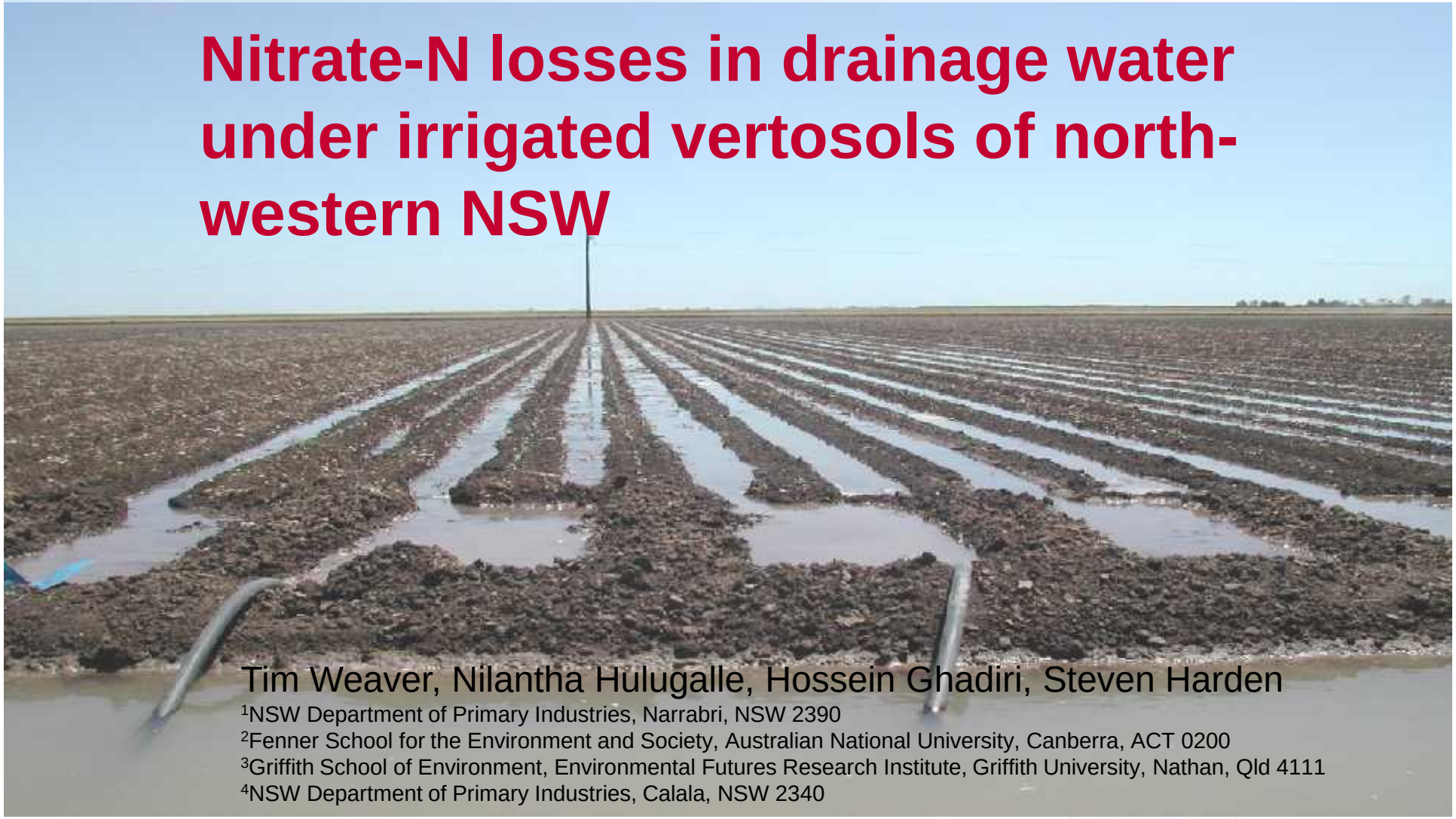
Department of Primary Industries

Nitrate-N losses in drainage water under irrigated vertosols of north-western NSW



