Technology Development in Regional NRM

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There is a range of approaches available to regional NRM bodies to pursue their objectives, including:

- Beneficiary-pays approaches: e.g. grants to landholders, conservation tenders
- Polluter-pays approaches: e.g. command and control regulation (≈ "duty of care")
- Extension: e.g. communication, technology transfer, community capacity building, small temporary grants to encourage trialling
- Technology[1] development: e.g. plant breeding of new perennials, participatory research to test and improve new systems
- Engineering: e.g. direct investment by government in pumping to protect a road
- No action: budgets are limited and some potential targets less important than others.

The decision on how to allocate resources between these approaches is complex. One particular challenge discussed here is the balance between (a) targeted funding to protect particular assets in the short term, and (b) less targeted funding to develop new technologies that are hoped to pay off in the long term. The context is salinity management, but the relevant technologies are likely to have benefits for other NRM issues as well.

Both these approaches can lead to NRM outcomes, and both have been recognized as important strategies (e.g. Ridley and Pannell, 2005; Sparks et al., 2006). However, they differ in some important respects (Table 1).

Table 1. Different features of targeted investment and technology development

Issue	**Targeted investment**	**Technology development**
Time lag until land-use change	Shorter	Longer
Area of land-use change for a given budget	Low	High
Ability to target the changes	Can be tightly targeted	Loosely targeted
Certainty of results (in terms of land-use change)	High (if targeted and designed well)	Moderate (depending on the available avenues for development)
Reliance on government funding in the long term	If practices are adoptable, need short-term funding. If not adoptable, need large ongoing funding.	Self sustaining in the long term.
Ability to catalyze co-investment from landholders, processors, etc.	Low or moderate	High

In summary, technology development is likely to generate benefits over a substantially larger area, but it may take significantly longer before the change occurs. Technology development

[1] I use the term "technology" in a general sense, including management practices and systems. It does not imply high technology.

may be the only feasible way of achieving some outcomes, especially if the available "sustainable" technologies are not sufficiently attractive to landholders. On the other hand the outcome of investing in technology development is less certain than investing in targeted on-ground works.

Clearly, neither strategy clearly dominates the other. It is a question of striking a balance between the two. No quantitative analysis has been conducted to assess where the balance should be struck in difference cases. The relative investment in technology development would ideally be higher in regions where:

- there are fewer highly valuable, localized assets (icons) needing investment;
- the threats to iconic assets are not urgent;
- there is a lack of existing sustainable technologies that are attractive to landholders;
- there are good opportunities for development of improved technologies that are attractive to landholders;
- landholders are commercially motivated, rather than lifestyle oriented.

Targeted investment is particularly relevant to high-value assets in a concentrated area (e.g. a threatened stretch of highway, or an important wetland), whereas technology development is more relevant to protection of dispersed assets, such as farm land or patches of native vegetation on private land that are threatened by salinity. Nevertheless, both approaches have some relevance to localized and dispersed assets (Table 2).

Table 2. Relevance of targeted investment and technology development to different sorts of assets.

	Targeted investment	**Technology development**
Localised, high-value assets	✓✓✓	✓✓
Dispersed assets	✓	✓✓✓

To explain, targeted investment does provide some benefits in the form of protection of farm land that is close to the targeted assets, but this is, of course, a small area. Conversely, technology development can benefit localized assets by reducing the cost of land-use change close to those assets, or by increasing the adoptability of relevant new practices. This joint relevance was recognized by Sparks et al. (2006) and is reflected in their Figure 1, reproduced below.

A further question is how the investment in technology development should be spatially allocated within an NRM region. The nature of technology development means that precise targeting of uptake is not possible. Farmers will make their own decisions about how and where to adopt new farming systems options. Nevertheless, some loose targeting is possible. Table 3 suggests variables that would influence the relative priority of investing in technology development in a particular sub-region.

