kg)	\$356.51	\$403.55	\$418.54	\$433.54	\$448.54	\$463.53	\$478.53	\$493.52	\$508.52	\$523.52	\$538.51	\$553.51	\$568.51	\$583.50	\$598.50
28	Sire salvage value (600 kg)	\$675.64	\$756.29	\$785.97	\$815.64	\$845.31	\$874.99	\$904.66	\$934.34	\$964.01	\$993.69	\$1,023.36	\$1,053.03	\$1,082.71	\$1,112.38	\$1,142.06
29																
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Individuals would engage in the activity only if their private Gains exceed the expected fine



$$NPV_3 - NPV_2 = \frac{(F)(p) + (\sim F)(1 - p)}{(1 + i)}$$



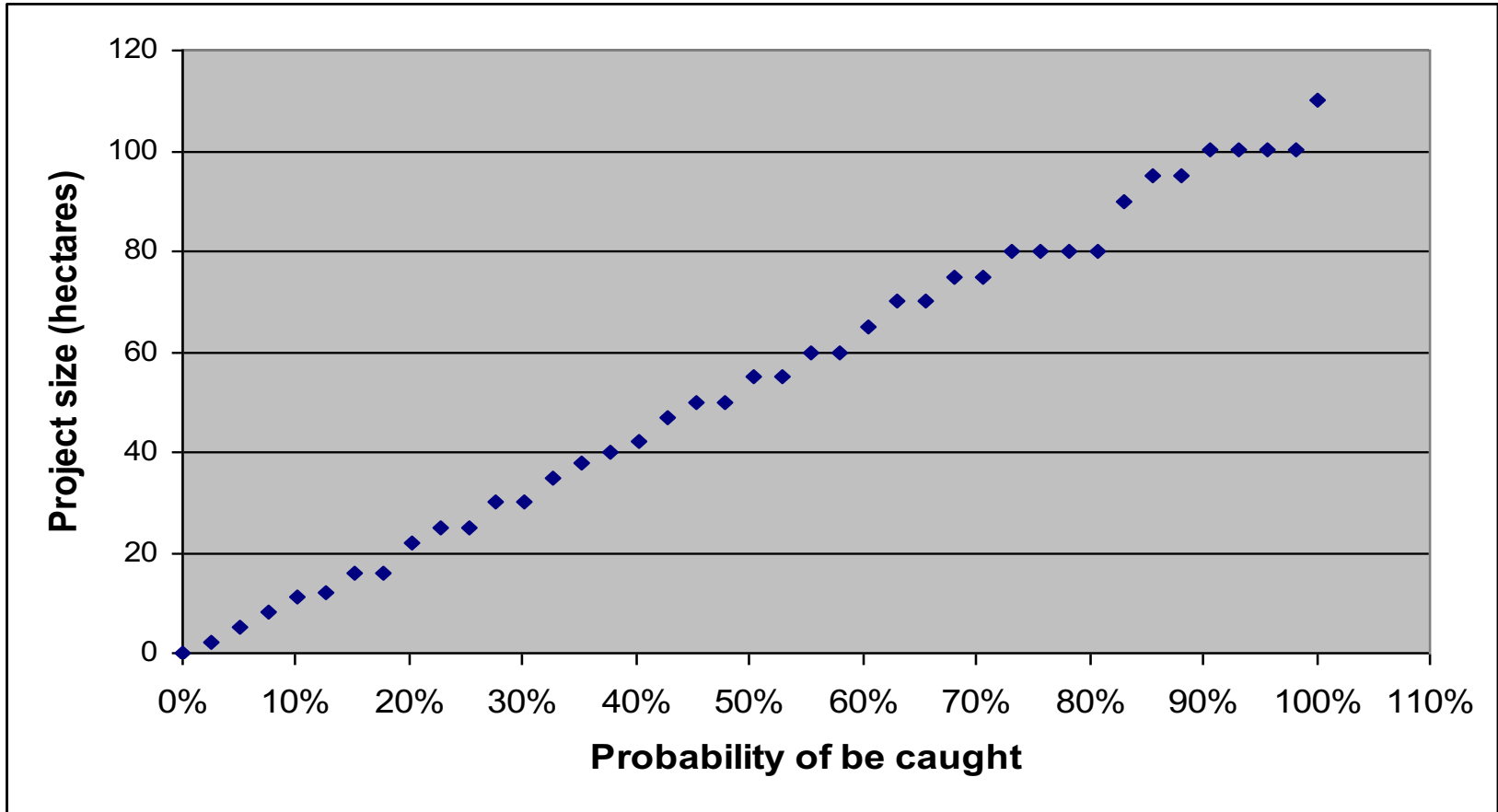
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Objective Function (Max Revenues) = \$17,698,544.30