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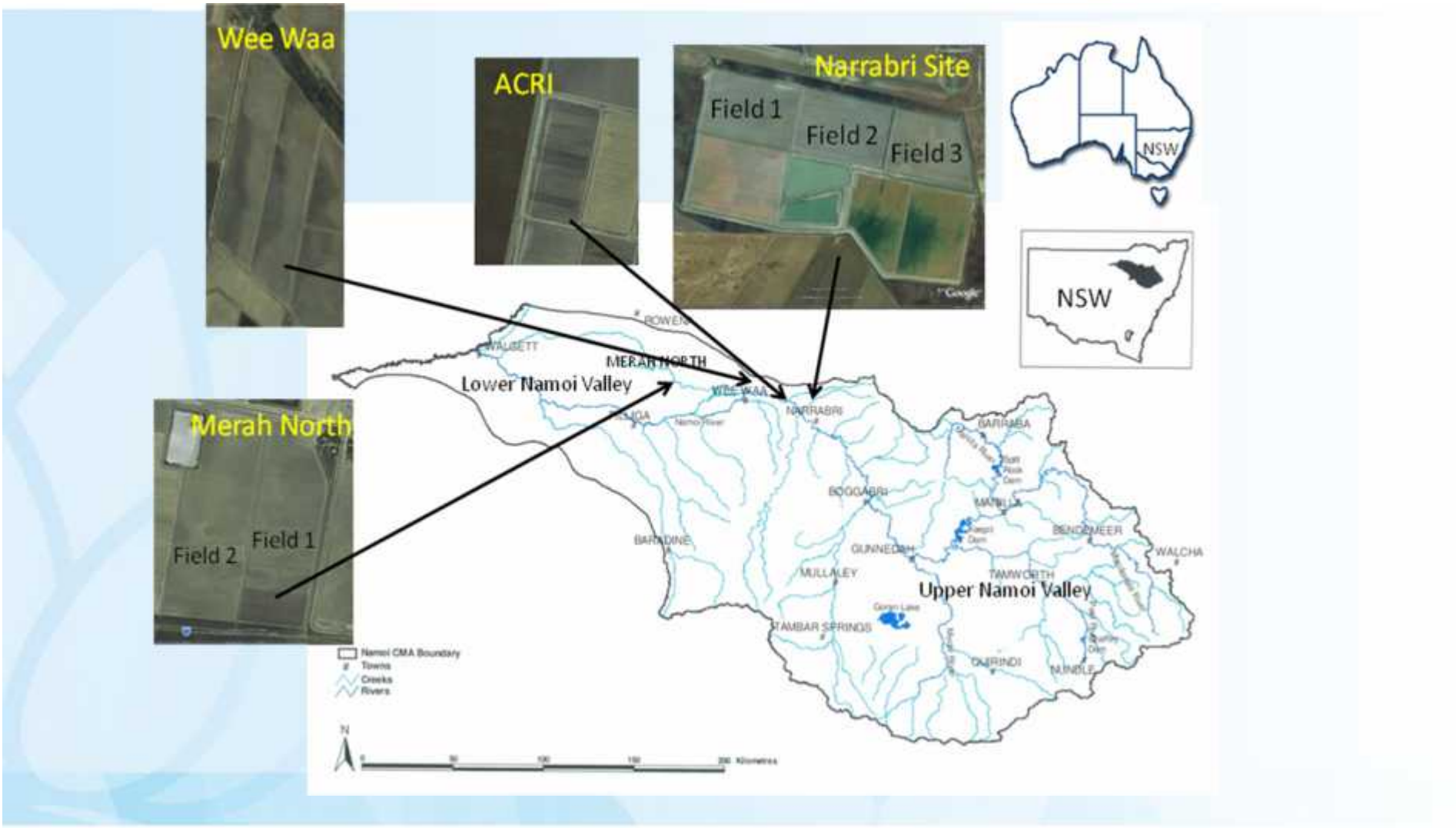
Why study nitrate-N leaching in irrigated Vertosols

Do they experience deep drainage (high in clay)?

If so:

- What is carried with the soil water?
- Do crop rotations, tillage management or soil chemistry impact the movement of nitrate-N?

Study Locations



Soil Chemistry/Rotation/Management

Standing Stubble vs Stubble Incorporated

Soil Chemistry:- Sodic and Non-sodic Vertosols

Crop Rotations: - continuous cotton (*Gossypium hirsutum* L.), cotton–dolichos (*Lablab purpureus* L.), cotton–wheat (*Triticum aestivum* L.).

