Potential economic benefits of integrating irrigated forage crops in traditional beef cattle operations in the gulf catchments of northern Queensland

Marta Monjardino and Neil MacLeod

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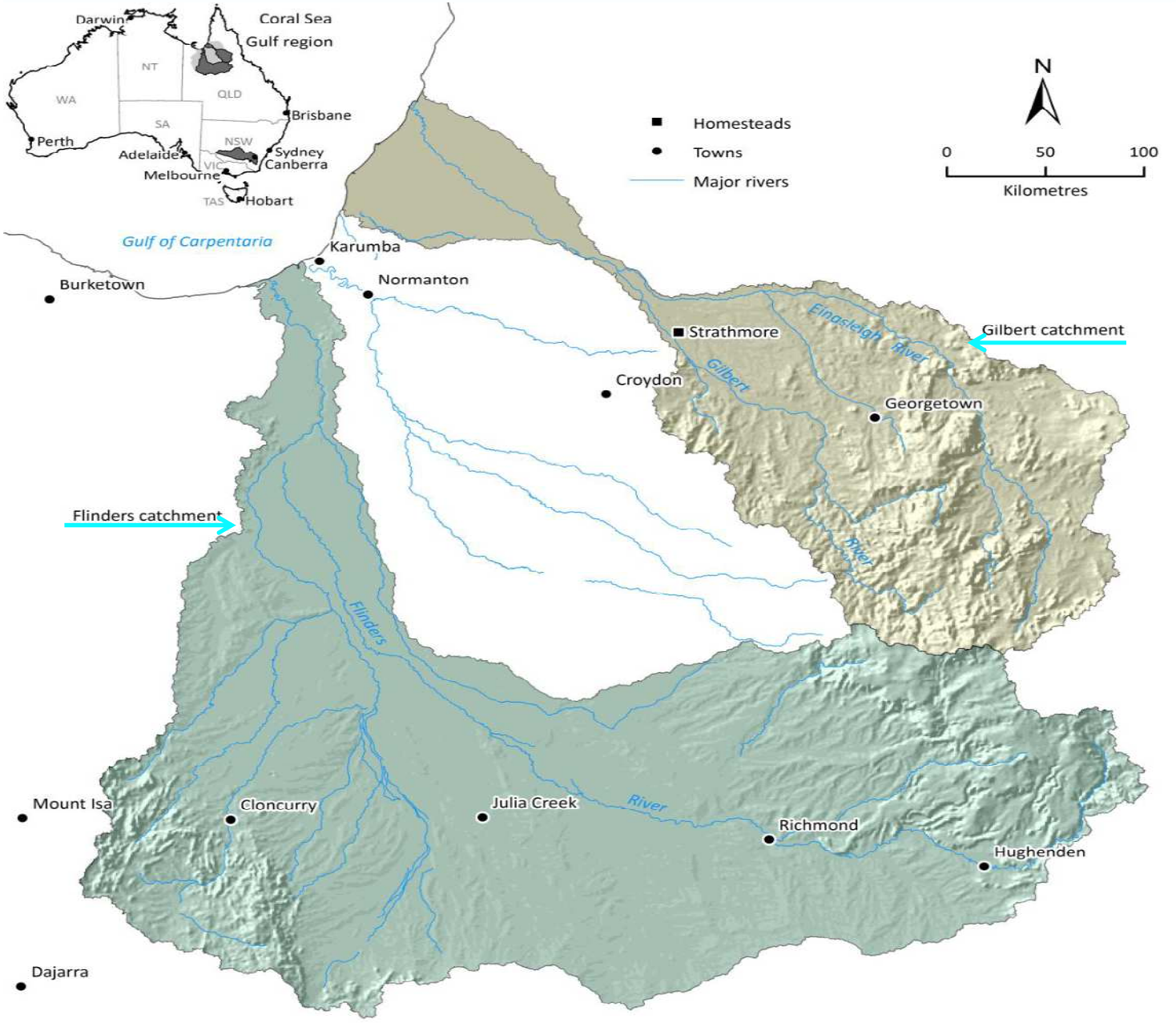
FGARA project

- Flinders and Gilbert Agricultural Resource Assessment (CSIRO)
- Part of the North Queensland Irrigated Agricultural Strategy
- Focus on re-assessment of potential for irrigation in two gulf catchments in northern Queensland:
  - Flinders (Flinders River)
  - Gilbert (Gilbert-Einasleigh River)

Assessment area



Why consider irrigation in the north?

- Semi-arid tropical climate with high but unreliable rainfall
  - Mean annual rainfall ~550 mm (Flinders)/700 mm (Gilbert)
  - 88% (F) – 93% (G) of rainfall in wet season (Dec-Mar)
  - Mean annual rainfall deficit > 600 mm
  - Mean potential evaporation of up to 2000 mm
  - Monsoon variability and cyclone activity
- Some suitable soils for selected crops (e.g. alluvial vertisols)
- Potential to stimulate beef industry
- Potential to enlarge economy of NW Queensland

Flooding in January, Flinders catchment

The mighty Flinders River, November 2012

FGARA key components

1. Resource assessment

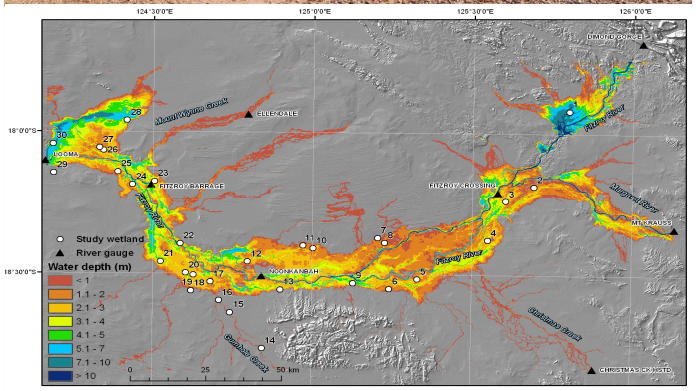
   Climate, geophysics, land suitability, river modelling

2. Sustainability

   Groundwater, dry-season pools, flood mapping, aquatic and riparian ecology, indigenous water values

3. Economic viability

   Agricultural productivity, irrigation infrastructure, irrigation costs and benefits, triple-bottom-line accounting (socio-enviro-econ)



provided funding to local government through the states since the 1920s.

The reason the proposal is dangerous is that it would further weaken the system of federalism in Australia at a time when the commonwealth's financial domination of the federation has already gone far beyond what was envisaged by those who drafted the Constitution as it was adopted in 1901. It would enable the commonwealth to use its financial strength to impose conditions on funding to local governments, giving the commonwealth considerable practical control over local councils, while at the same time reducing the role of the states.

The current balance between state and commonwealth responsibilities has only limited merit, but there is a strong case to be made that this proposal is completely misconceived.

Michael Sexton SC is the author of several books on Australian politics and history.

