Irrigation Domain — Framework Effectiveness Summary

78 CRSS agents × 42 years × 3 seeds | Gemma-3 4B | Colorado River Basin

Metric	Governed	Ungoverned	A1 (No Ceiling)	FQL Baseline
Mean demand ratio	0.394 ± 0.004	0.288 ± 0.020	0.440 ± 0.012	0.395 ± 0.008
42-yr mean Mead elev. (ft)	1,094	1,173	1,069	1,065
Demand–Mead coupling (r)	0.547 ± 0.083	0.378 ± 0.081	0.234 ± 0.127	0.057 ± 0.323
Shortage years (/42)	13.3 ± 1.5	5.0 ± 1.7	25.3 ± 1.5	24.7 ± 9.1
Min Mead elevation (ft)	1,002 ± 1	1,001 ± 0.4	984 ± 11	1,020 ± 4
Strategy diversity (EHE)	0.738 ± 0.017	0.637 ± 0.017	0.793 ± 0.002	—
Behavioural Rationality (BRI %)	58.0	9.4	—	—

Key Findings for CS Faculty:

- Governed agents extract MORE water (0.394 vs 0.288) while coupling to drought (r = 0.547) → adaptive exploitation
- Removing 1 rule of 12 (demand ceiling) → coupling collapses (0.547 → 0.234), shortage doubles → institutional rule decomposition
- FQL extracts same volume (0.395) but zero coupling (r = 0.057) → language reasoning required, not just governance
- Governed BRI 58% vs Ungoverned 9.4% → governance eliminates increase-bias without prescribing actions