Irrigator budget preferences

How irrigators would allocate funds across environmental water recovery programs, given the opportunity

UniSA | Centre for Regulation and Market Analysis

Adam Loch — Water Markets Workshop, ANU: August 3rd

Context - importance

- Recent agreement on future Basin Plan direction at the Water Minister's meeting (July 9)
- Focus on:
  - Strategic buyback
  - Infrastructure investment
  - 650GL environmental works and measure savings
  - No clear agreement on bridging the gap target

- Irrigator groups OK
- Conservation groups so-so
- Actual irrigators … ?

Budget amount

Table 1: 2009-2019 water recovery policy summary—*NPWS* and *WFF*

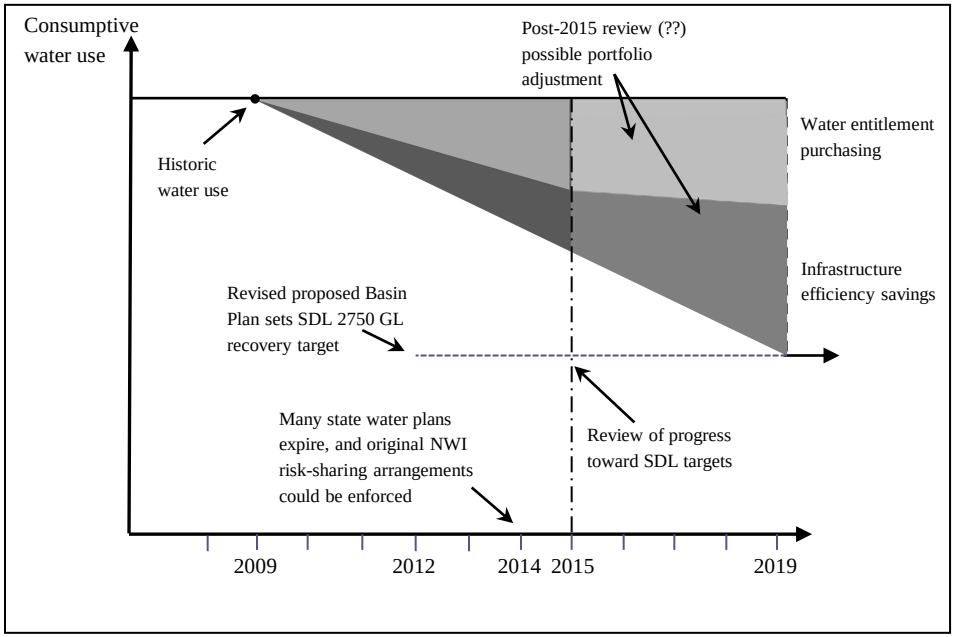
Policy	Water entitlement purchases	Urban water or desalination	Improved water information	Exit packages	Town and city water security	Grey and rainwater initiative	Infrastructure efficiency investment
NPWS	$3.0 B	$600 M	$480 M				$3.13 B off-farm $1.635 B on-farm $620 M metering $500 M operations
						Total:	$10.05 billion
WFF	$3.1 B	$1.5 B	$450 M	$57.1 M	$250 M	$250 M	$5.8 B across areas similar to those stated above
						Total:	$11.92 billion

$9.5 Billion (61%)

Sources: Howard (2007), Wong (2008), DEWHA (2009), Crase & O'Keefe (2009)

Prioritise how?

- Many ways to look at prioritisation:
  - Allocate more funds (already done - $5.4 billion)
  - More emphasis in policy (changing order or rank)
  - Could it simply be >50% focus and/or funding?



- How do irrigators prioritise funding allocations?