When challenged last year about his knowledge about the James Ashby legal attack on Peter Slipper, he tried the Sergeant Schultz defence — I know nothing. Only when confronted with the evidence did he concede he had met Ashby on several occasions. Second, what would the reaction have been had this been a function attended by a senior Labor figure. How much room to move would the opposition or the media offer in that instance? I think we all know the answer.

Still at least there is bipartisan support for limiting gun use in Australia. It saddens me to think that this is the only ground upon which we can find agreement.

P.S. With only a few months to go before an election, wouldn't it be a real treat to hear the Prime Minister speak about a positive vision for Australia's future. I guess that is a forlorn hope. As one Labor stalwart said to me yesterday, it will never be too late to get rid of Gillard.

Graham Richardson hosts Richo on Sky on Wednesday at 8pm.

...VIOUR

Worst of all, the cult of the whistleblower reveals the mainstreaming of conspiratorial thinking, of the belief that dark forces rule over a weak and emaciated public that is kept in blissful ignorance. The crossover between respectable worshippers of whistleblowers and irritious purveyors of crank theories is great.

The Guardian has a list of "brave whistleblowers" that includes Annie Machon, formerly of MI5 and now a notorious 9/11 "truther". Assange has written cranky essays with titles such as "Conspiracy as governance". And a top *Guardian* columnist says the Snowden revelations "seem to confirm all the old bug-eyed conspiracy theories about governments and corporations colluding to enslave the rest of us".

That's the real impact of the cult of the whistleblower: the further promotion that evil networks control the unenlightened horde. Yes, there are numerous attacks on our civil liberties but we are more than capable of seeing who is carrying them out without a secular icon of "truth" to hold our hands or massage our allegedly tiny minds.

Brendan O'Neill is editor of Spiked, where this article first appeared in longer form.

UNLOCKING THE NORTH

The Australian 14/6/13 p10

CSIRO is already making progress in developing the wealth of tropical Australia

ANDREW JOHNSON

N February 11, 1861, Robert O'Hara Burke reached the Gulf of Carpentaria. He described in his diary the environment: "a considerable portion is rangy but well watered and richly grassed".

More than 150 years after the ill-fated Burke and Wills expedition, many Australians consider north Australia to be a place of limitless potential. Throughout the 20th century, governments promoted development in the north. With a few notable exceptions, these ended in failure.

More recently, state and federal governments of both political persuasions have had the foresight and courage to mandate scientific investigations to quantify the capacity of the north's land and water assets, to understand constraints to sustainable development presented by market opportunities, transport infrastructure and land tenure.

The passionate commentary demonstrates the diversity of views and the breadth of misunderstanding about the challenges of the tropics. Indeed, there are perhaps more urban myths about northern Australia than any other part of the nation. So let's get some facts on the table.

CSIRO has identified the capacity to sustainably double or triple the north's irrigation area using renewable groundwater resources. The potential is even greater if surface water is used. History has shown the challenges. Unlocking investment requires confidence about the scale of opportunities, and knowing the risks. A scarcity of detailed information about soil and water availability made it difficult to establish water storage options, agricultural productivity estimates or establish locations for irrigation. The cost of acquiring reliable soil, water and agricultural productivity estimates has often been an insurmountable barrier to private and public investors.

Underdeveloped transport infrastructure and long distances increase the cost of accessing inputs and selling outputs, as well as reducing the mass, quality and value of outputs.

Inconsistency in land and water regulations across jurisdictions and lack of clarity within them poses significant barriers to investment. Northern Australian tenure systems are complex. There are multiple, often overlapping tenure types for the same piece of land. Administrative arrangements vary across state boundaries. There are new and emergent tenures for water and carbon that are uncertain and are evolving.

Despite this, there are positive developments. In the Gulf country, the federal and Queensland governments, with CSIRO, have demonstrated methods for rapidly and economically quantifying water flow and function, identifying water storage options, constructing soil maps of high precision and combining them to establish estimates of regional agricultural production potential. These provide a blueprint for irrigation across the north.

The establishment of mosaic irrigation for the beef industry will enable increased productivity by overcoming seasonal feed shortages and intensifying production. This will allow producers to improve long-term viability. A year-round feed supply will also enable more efficient use of existing beef industry infrastructure.

Smarter transport logistics that deliver least-cost pathways for existing infrastructure — critical where rerouting is often required in response to flooding — is essential. A focus on logistics will prioritise investment in strategic infrastructure such as holding yards, rest stops, road configuration, the location of abattoirs and more efficient use of ports.

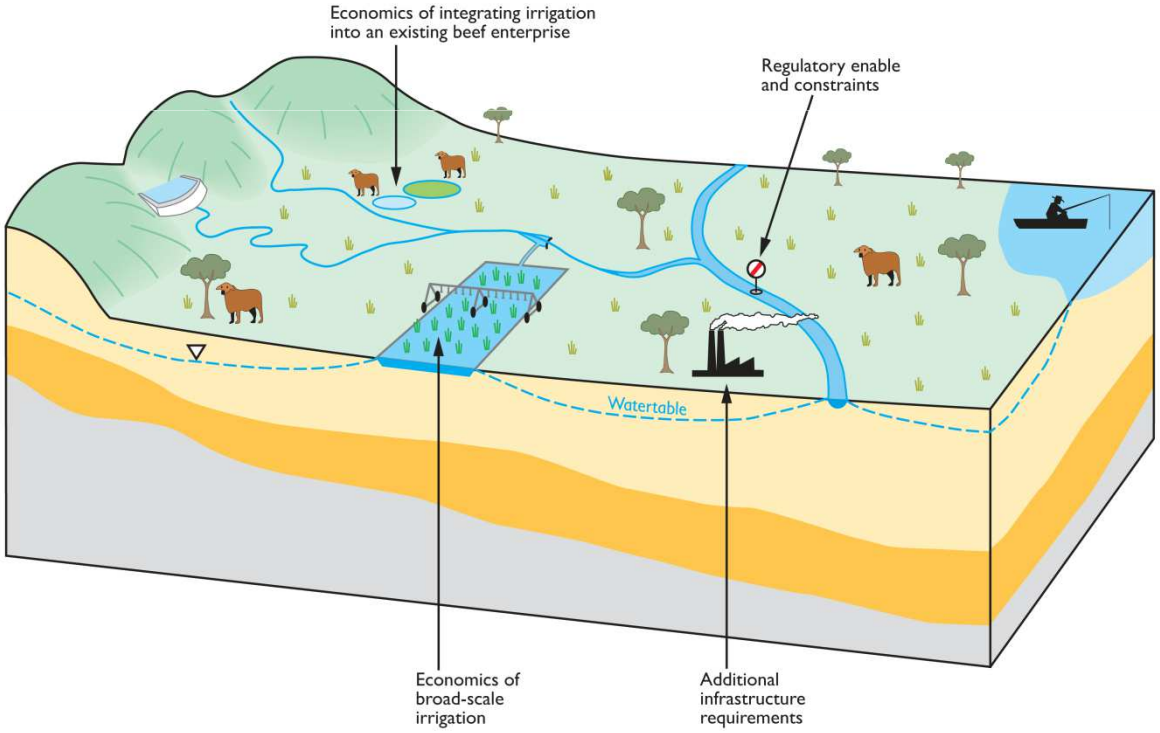
We also need to address property rights. Changes to land tenure regimes have the potential to transform indigenous communities from welfare dependency to economic participation as well as create a more positive environment for investment. Revisions to tenure arrangements aim to enable more diverse uses and clarify access and use rights. Much of this work has focused on pastoral lands, clarifying indigenous interests in land and water.