Residue Management:- wheat stubble incorporated or retained as *in situ* mulch

Soil Chemistry

Site	Depth (m)	pH	EC1:5 (dS/m)	Cl (mg/kg)	Organic carbon (g/100g)	Exchangeable cations (cmolc/kg)				ESP
						Ca	Mg	Na	K	
Myall vale	0-0.3	7.4	0.24	9	0.71	21	9	0.6	1.2	2
	0.3-0.6	7.5	0.21	17	0.54	19	11	1.3	0.9	5
	0.6-0.9	7.6	0.24	23	0.48	18	13	1.9	1	7
	0.9-1.2	7.6	0.24	21	0.4	18	13	2.1	1	7
Merah North	0-0.3	7.2	0.37	14	0.62	21	15	3.1	0.9	9
	0.3-0.6	7.4	0.38	29	0.48	19	15	5.4	0.7	14
	0.6-0.9	7.4	0.46	67	0.43	18	15	6.7	0.7	18
	0.9-1.2	7.4	0.57	526	0.41	17	14	6.5	0.7	18
Wee Waa	0-0.3	7.2	0.26	16	0.72	19	11	0.9	0.8	3
	0.3-0.6	7.3	0.26	18	0.62	18	11	1.1	0.7	4
	0.6-0.9	7.4	0.3	15	0.51	17	12	1.5	0.8	6
	0.9-1.2	7.3	0.26	14	0.46	16	12	1.5	0.9	5

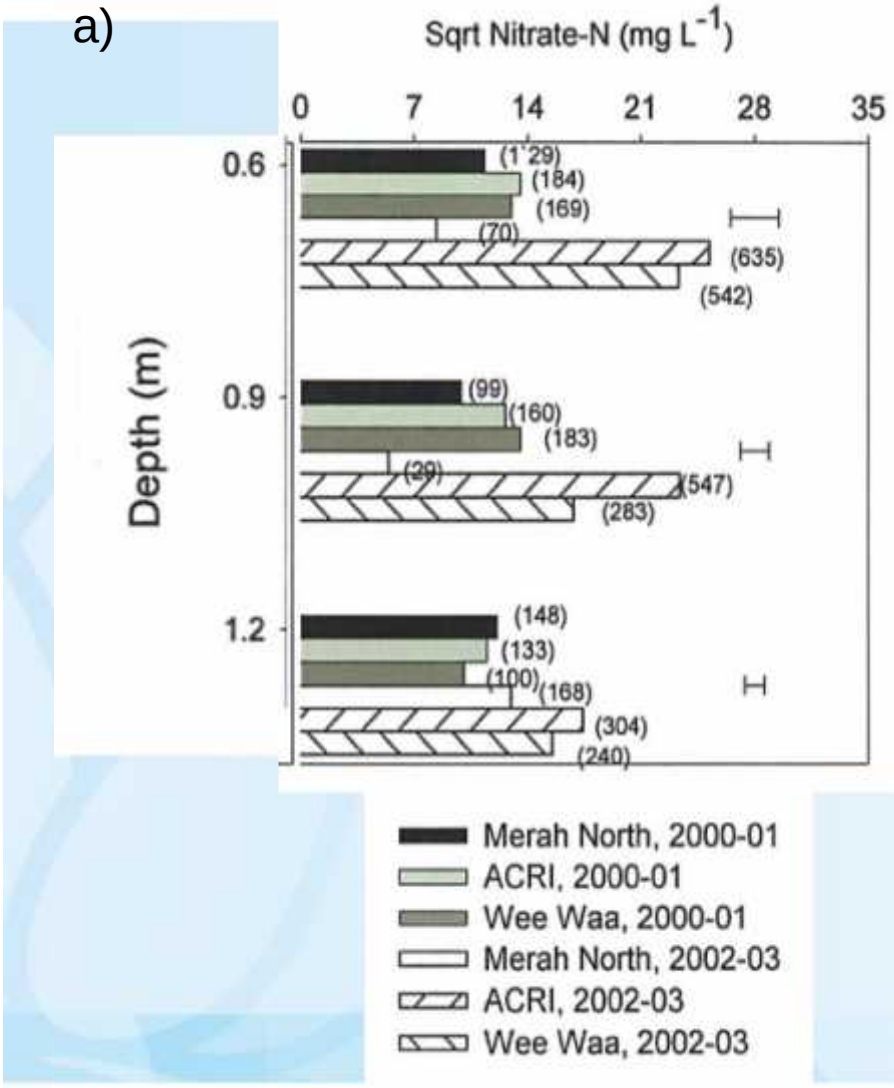
Installation of Ceramic cups

50-mm diameter

200 kPa high-flow ceramic-cup samplers

(Soil Moisture Equipment Corporation, type 653X01-B02M21)