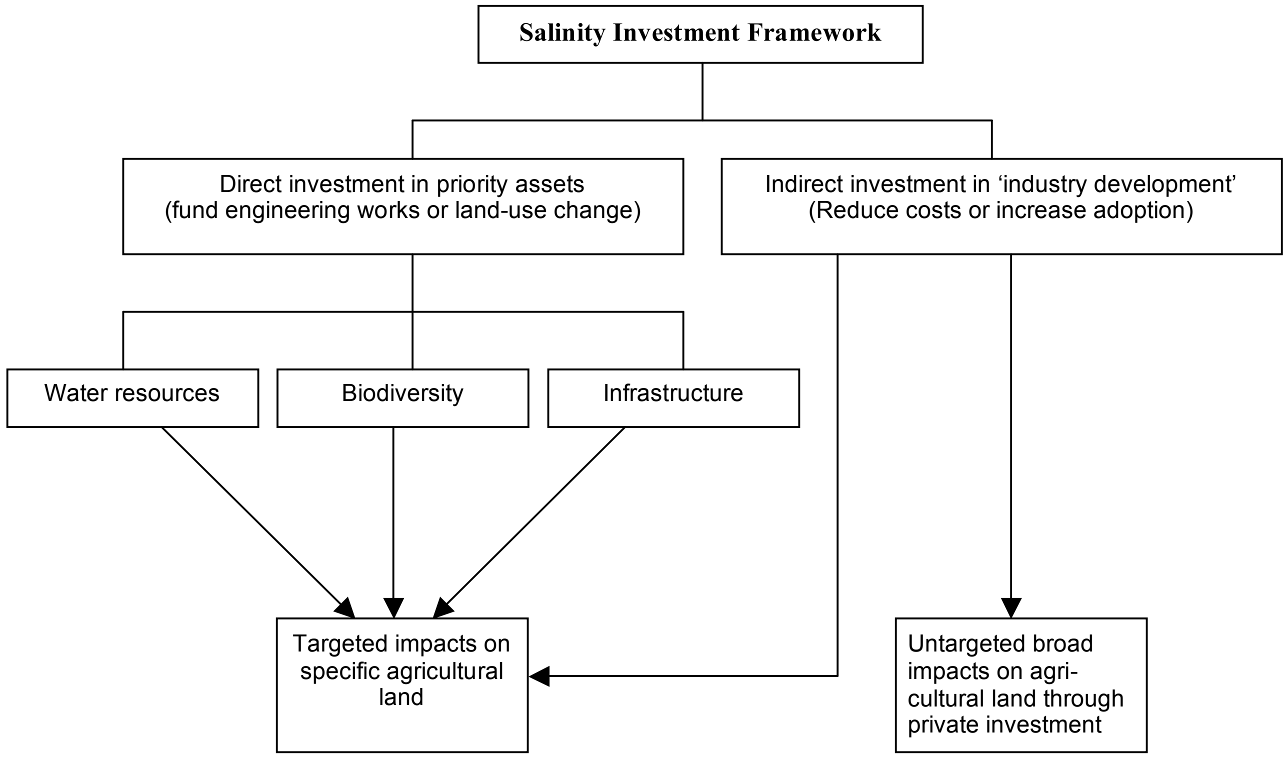

Figure 1. The interplay of targeted investment and technology development (referred to in this case as 'Industry development') in protecting specific assets (left side of figure) versus dispersed assets (right side of figure). Source: Sparks et al. (2006), Figure 1.

Table 3. Variables that influence the relative priority of different sub-regions for investment in technology development.

Variable	Influence on priority
1. Bio-physical factors	
1.1 Predicted area of salinity (and related threats) in that sub-region	+
1.2 Predicted lag until salinity onset (related to depth/rate of rise)	−
1.3 Physical feasibility of preventing or containing salinity	+
1.4 Presence of high-value assets in the sub-region	+
2. Agricultural factors	
2.1 Productivity of the agricultural land that is threatened, including access to relevant infrastructure (e.g. ports) and to relevant resources (e.g. ground water, or labour)	+
2.2 Economic feasibility/adoptability of existing farming options for salinity management	−
3. Social factors	
3.1 Farmer interest and economic and social capacity to respond	+
3.2 Research partner interest	+
4. Research factors	
4.1 Feasibility of the research to deliver adoptable and environmentally beneficial land uses in that region	+

4.2 Cost of conducting the research in that region	−

We would not expect to target investments in technology development very precisely, but would generall favour areas that were indicated by the criteria in Table 3.

A + sign in the right column indicates that a larger value for that variable would increase the priority of that sub-region for investment in technology development. For example, if the predicted area of salinity is higher, the sub-region would have a higher priority. Conversely, If the predicted lag to salinity onset is higher (negative sign), the sub-region would have a lower priority.

As an input to the planning process of SCRIPT, Overhue et al. (2004) conducted a GIS analysis to identifying “priority agricultural land”. They selected areas of high land capability (judged to be suitable for perennial horticulture), that was no more than a specified distance from regional port facilities and which has an average annual rainfall greater than 500 mm. This approach could be adapted to help assess the spatial allocation of investments in technology development. For example, from Table 3, the analysis could potentially include items 1.1, 1.2, 1.3, and 1.4. (The existing analysis focuses on item 2.1.) Then items 2.2, 3 and 4 of the table could be considered more qualitatively when examining results of the GIS analysis.

References

Overhue, T. et al. (2004). Priority Agricultural Land (South Coast Region of Western Australia), Draft 2.1, Department of Agriculture, Western Australia, Albany.

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