Department of Primary Industries and Regional Development

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Compaction of pindan sands and its impact on crop production, West Kimberley

Carla Milazzo, Henry Smolinski, Aimee Grieves

Department of
Primary Industries and
Regional Development

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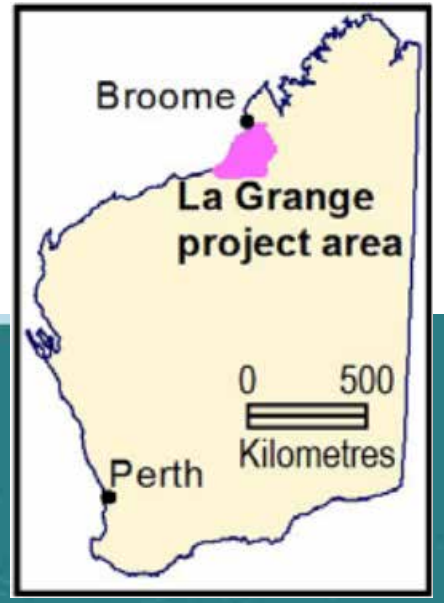
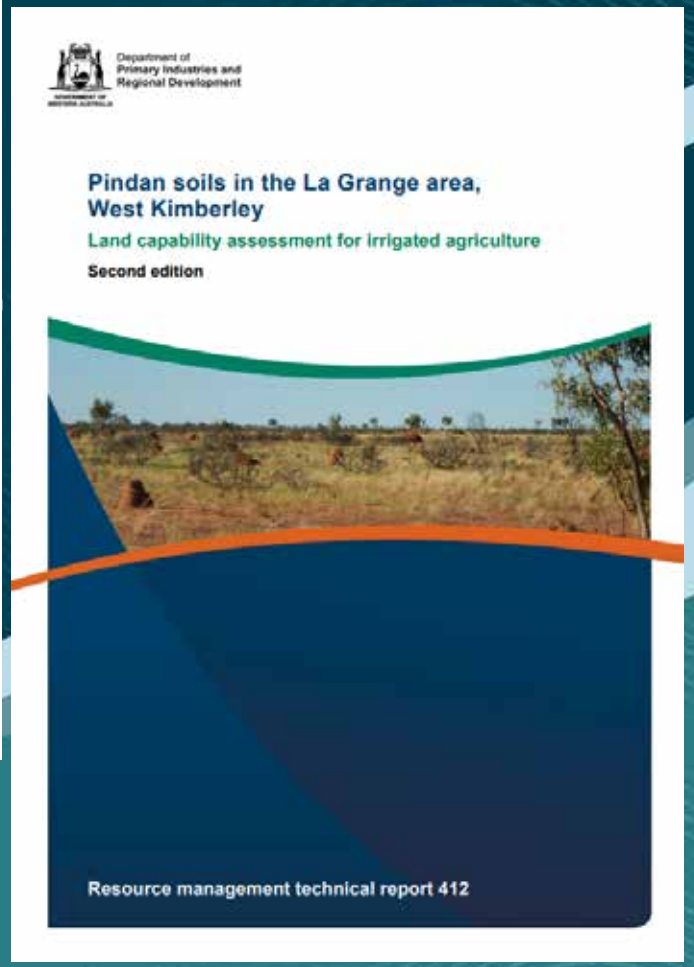
Pindan soils in the La Grange area, West Kimberley: land capability assessment for irrigated agriculture, 2nd edition

