Economic Benefits from Ragwort Biocontrol

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Ragwort – The Weed in NZ

- Major pasture weed – spread into all areas >870mm annual rainfall by 1930s
- Displaced pasture and poisoned stock

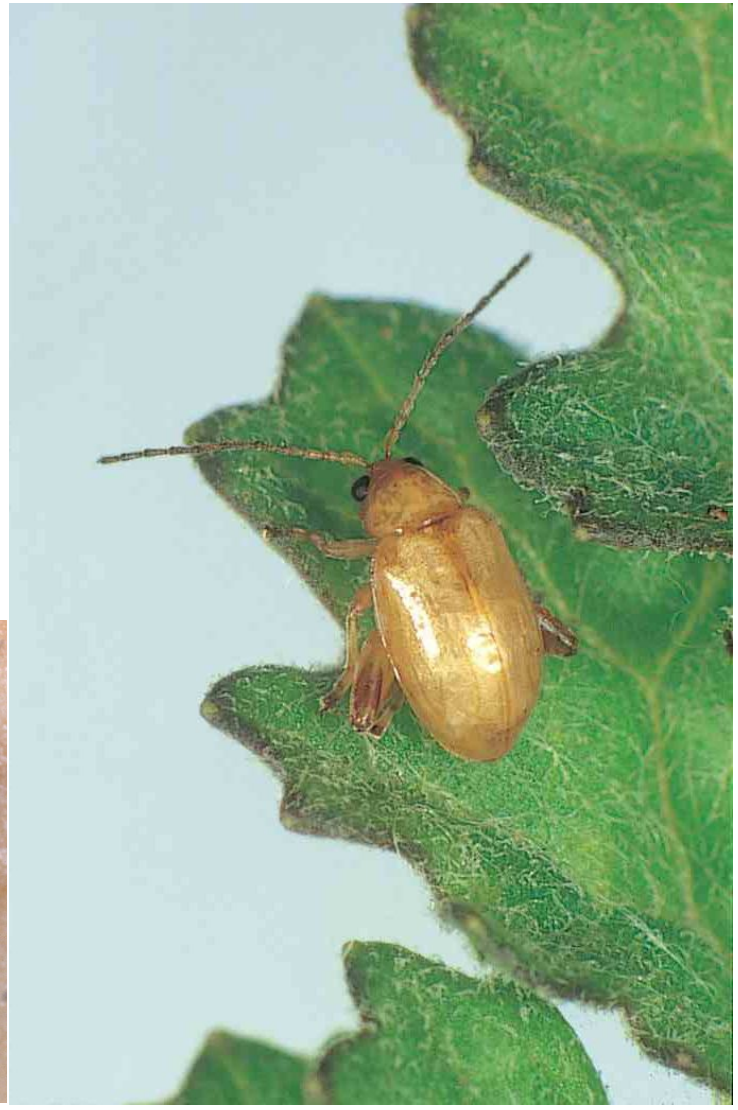
Biological Control of Ragwort

- Pioneered by NZ: Cinnabar moth and seed fly established in 1930's

- Both ineffective
- Programme ceased – weed remained a serious problem

Biological control revisited

- USA/Australia 1960/70s: success with ragwort flea beetle
- NZ followed in 1983: also successful



Beetle didn't succeed everywhere

- Control failed in high rainfall areas
- Research → Beetle rare where rainfall >1700 mm/yr
- NZ released ragwort plume moth, 2005; better adapted to wet areas

- Release application included a cost-benefit analysis from the West Coast where biocontrol was failing

Expanding on the Economic Survey

- Survey: Control costs (labour + herbicide) on 32 dairy farms on West Coast (where biocontrol ineffective)
- Mean ragwort control per farm = $2789 in 2005
- Now extrapolate to all 12000 dairy farms in NZ i.e. control costs if biocontrol hadn't happened
- 2005 data adjusted for av. inflation (3%/yr) and national herd size (1926: 2.3m → 2015: 6.8m)
- Without biocontrol, NZ dairy farms would have spent $64m on ragwort control in 2015
- Now need to know benefit from biocontrol, and costs of the biocontrol programme (1920s - 1990s)

Trial Data - % change in ragwort density

Horomanga	Bay of Plenty, NI	–100%
Orere Point	Hunua, NI	–100%
Carterton	Wellington, NI	–100%
Turakina	Wanganui, NI	–100%
Alcove	Kaipara, NI	–100%
Sisam	Bay of Plenty, NI	–100%
McCann	Bay of Plenty, NI	–100%
Hampden	Otago, SI	–100%
Pahiatua	Wanganui, NI	–96%
Woodside	Otago, SI	–96%
Leader River	Canterbury, SI	–82%
Turakina	Wanganui, NI	–68%
Nettingham	Bay of Plenty, NI	–33%
Larkin	Taranaki, NI	–20%
Tukituki River	Hawke's Bay, NI	21%
Ward Rd	Southland, SI	38%

50% of trials: ragwort eliminated

25% of trials: mean reduction of 86%

25% of trials: <50% reduction (or increase) – assume zero benefits

Benefit from Biocontrol

- Extrapolated nationally from these trials
- 100% reduction (6220 farms), 86% (3110), 0% (3110)
- Conservative assumptions:
- Benefit started 7 years after beetle release in 1983
- Increased at 10% per year to maximum by 1999
- Ragwort flea beetle saved dairy farmers $44 million in 2015 in reduced ragwort control costs – with savings per year now ongoing

Biocontrol Costs

- No past cost data, but very detailed descriptions of activities
- Used equivalent costs of modern programmes, inflation-adjusted back to 1920/30s for first two agents, and to 1980s for the flea beetle.

Benefit:Cost Ratio

- Net present value analysis used to compare costs and benefits over time
- All past costs (or benefits) are inflated at 8%/yr to add higher value to past $$ spent or saved
- Taking costs, the rationale is that each $ invested early-on in ragwort biocontrol could have been spent on something else, and made (according to NZ Treasury) an 8%/yr return
- For ragwort biocontrol the benefit:cost ratio is 14:1 (i.e. every $ spent has generated $14 in savings)
- Not many investments give $14 for each $1!

Retrospective/Reflections

- NZ rejected flea beetle in 1930s based on field observations, and advice from a botany professor, rather than experimental trials
- This rejection cost NZ $8.6 billion (NPV) from the 1940s to 1999 – which could have been avoided with a bit of investment in some science!
- Do the science; don't give up too easily!
- Research into flea beetle failure in wet areas led to the plume moth release – potentially saving a further $20m/yr.
- More detail in paper out soon in NZ Journal of Agricultural Research e.g. key assumptions, sensitivity analyses.

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