Nitrate-N in soil drainage water

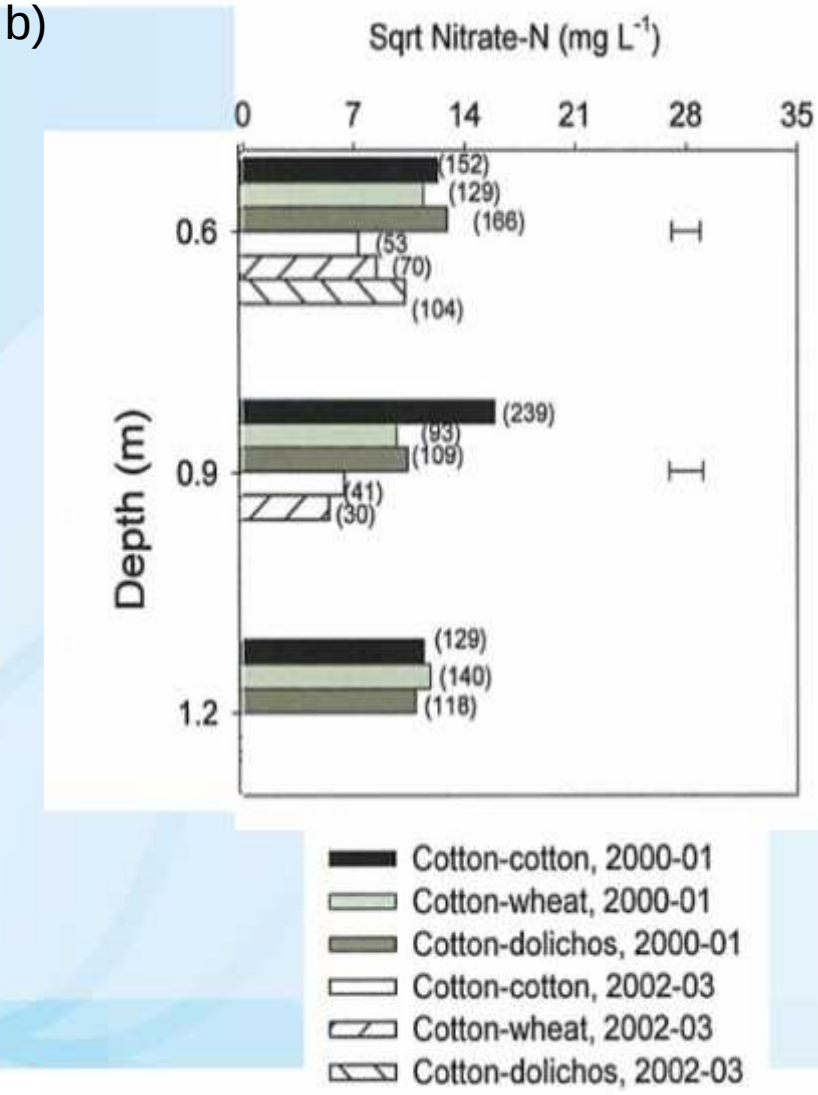


Sodic sub-soil reduced drainage of nitrate-N

Standing wheat stubble = higher drainage

Nitrate-N in soil drainage water at Merah North Site

b)



Cotton-Dolichos + Sodic soil = zero drainage at 1.2 m

Order of impact on nitrate-N leaching

Standing stubble>stubble incorporated

Non-sodic>sodic soil

Variable Tension Lysimeter installed in Myall Vale Trial

Lysimeter installed in Myall Vale Trial

Piezometers measure aquifer movement

Lysimeter collects water samples

Acknowledgements

The technical assistance of L. Finlay is gratefully appreciated. We are grateful to Messrs D. and J. Grellman, and J. Kahl for providing access to their farms to conduct this research.

Water and nitrogen inputs during irrigated seasons of 2000-01 and 2002-03 at the Narrabri, Wee Waa and Merah North sites.

Site	Season	N (kg N/ha)[a]	Number of Irrigations	Irrigations (mm)	Rainfall (mm)	Total water input (mm)
Narrabri	2000-01	140	2	200	517	717
	2002-03	150	5	500	279	579
Merah North	2000-01	130	7	700	300	1000
	2002-03	220	10	1000	265	1265
Wee Waa	2000-01	151	4	400	579	979
	2002-03	160	7	700	300	1000

Ceramic cups

Bubbling pressure of 4.6–6 kPa,

Porosity was 38%,

Saturated Hydraulic Conductivity 6.9 X 10^{-8} mms^{-1}

The effective pore size 1.3 mm (Soil Moisture Equipment Corporation)
http://www.soilmoisture.com/prod_details.asp?prod_id=539&cat_id=10).

Each ceramic cup was composed of 55% Al_2O_3, 35% SiO_2 with minor amounts of Fe_2O_3, TiO_2, CaO, MgO, Na_2O, K_2O and SO_3 (Creasey and Dreiss, 1988).