Perhaps at no time since Federation has the nation's interest in the north been so strong. A positive agenda will benefit all Australians, especially indigenous peoples. Whatever the actions taken, there are no easy fixes. They require patience, persistence, flexibility and a long-term commitment from all stakeholders.

CSIRO group executive Andrew Johnson is chairman of the expert panel advising the Northern Australia Ministerial Forum.

Irrigation costs and benefits

- Farm-scale analyses (cash crops, fodder for beef cattle)
- Regional-scale analyses (TERM)
- Legislation and regulation
- Supply-chain analyses (e.g. new abattoir, sugar mill, cotton gin)



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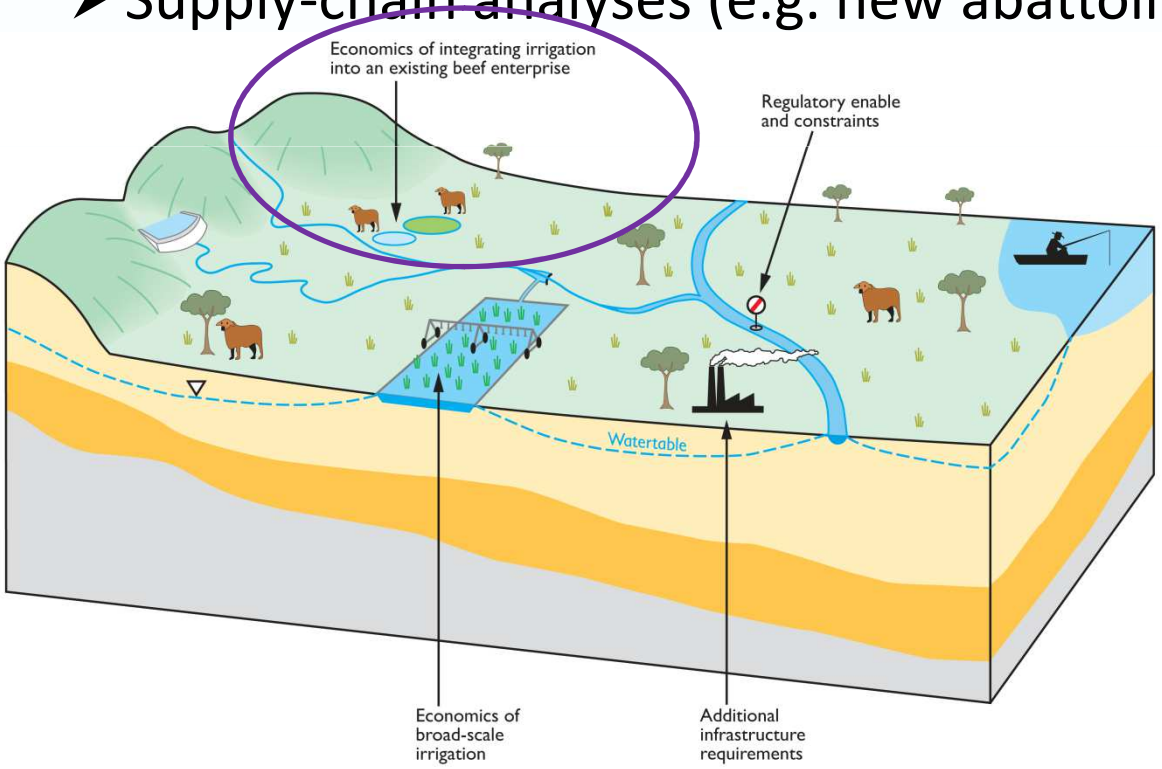
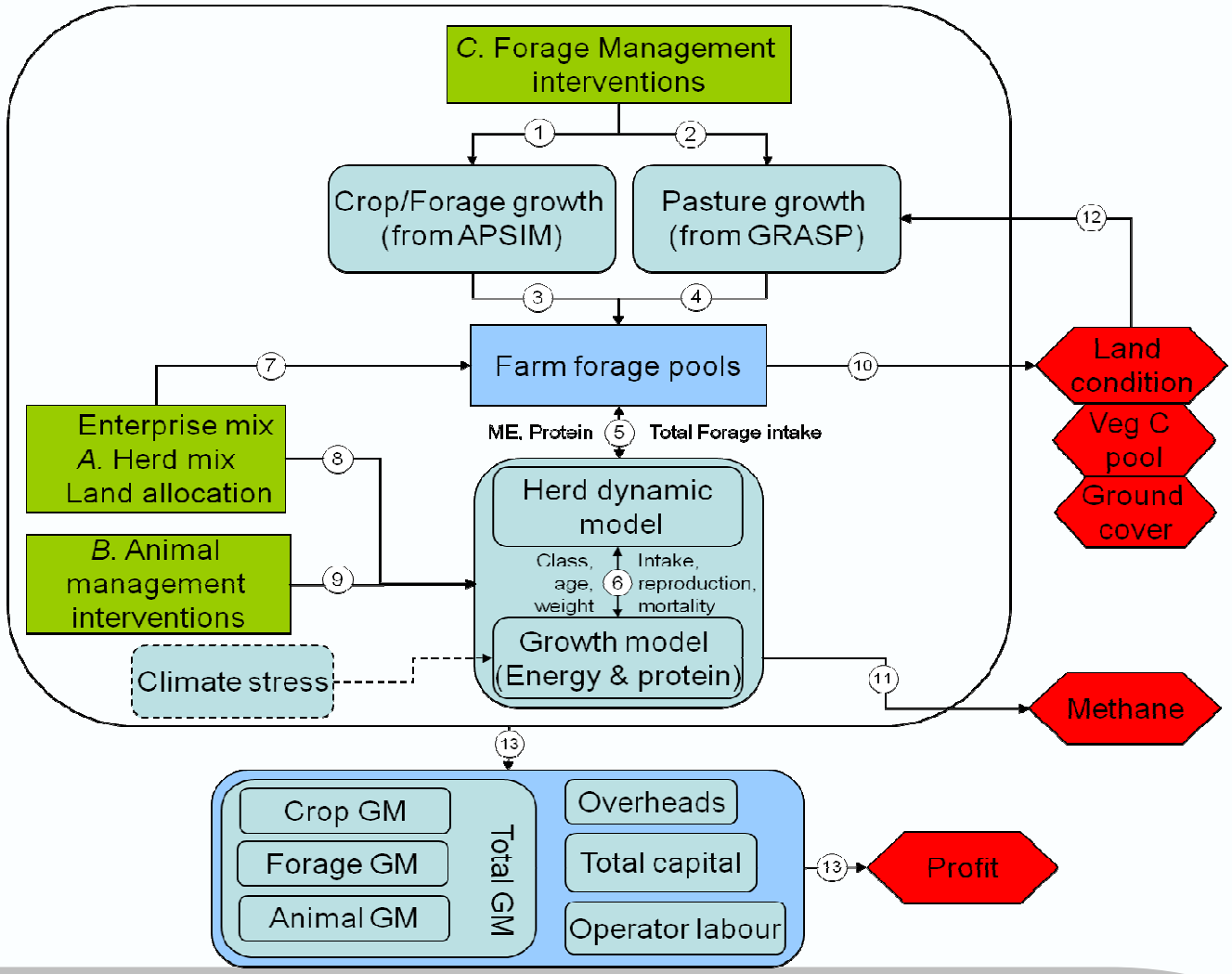