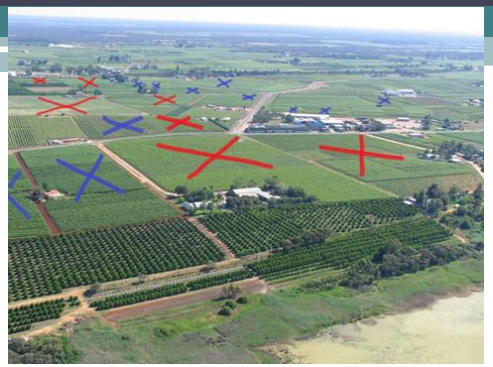
Buyback issues

- Perceived negatives:
  - Stranded assets
  - Community depopulation
  - Untargeted purchasing ≠ environmental matching
  - Reduced food and fibre production (⬆ burdens on remaining farmers)
- But buyback has positives:
  - Compensates for required adjustment
  - Average price = $1,500/ML
  - Market adjustment is possible
  - 70% only sell part entitlement (with ~50% prod ⬇)
  - Irrigators and community have engaged to reduce consumptive pool

Infrastructure issues

- Infrastructure investment =
  - $10,000 - $15,000/ML costs
  - Fail cost/benefit assessments - NVIRP
  - Uncertain water savings ≠ environmental water
  - Energy and variable supply cost ⬆ in future
  - Contrary to NWI emphasis on state responsibility
  - Contribution likely < 600GL
- Strategic investment may =
  - Improve farm flexibility, community income and reduce future burden on remainder
  - Link with targeted buyback for system-wide appraisals (lowers stranded assets and termination fee issues; improves efficiency)

Exit package issues



- Useful for:
  - Retiring irrigators with off-farm investments
  - Marginal farms
  - Assisting communities to adjust/find new identity

- Perceived negatives:
  - Non-inclusion of land purchases for env. benefit
  - Quarantines once productive land
  - Reduces regional economic output/growth
  - Invasive weed/feral pest issues

Irrigator preferences - motive

- Little general preference knowledge
  - Sectoral interests may claim otherwise
- Less specific preference driver understanding
  - Historical land/water assignments
  - Climate change perceptions
  - Future supply risk
- What do irrigators want?
  - Buyback
  - Infrastructure
  - Exit packages
- How does this reflect current priorities?

Program alternatives

- Looked at six options:
  - Permanent water entitlement purchasing
  - Temporary water allocation trade
  - On-farm infrastructure investment
  - Off-farm infrastructure investment
  - Standard exit packages
  - Exit packages with revegetation payments

- Irrigators asked to assign preferences out of 100% - which had to sum exactly to 100% across the six alternatives

$$E[y_{im}|\boldsymbol{x_i}] \in (0,1) \text{ and } \sum_{m=1}^{M} E[y_{im}|\boldsymbol{x_i}] \equiv 1 \text{ for all } i$$

Data and model

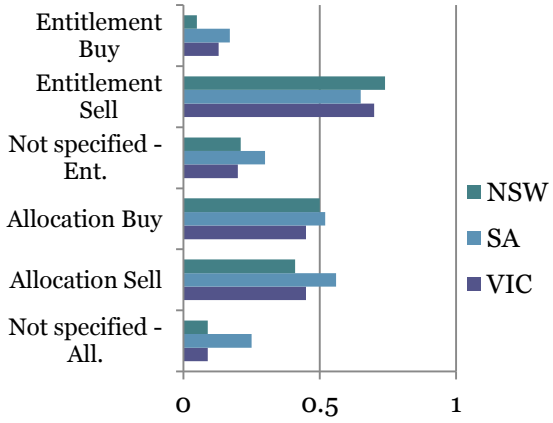
- Sample of 946 MDB irrigators
  - Telephone survey in 2010/11
- Sub-sample of same group
  - Mail-out survey in 2011/12 (N=535 – 66%)

- Queried about:
  - Current scope and magnitude of recovery budget
  - Views on appropriateness of current programs
  - How they would apportion budget?