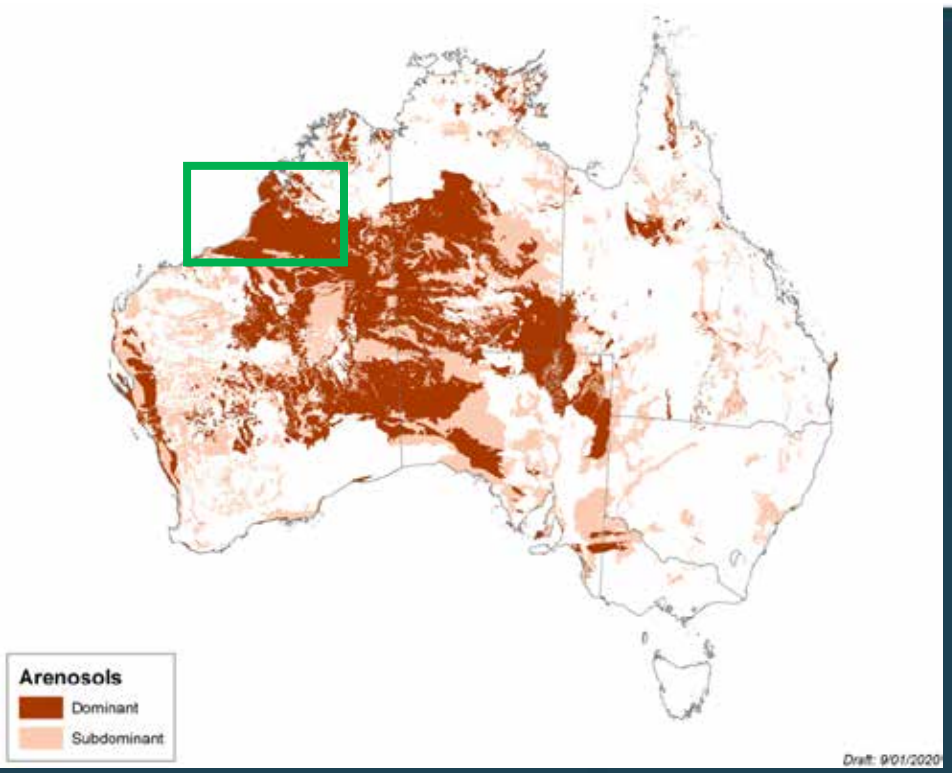
Henry Smolinski

Paul Galloway

Justin Laycock







Derby

Broome

Fitzroy Crossing

Port Hedland

	Fodder	Horticulture
Kimberley	2547 ha	690 ha
Pilbara	960 ha	0 ha


Stand and graze


Cut and carry


NEW HOLLAND

Perennial grasses are highly productive

Cultivar	Species	kg DM/ha/day	t DM/ha/year
Reclaimer	Rhodes *(Chloris gayana)*	117.7	43.0
Callide	Rhodes *(Chloris gayana)*	114.8	41.9
Gatton	Panic *(Megathyrsus maximus)*	114.3	41.7
Megamax 059	Panic *(Megathyrsus maximus)*	111.8	40.8
Epica	Rhodes *(Chloris gayana)*	111.5	40.7
Mariner	Rhodes *(Chloris gayana)*	110.8	40.4
Endura	Rhodes *(Chloris gayana)*	110.6	40.4
Strickland	Digit *(Digitaria milanjiana)*	92.2	33.7
Premier	Digit *(Digitaria eriantha)*	82.0	29.9
Jarra	Digit *(Digitaria milanjiana)*	39.5	14.4
Splenda	Setaria *(Setaria splendida)*	–	–
Humidicola	*(Brachiaria humidicola)*	–	–

Pindan is an indigenous word for the red soil and country occurring in the Kimberley and Pilbara

Arenosols, Kandosols, Tenosols

Sand to clayey sand topsoil grading to sandy loam or sandy clay loam (up to 15% clay).

Parent material: Sandstones, siltstones and shale.

Structureless, massive structure and prone to compaction. Slumps when wet.

Soil depth: >5 m (commonly 10 to 30 m).

Cemented by Fe-kaolinite and iron oxides.

Rapidly drained to well drained red soils. Yellow-brown soils occur where drainage is restricted.