Two case-studies

- **Georgetown (Gilbert)**
  - Typical breeding operation
  - 40,000 ha property
  - Average 3,000 breeding cow herd (700 calves)
  - Turning off young steers for export or backgrounding in southern properties

- **Richmond (Flinders)**
  - Typical fattening operation
  - 20,000 ha property
  - Mixed herd of approx. 2,000 AE
  - Turning off older steers for the live export trade or carrying stock to heavier weights suited to feedlot finishing or slaughter for N Asian markets

NABSA-North Australia Beef Systems Analyser



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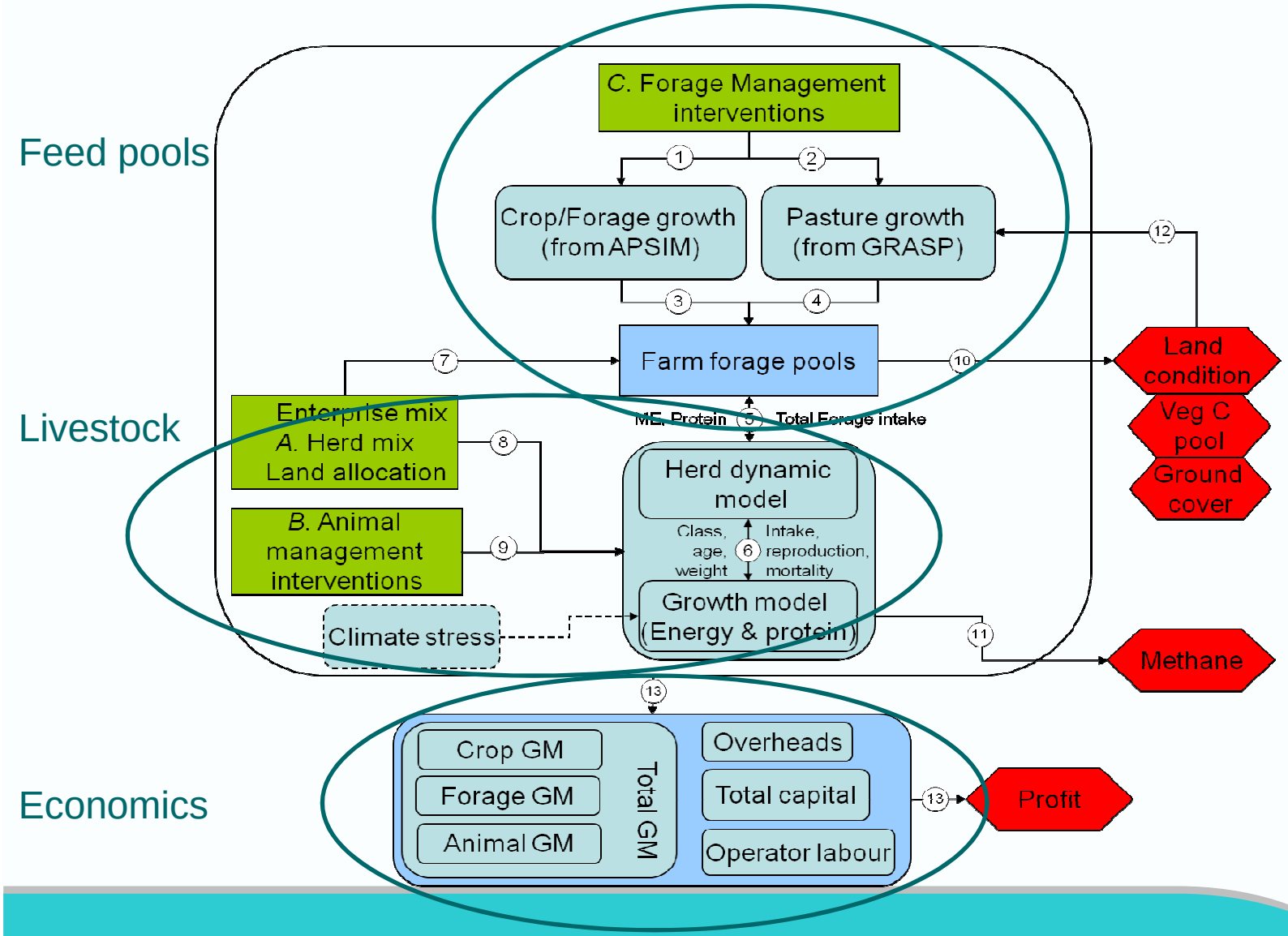
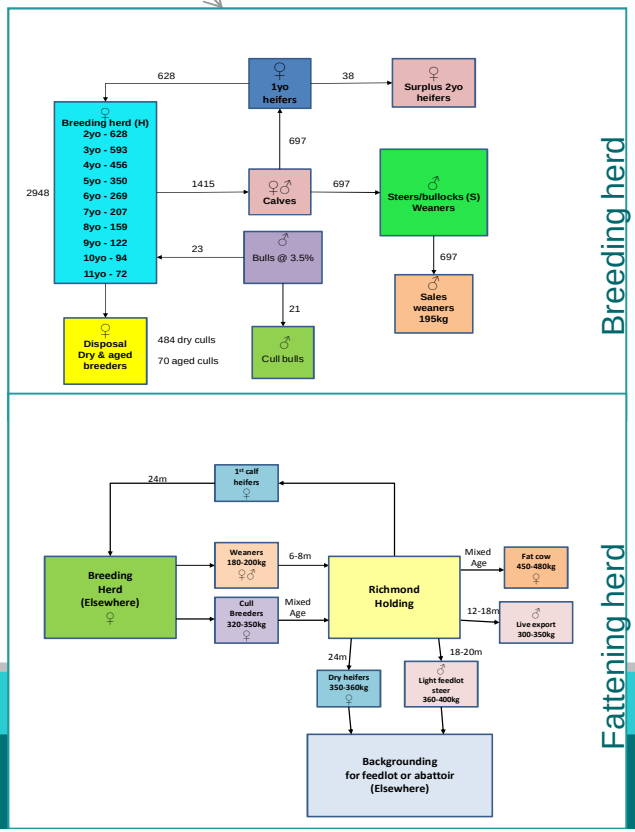