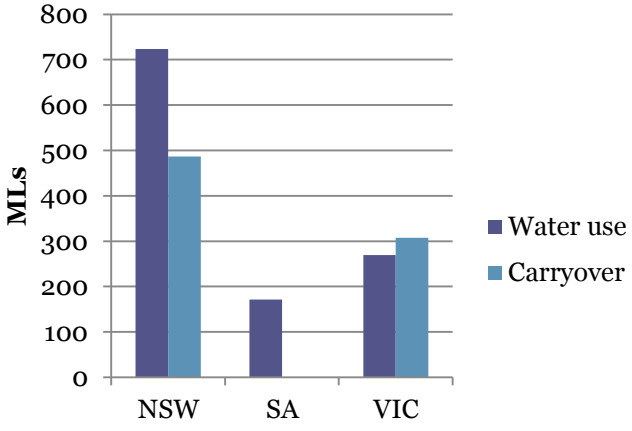
Farm characteristics – 2010/11

- NSW farms = larger size and general security
  - Also bias toward budget preference refusal
- SA farmers most likely to trade
- NSW highest water use and carryover
- NSW higher debt, land values and income

2010/11 water entitlement holdings



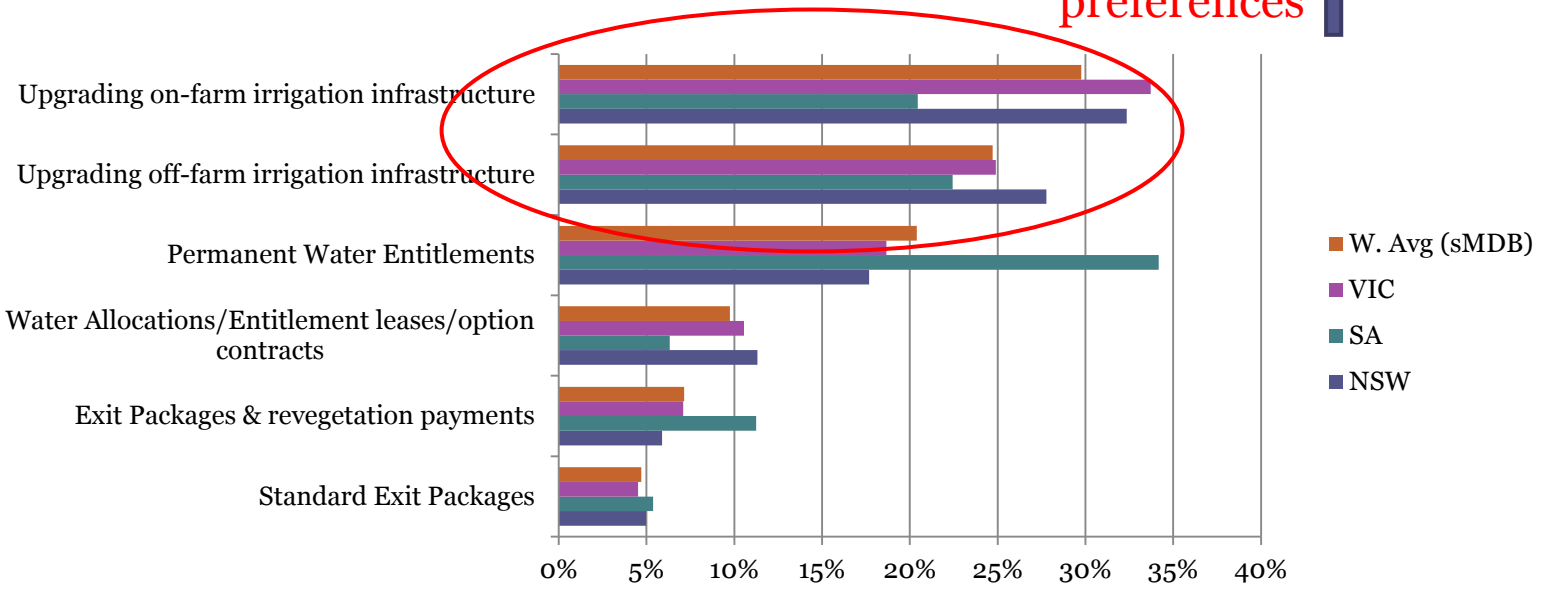
Percentage of irrigators who traded 2010/11



2010/11 water use and carryover (MLs)