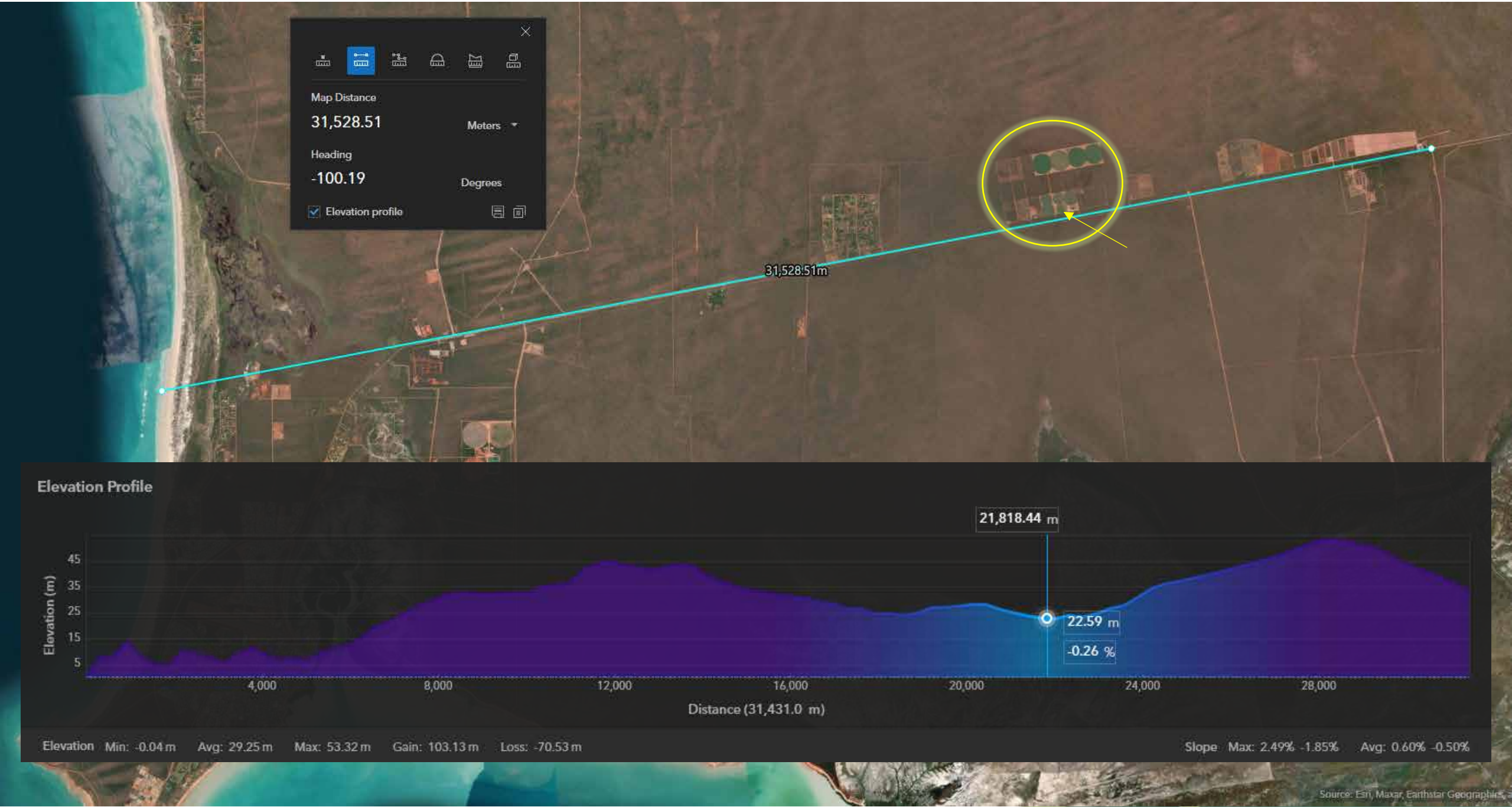
A typical Broome Pindan profile

WA soil group: Red sandy earth
ASC: Basic Regolithic Red-Orthic Tenosol

Native vegetation: Open woodland; *Acacia tumida, A. longifolia* (Long-leaved wattle/Golden wattle), *Corymbia terminalis* (Inland bloodwood), *Persoonia* spp., ribbon grass

Soil profile description

A11	0–15	dark reddish-brown (2.5YR 2.5/3 moist) loamy sand; apedal, single grain structure
A12	15-30	dark red (2.5YR 3/6 moist) loamy sand; apedal, massive structure
A3	30–60	dark red (2.5YR 3/6 moist) clayey sand; apedal, massive structure
B11	60–250	dark red (10R 3/6 moist) sandy loam; apedal, massive structure
B12	250–450	dark red (10R 3/6 moist) sandy loam
B21	450–600	dark red (10R 3/6 moist) sandy clay loam
B22	600–720	dark red (10R 3/6 moist) sandy clay loam


Map Distance
31,528.51
Meters
Heading
-100.19
Degrees
Elevation profile
31,528.51m
Elevation Profile
21,818.44 m
22.59 m
-0.26 %
Elevation (m)
45
35
25
15
5
4,000
8,000
12,000
16,000
20,000
24,000
28,000
Distance (31,431.0 m)
Elevation Min: -0.04 m Avg: 29.25 m Max: 53.32 m Gain: 103.13 m Loss: -70.53 m
Slope Max: 2.49% -1.85% Avg: 0.60% -0.50%
Source: Esri, Maxar, Earthstar Geographics

Skuthorpe Trial Site, Roebuck Silage and Hay

Pindan sand up to 10m deep over groundwater (Broome Aquifer)