Modelling irrigation options in NABSA

- Native pasture simulation: GRASP
- Forage crops simulation: APSIM
- Livestock dynamics
- Enterprise economics



NPV of net profit
Net value of irrigation
Payback period
(15 yrs: 1996-2010)

Scenarios

1. Cattle only (baseline)
2. Cattle and 100 ha irrigated forage sorghum for grazing in situ
3. Cattle and 200 ha irrigated Bambatsi for grazing in situ (perennial crop)
4. Cattle and 500 ha irrigated lablab cut for hay (fed back to animals or sale)
5. Cattle and 1000 ha irrigated forage sorghum cut for hay (fed back to animals or sale)

Scenario assumptions (Georgetown)

Feature	Scenario 1 (baseline)	Scenario 2	Scenario 3	Scenario 4	Scenario 5
Irrigated area (ha)	-	100	200	500	1000
Irrigated forage type	-	Sorghum (grazing)	Bambatsi (grazing)	Lablab (hay)	Sorghum (hay)
Water alloc. (ML/ha)	-	4	10	6	4
Water demand (ML)	-	400	2,000	3,000	4,000
Total irrig. efficiency	-	0.42	0.18	0.57	0.52
Water storage size (ML)	-	~1,000	~12,000	~6,000	~8,000
Total annual capital and OH costs of irrig. investment ($/year)	-	341,839	1,026,253	806,646	1,139,973
Target herd class	Weaner	Steer	Steer	Steer	Steer
Selling age (months)	6-8	12-14	12-14	12-14	12-14
Selling weight (kg)	180-200	300	300	300	300
Selling price ($/kg)	2.00	1.80	1.80	1.80	1.80

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Selling weight (kg)	180-200	300	300	300	300
Selling price ($/kg)	2.00	1.80	1.80	1.80	1.80

Scenario assumptions (Richmond)

Feature	Scenario 1 (baseline)	Scenario 2	Scenario 3	Scenario 4	Scenario 5
Irrigated area (ha)	-	100	200	500	1000
Irrigated forage type	-	Sorghum (grazing)	Bambatsi (grazing)	Lablab (hay)	Sorghum (hay)
Water alloc. (ML/ha)	-	3	9	7	4
Water demand (ML)	-	300	1,800	3,500	4,000
Total irrig. efficiency	-	0.49	0.34	0.55	0.53
Water storage size (ML)	-	~1,000	~6,000	~7,000	~8,000
Total annual capital and OH costs of irrig. investment ($/year)	-	317,754	628,413	744,497	899,117
Target herd class	Light steer	Japan ox	Japan ox	Japan ox	Japan ox
Selling age (months)	18-24	36-42	36-42	36-42	36-42
Selling weight (kg)	360-400	590-620	590-620	590-620	590-620
Selling price ($/kg)	1.90	1.80	1.80	1.80	1.80

Key NABSA results (Georgetown)

	Scenario 1 (baseline)	Scenario 2	Scenario 3	Scenario 4	Scenario 5
Total herd (AE)	3,161	3,310	3,685	3,597	3,357
Weaning rate (%)	56	59	68	66	60
Total head turn off (hd)	1,349	1,453	1,677	1,649	1,500
Total beef turn off (kg)	331,493	413,411	564,037	456,857	400,909
Average total gross margin per animal ($/AE)	111	136	161	78	16
NPV of net profit ($)	1,423,830	-1,113,592	-6,897,313	-8,090,577	-15,555,503
Net value of irrigation ($/ha)	-	-72	-238	-272	-485
Payback period (yr)*	-	13	15	15	15

* Within the considered 15-year period of 1996 to 2010 (i.e. no payback in Scenarios 3 to 5).

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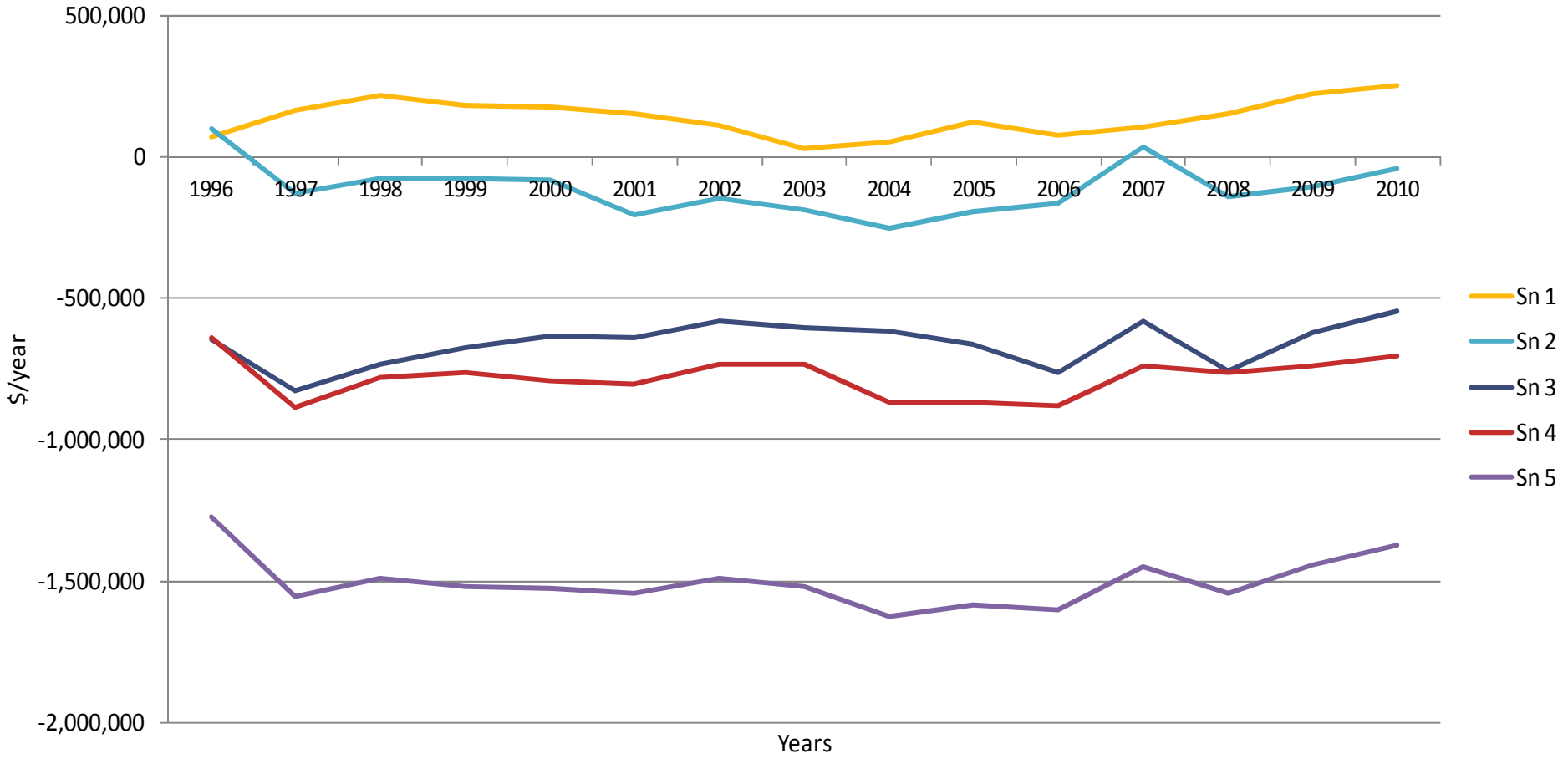