Budget preferences

- Infrastructure preferences ↓
- Targeted allocation and exit preferences ↑



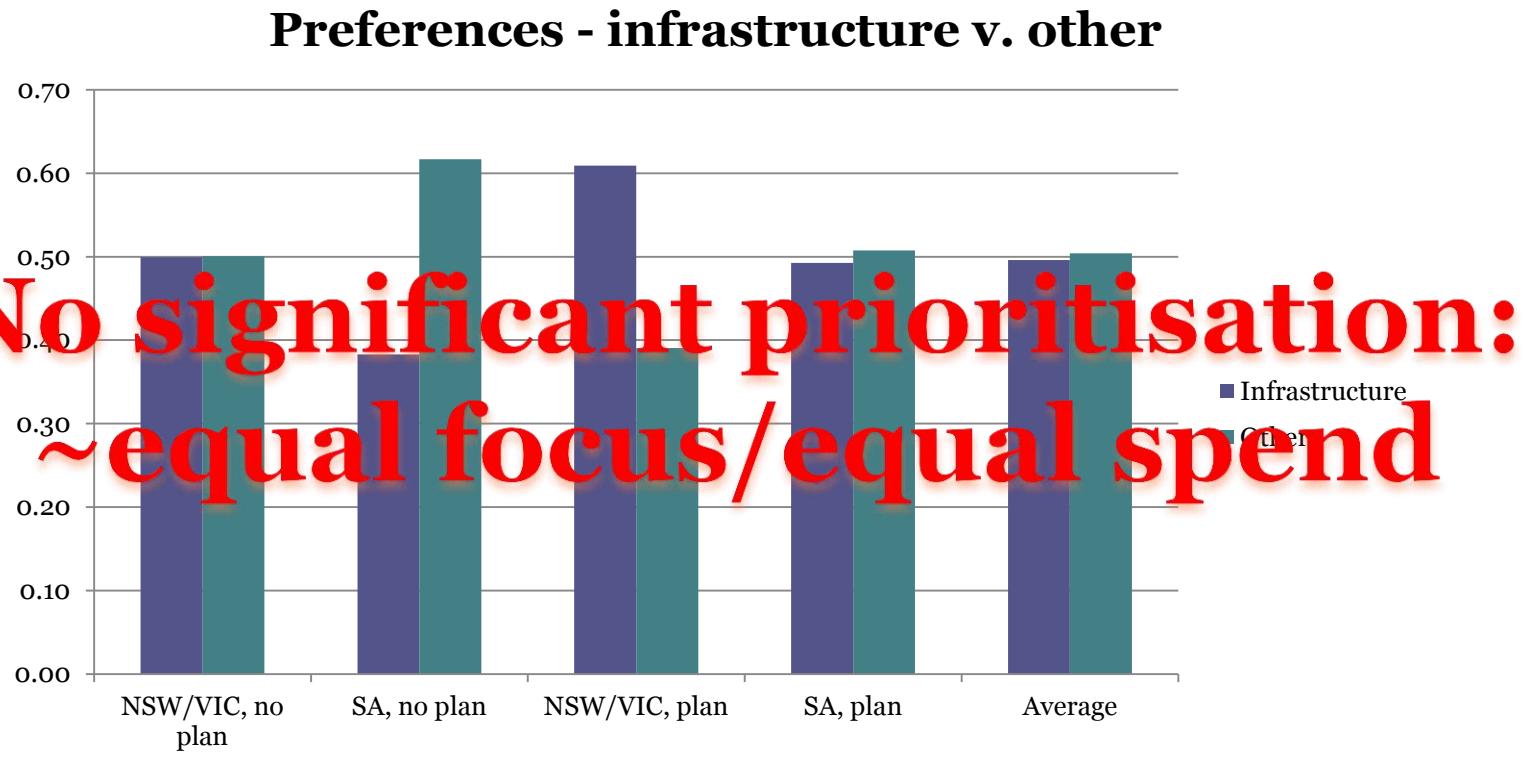
Average percent of funds that should be spent	NSW	SA	VIC	W. Average
Permanent Water Entitlement purchases	18%	34%	19%	20%
Water Allocations/Entitlement leases/option contracts	32%	20%	34%	30%
Upgrading on-farm irrigation infrastructure	32%	20%	34%	30%
Upgrading off-farm irrigation infrastructure	28%	22%	25%	25%
Standard Exit Packages	5%	5%	5%	5%
Exit Packages & revegetation payments	6%	11%	7%	7%

Note: calculation does not include 'no answer' responses

Infrastructure looks significant, but is it?