20-30 years of mangoes, pumpkins, fodder

‘Deep’ ripped 5 years ago, 10 t/ha lime 2 years ago and surface cultivated

2024 forage sorghum trial – Establishment 😊

2024 forage sorghum trial – Before second cut 😄

2024 forage sorghum trial – After third cut □

2024 forage sorghum trial – After fourth cut 😫

2025 soil pits

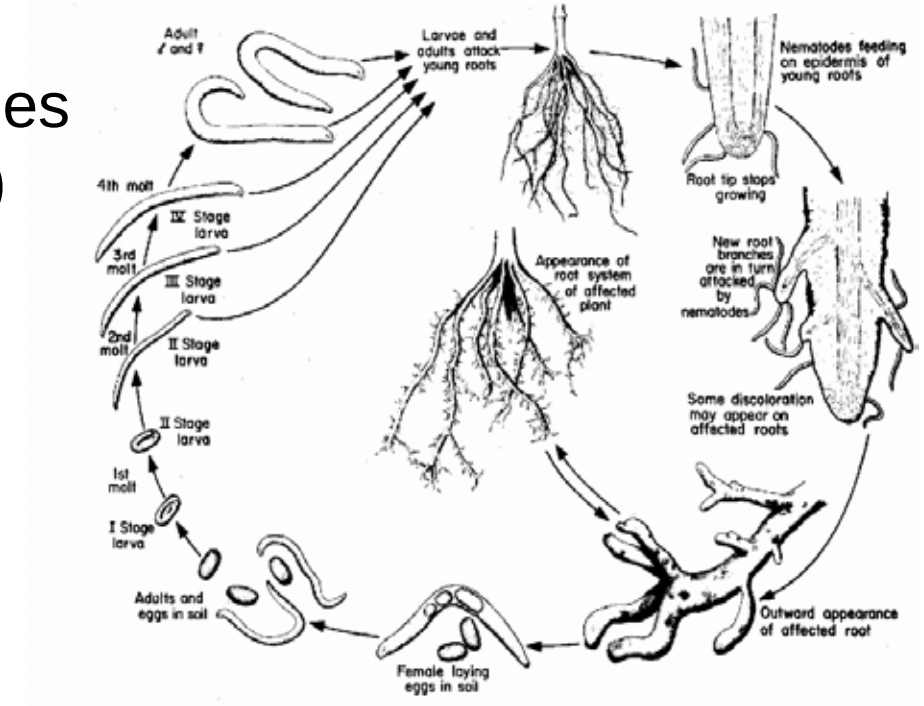
- 3x in forage sorghum (unhealthy)
- 2x in sweet sorghum (healthy)
- 1x in established perennial grass
- 1x in virgin natural vegetation
- Soil physical and chemical analysis
- Plant parasitic nematode survey
- Sorghum plant pathology (DDLS)

Root growth restricted below 20–30cm

High bulk density below 20cm
(>1.8 g/cm^3)

Pythium root rot

Stubby root nematodes
(*Paratrichodorus* sp.)
(343 per 200ml soil)
cause stunting,
debilitation and
swelling of root tips.



	1.Sorghum healthy		2.Sorghum unhealthy		6. Baseline (native veg)	
Depth	Penetrometer	Bulk density	Penetrometer	Bulk density	Penetrometer	Bulk density
cm	kg/cm^2, *n*	g/cm^3	kg/cm^2, *n*	g/cm^3	kg/cm^2, *n*	g/cm^3
0-10	0.97 (0.5-1.3, *3*)	1.76	1.23 (0.8-1.8, *3*)		0.60 (0.3-0.8, *5*)	
10-20			1.99 (1.1-2.6, *9*)		0.63 (0.1-1.0, *6*)	
20-30	1.90 (1.8-2.0, *2*)	1.83	2.63 (1.9-3.1, *3*)	1.84	0.50 (0.1-0.8, *5*)	1.60
30-40	1.78 (1.6-2.2, *5*)		2.07 (1.8-2.4, *3*)	1.85	0.98 (0.7-1.5, *4*)	
40-50			2.30 (*1*)			
50-60	1.84 (1.3-2.3, *10*)	1.67	1.98 (1.8-2.2, *5*)			
60-70			2.40 (1.6-3.0, *7*)		1.20 (0.8-1.9, *6*)	1.67
70-80						
80-90			2.29 (1.9-2.8, *7*)			
90-100						

Conclusion

- Impact and longevity of deep ripping questions…
- Pivot renovation questions…
- Soil biological health questions…
- Industry benchmarking for compaction and acidity

Thank you

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Carla Milazzo | Development Officer
Horticulture and Irrigated Agriculture
0436 826 970
Carla.Milazzo@dpird.wa.gov.au