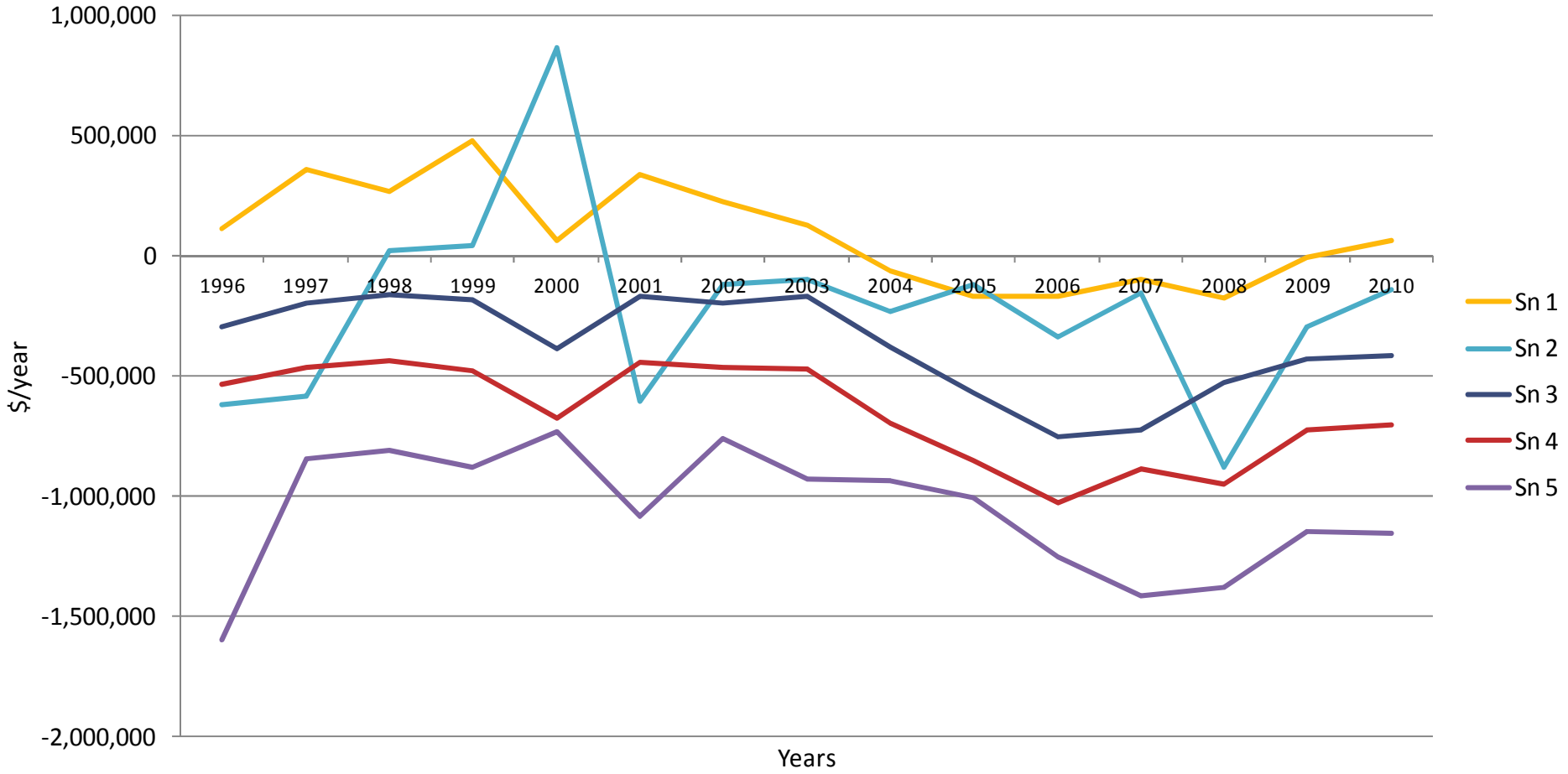
Change in annual net profit between 1996 and 2010 for the five Georgetown scenarios

Key NABSA results (Richmond)

	Scenario 1 (baseline)	Scenario 2	Scenario 3	Scenario 4	Scenario 5
Total herd (AE)	3,558	3,847	3,707	3,785	3,936
Weaning rate (%)	50	46	51	51	50
Total head turn off (hd)	1,002	909	1,034	1,012	973
Total beef turn off (kg)	366,441	409,803	**506,488**	502,404	474,934
Average total gross margin per animal ($/AE)	110	104	**151**	103	35
NPV of net profit ($)	1,248,651	-2,175,544	-3,554,062	-6,480,504	-10,855,681
Net value of irrigation ($/ha)	-	-57	-80	-129	-202
Payback period (yr)*	-	12	15	15	15

* Within the considered 15-year period of 1996 to 2010 (i.e. no payback in Scenarios 3 to 5).

Key NABSA results (Richmond)



Change in annual net profit between 1996 and 2010 for the five Richmond scenarios

Testing best-performing scenario

Scenario 3 has the second best net value of irrigation, but the relatively largest bio-economic benefits of all scenarios.