Results

- Summed infrastructure preferences (MFX):
  - On- and off-farm v. other alternatives
  - Clear state differences



No significant prioritisation: ~equal focus/equal spend

Conclusions

- Could surmise prioritised budget allocation to infrastructure spending = > 50%:
  - Not supported by these analyses – closer to even
  - Strong state differences, as expected
- Good support by irrigators for other budget allocations
  - Strong permanent buying + allocation trade
  - SA preferences for exit packages (> where includes revegetation) = targeted
- Costs issues remain:
  - Infrastructure at $10,000 - $15,000 /ML? **Source**: Wittwer (2011)
  - $3.1 billion by $1,500/ML = ~20,000 ML **Source**: SEWPAC (2012)
- + socio-economic benefits in both

Next steps

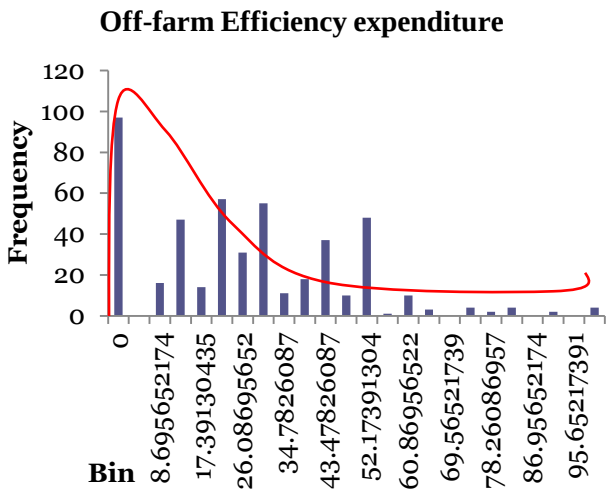
- Examine the economic drivers of preferences:
  - For proportional responses
  - For zero/one responses

- Approaches include:
  - GLM
  - Zero-one inflated beta (zoib)
  - Fractional multinomial logit
  - MFX estimates

Preference drivers

- Computed using fractional logit (glm)
  - Non-linear assumption (matched by plots)
  - Simple model

- Variables include:
  - State dummies
  - Farm characteristics
  - Management variable
  - Water use



- Marginal effects computed and reported
  - Controlled proportional estimates

Model

```
. glm exp_infsum d_sa wateruse11 dair_pc landval10_11 farmsize10_11 wfplan, family(binomial) link(logit) vce (robust) nolog
note: exp_infsum has noninteger values

Generalized linear models                         No. of obs      =       453
Optimization     : ML                             Residual df     =       446
                                                  Scale parameter =         1
Deviance         =  185.6291267                   (1/df) Deviance =  .4162088
Pearson          =  150.0575935                   (1/df) Pearson  =   .336452

Variance function: V(u) = u*(1-u/1)               [Binomial]
Link function    : g(u) = ln(u/(1-u))             [Logit]

                                                  AIC             =  1.051938
Log pseudolikelihood = -231.2639046               BIC             = -2542.059
```

exp_infsum	Coef.	Robust Std. Err.	z	P>|z|	[95% Conf.	Interval]
d_sa	-.4744931	.1438653	-3.30	0.001	-.756464	-.1925222
wateruse11	.3632622	.21024	1.73	0.084	-.0488007	.7753251
dair_pc	.3749105	.2033925	1.84	0.065	-.0237315	.7735526
landval10_11	.0909175	.0255799	3.55	0.000	.0407818	.1410531
farmsize10_11	-.0000687	.0000326	-2.11	0.035	-.0001326	-4.81e-06
wfplan	.4462004	.1404084	3.18	0.001	.171005	.7213959
_cons	-.4470613	.1658084	-2.70	0.007	-.7720399	-.1220828

But more on these next time …

Research partners

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