Green paper submission – Chris Buddenhagen PhD, Senior Scientist, AgResearch (plant ecology and weed management)

Competitive funding, and funding duration is a problem.

Competitive research funding systems are inefficient in terms of the time cost to proposers and reviewers [1,2], they are fickle, i.e., there is a low likelihood that decisionmakers will select winning projects [3], and this creates a cynical and demoralized science community. Innovation may actually be stymied by grant reviewers with direct expertise in a field, raising the ugly spectre of in-group identification and gate-keeping as a limit to transformative science [4]. Competition leads to less inter-agency collaboration, silos, and uneasy alliances between people who should work together. Lotteries may be more efficient [5], or a hybrid, e.g., a lottery after an initial assessment to remove proposals that are clearly lower quality. Funding is often provided for single year, or perhaps 5-year projects – for big questions, and for many biological and social science problems research should cover several seasons, or longer term trends. Scientists continually live under the fear of losing their jobs if funding cannot be raised. How can we tackle the big questions if we focus continuously on proposal writing on top of publishing?

Science as a business/public good

Many of us in CRIs and universities see ourselves as scientists working for the "public good". However, our institutions claim to be run as a business with public good aspects taking second place. Managers are often promoted based on their perceived business acumen, and favoring the view that we are a business, even if most of the funding is public. There are many examples of public good funding sparking innovation that transfers to business e.g., the internet, space research innovation, endophyte research for ryegrass in New Zealand. A public good focus might allow for more collaborative relationships between CRIs, Universities, local and national government, and businesses.

We have budgeting systems in CRIs that build in profit and overhead so that personnel costs are charged to a project are three times the actual salary costs. This prevents us from pursuing smaller contracts from some stakeholders e.g., industry or local government. We are driven to competing for large grants and might get rewarded for pursuing "transformative" science (but see fickle decisions above), but run the risk of losing contact with stakeholders we should engage with.

Technical support, developing young scientists

Science technical support is charged to projects with full overhead and profit. Technicians are science productivity multipliers. If something could be worked out to increase the affordability of technical support this could lead to higher productivity. Having more roles for scientists with qualifications other than a PhD could employ more scientists, and create conditions for succession. A key sticking point in many projects has been access to bioinformatics expertise.

A proliferation of manager roles, and getting the top-down, or bottom-up balance right

A proliferation of managers with job titles that mean little to most scientists, often managers act as gate-keepers for proposals that we might want to put up be they for internal and external funding. This can mean that good ideas are only tested on a few managers, rather than They often propose restructuring, based on business models not clearly suited to scientific endeavours. Rightly or

wrongly scientists can feel they are treated as a commodity, and manager proliferation must increase overhead costs.

I am in favour of some proportion of our work being dedicated to the realization of goals under a National Science Strategy, or other similar strategic documents.

Ideas that might help address these problems

1. Research institutions should mostly be run as a "public-good", more in the style of a not-for-profit or a government agency rather than as a business. The science-as-a-business should take secondary position in our priorities, the incentive to make money from research/intellectual property is intrinsic anyway.
2. Science structures should be as flat as possible, a proliferation of managers needs to be avoided.
3. Consider restructuring CRIs to combine the life-science focused ones and reduce manager numbers and combine resources/infrastructure.
4. Core funding could be allocated to cover all or a large proportion of salary costs, and/or overhead costs.
    a. A special cost/overhead model for technical support staff should be considered as an effort multiplier and support succession/young scientists.
    b. Bioinformatics technical expertise is an effort multiplier in the life-sciences.

    This may support CRIs to be broadly engaged with society and improve collaboration. It should also allow for deep focus, longer term projects, or new ideas to be pursued.

5. Reduce competitive funding, consider a lottery system for funding.
6. Scientists in CRIs could be required to contribute a proportion of their time to goals outlined in a future National Science Research Strategy to organize our efforts.
7. Consider allowing secondments into areas where scientists are needed.