Are the benefits of 200 ha bambatsi for grazing due to:

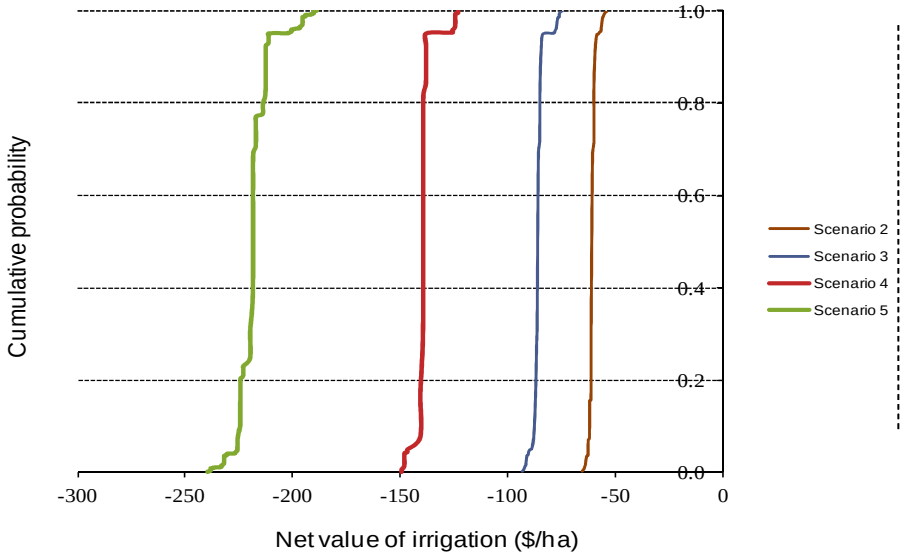
- The area of 200 ha being close to a technically optimal size?
- Bambatsi being a perennial crop (i.e. year-round feed supply)?
- The crop being grazed rather than cut for hay?
- Any combinations of the above?

Key NABSA results (Richmond, all 200 ha, exact storage size to meet demand)

	Scenario 1 (baseline)	Scenario 2	Scenario 3	Scenario 4	Scenario 5
Total herd (AE)	3,558	3,866	3,707	3,867	3,876
Weaning rate (%)	50	48	51	47	47
Total head turn off (hd)	1,002	931	1,034	927	900
Total beef turn off (kg)	366,441	431,426	**506,481**	430,796	392,486
Average total gross margin per animal ($/AE)	110	104	**151**	92	68
NPV of net profit ($)	1,248,651	-2,583,108	-1,936,095	-3,529,259	-3,903,582
Net value of irrigation ($/ha)	-	-64	**-53**	-80	-86
Payback period (yr)	-	13	15	14	15

Sensitivity and factorial analyses (explored in the paper…)

Parameter	Range
Liveweight sale price of steers ($/kg)	1.60 – 2.00
Sale price of hay ($/t)	50 – 150
Purchase price of urea fertiliser ($/t)	400 – 800
Discount rate (%)	4 – 7
Pumping costs of irrigation for centre pivot system ($/ML)	0 – 59
Total irrigation efficiency (%)	Low - high
Reliability of water supply over 120 years (%)	70 – 100
Change in annual capital and overhead cost of irrigation investment (%)	0 – 100



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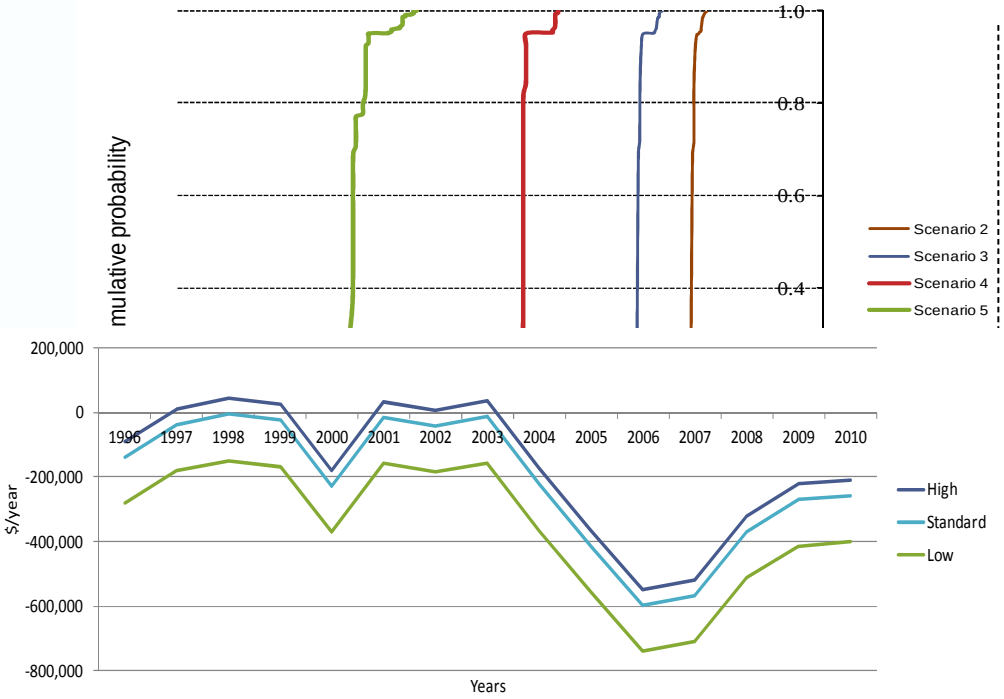

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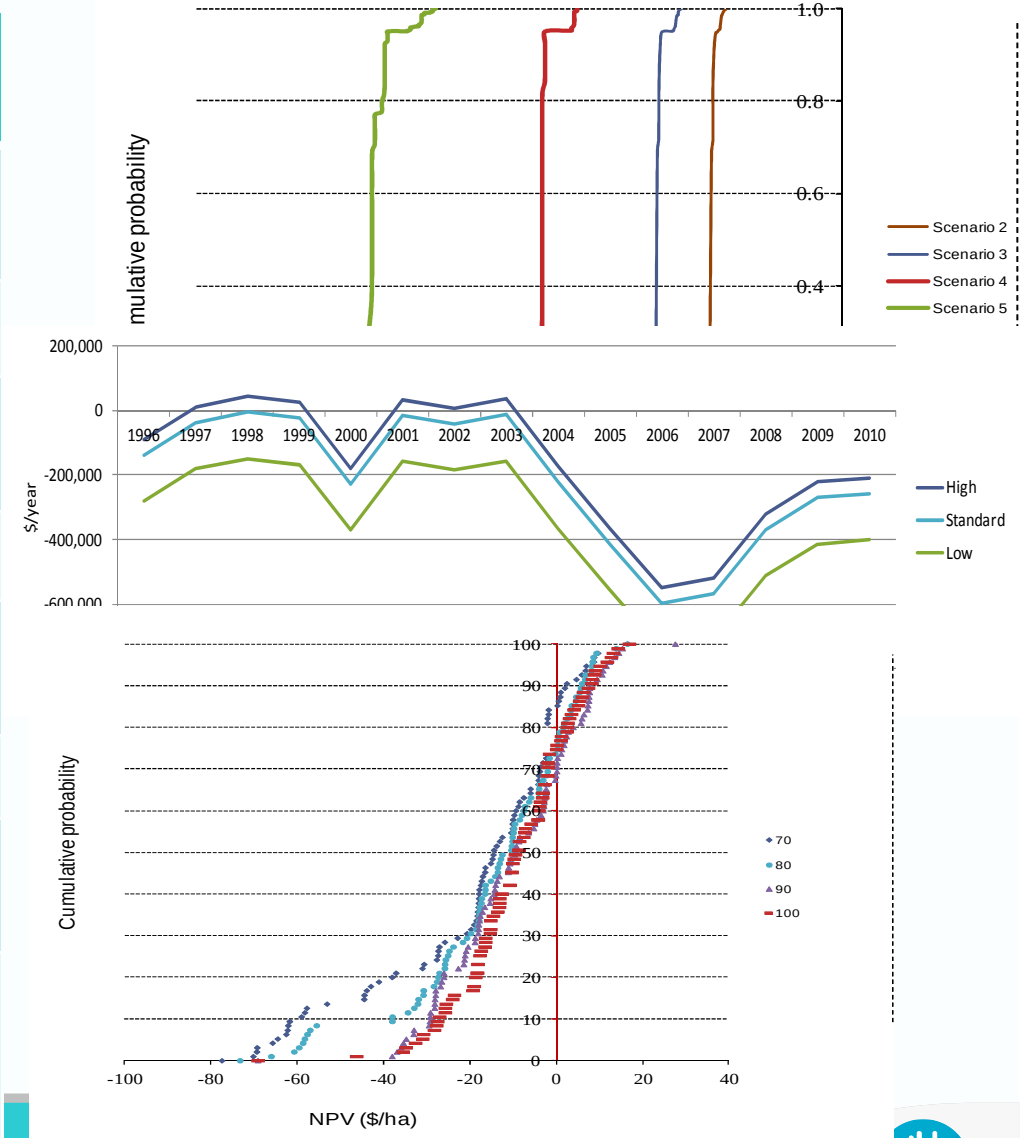