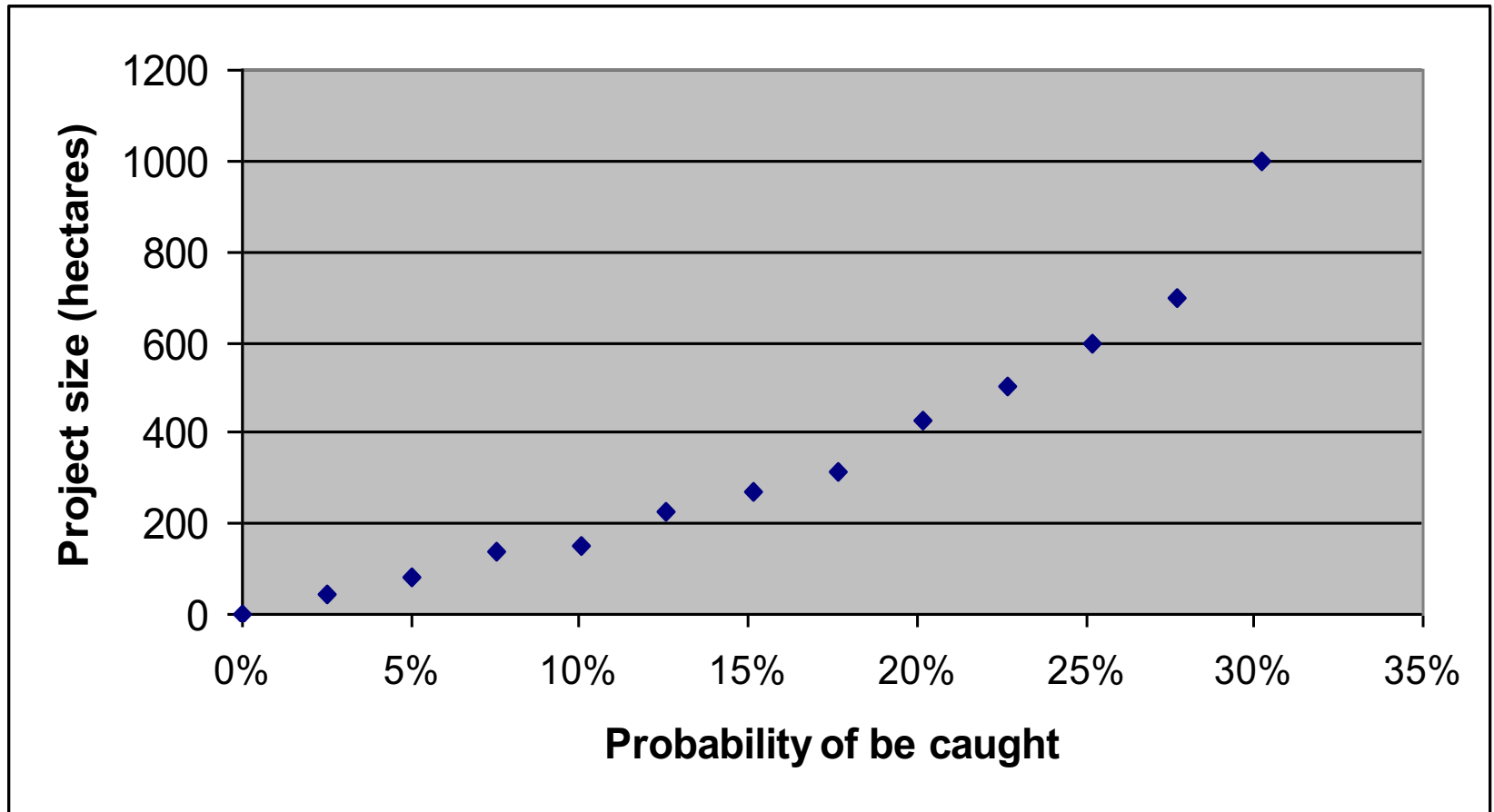
Project Area hectares	$\omega_1$	$\omega_2$	$\omega_3$	LHS	=	Number of Projects	p	Fine	E(F)	N	# Inspections
							0.2770781	\$231,762.00	\$62,729.48	397	110
1	0	4	0	4	=	4		$\omega_1$	$\omega_2$	$\omega_3$	
2	0	2	0	2	=	2	1	\$196.58	\$330.01	-\$62,281.47	\$448.01
3	0	2	0	2	=	2	2	\$393.16	\$723.52	-\$61,769.97	\$959.51
4	0	3	0	3	=	3	3	\$589.73	\$1,117.03	-\$61,258.47	\$1,471.01
5	0	5	0	5	=	5	4	\$786.31	\$1,510.54	-\$60,746.96	\$1,982.52
7	0	1	0	1	=	1	5	\$982.89	\$1,904.05	-\$60,235.46	\$2,494.02
8	0	2	0	2	=	2	7	\$1,376.05	\$2,691.07	-\$59,212.45	\$3,517.03
9	0	1	0	1	=	1	8	\$1,572.62	\$3,084.58	-\$58,700.95	\$4,028.53
10	0	24	0	24	=	24	9	\$1,769.20	\$3,478.09	-\$58,189.45	\$4,540.03
11	0	2	0	2	=	2	10	\$1,965.78	\$3,871.60	-\$57,678.05	\$5,051.43
12	0	3	0	3	=	3	11	\$2,162.36	\$4,265.11	-\$57,166.44	\$5,563.04
15	0	4	0	4	=	4	12	\$2,358.94	\$4,658.62	-\$56,654.94	\$6,074.54
16	0	1	0	1	=	1	15	\$2,948.67	\$5,839.14	-\$55,120.43	\$7,609.05
20	0	14	0	14	=	14	16	\$3,145.25	\$6,232.65	-\$54,608.93	\$8,120.55
22	0	1	0	1	=	1	20	\$3,931.56	\$7,806.69	-\$52,562.91	\$10,166.57
25	0	3	0	3	=	3	22	\$4,324.72	\$8,593.71	-\$51,539.91	\$11,189.57
30	0	10	0	10	=	10	25	\$4,914.45	\$9,774.24	-\$50,005.40	\$12,724.08
35	0	1	0	1	=	1	30	\$5,897.34	\$11,741.78	-\$47,447.88	\$15,281.60
38	0	1	0	1	=	1	35	\$6,880.23	\$13,709.33	-\$44,890.37	\$17,839.11

# Results



With the minimum fine and inspecting all the 397 grants we will disincentive those that sow less than 110 hectares and over deterrence those that sow less than 25 hectares

# Results



With the maximum fine and inspecting 30% of the 397 grants we will disincentive those that sow less than 1000 hectares (397 projects) and over deterrence those that sow less than 164 hectares



# Conclusions

- Fines that already exists in Law, do not apply for these kind of projects, either because it is too low and require a to inspect a high number of projects, or because do not disincentive larger projects and over deterrence small ones.
- Further studies are necessaries to determine the ranchers risk affinity.

Questions?