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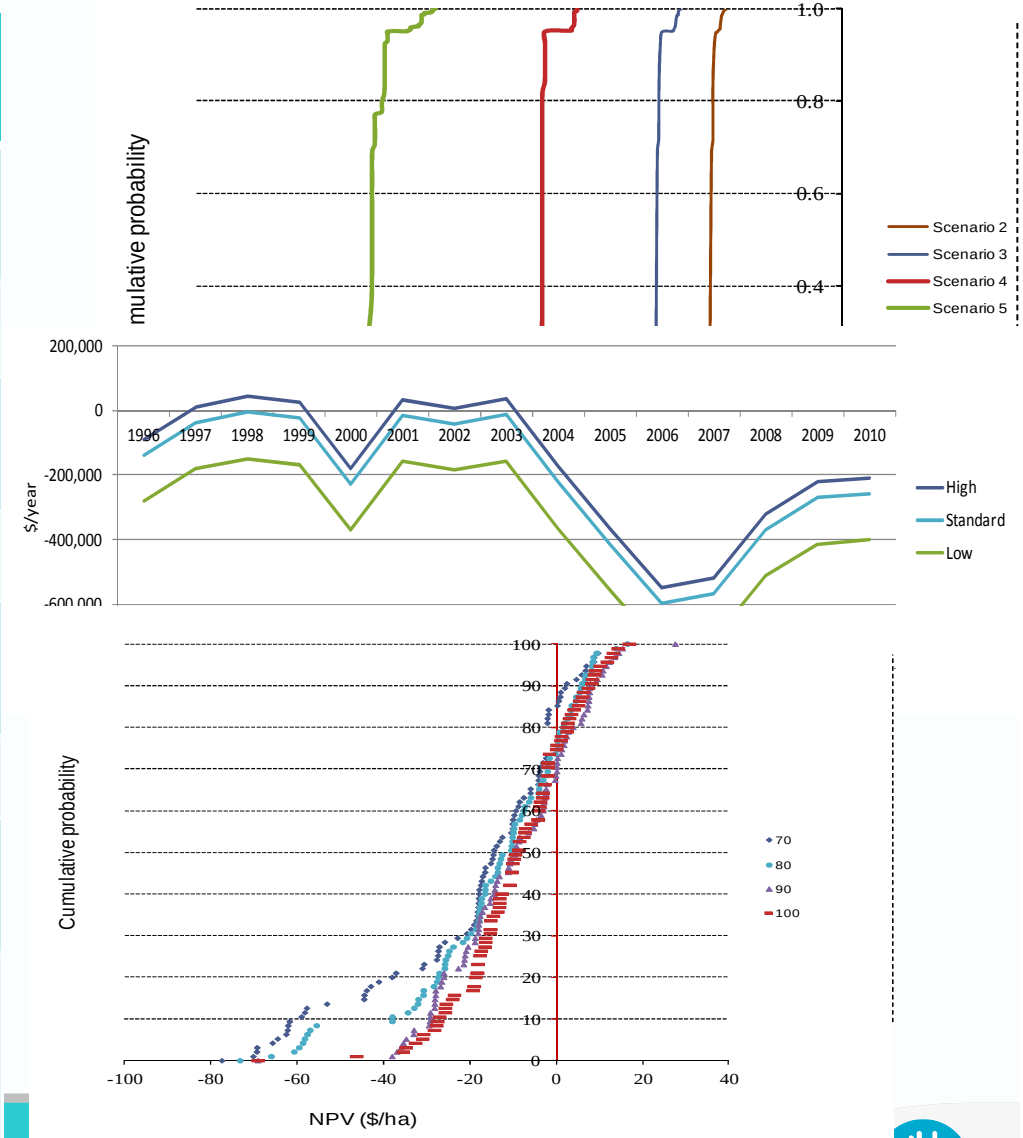

Change in annual capital costs of irrigation of best-performing scenario (% of total cost of irrigation)

	Scenario 1 (baseline)	100%*	50%*	0%*
NPV of net profit ($)	1,248,651	-1,936,095	517,988	**2,972,072**
Net value of irrigation ($/ha)	-	-53	-12	**29**
Payback period (yr)	-	15	6	**2**

In summary

- Under our assumptions, high capital costs of irrigation outweigh returns from raising productivity of cattle herd.
- The key benefit from irrigated fodder to beef cattle production is by means of overcoming seasonal feed shortages:
  - Higher turnoff weight attracting a higher price/head in market as a result of mix of longer fattening period and higher daily liveweight gain
  - Reduced need for costly supplementary feed due to provision of on-farm valuable feed
- Reliability of water supply a highly significant issue.
- Efficiency of irrigation and commodity prices also affect results.
- In complete absence of capital cost outlays, 200 ha of irrigated perennial forage crop results in higher net profits than baseline scenario (despite high irrigation efficiency losses).

Public release of FGARA reports: http://www.warrentruss.com/press.php?id=2187
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Dr Peter Stone nominated CSIRO spokesperson on the FGARA work
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Thank you

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