

AN EVALUATION OF THE CURRENT STATE OF VALUE ADDING IN AUSTRALIA, AND HOW THAT COMPARES INTERNATIONALLY.

AUSTRALIAN INSTITUTE OF MARINE SCIENCE.

Since its establishment in 1972, the Australian Institute of Marine Science (AIMS) has conducted scientific and technological research towards generating the knowledge needed for the sustainable use and protection of the marine environment, particularly in tropical Australia. AIMS recognises the immense conservation and economic value of Australia's marine territories, and advocates that publicly funded science and technology should focus on the dual needs of industry development and environmental protection. AIMS research activities currently include a focus on issues relating to management of the marine environment in support of industries such as offshore oil and gas, fisheries, and tourism; and the development of new marine biotechnologies.

This submission will discuss the current state of value adding to Australia's raw materials in the context of AIMS marine biotechnological research activities, which include research towards the discovery of new pharmaceuticals, agrichemicals, industrial agents, nutraceuticals, and genetic improvement of aquaculture species.

Australia's marine biodiversity is huge, inhabiting an immense ocean territory of 15 million square kilometres from the tropical Indo-Pacific to Antarctica. Today, this megabiodiversity represents a relatively untapped source of molecular diversity for screening programs aimed at discovering new commercial natural products such as pharmaceuticals, agrichemicals, and nutraceuticals. Australia also has significant potential for food aquaculture with a large coastline, a clean environment and a number of species with grow-out potential, not only as food but as potential sources of large scale supply of natural products.

Australia is in the unique position of being the only country of 12 megabiodiverse nations that could also be considered at the forefront of global biotechnology. Thus, Australia can boast of not only a wealth of diverse raw materials, but also the scientific facilities and capability to achieve its biotechnological potential. To realise the full value-added potential of this position, all activities from the discovery of innovative new products, to development of biotechnology and industry by which global demand can be sustainably met (primary production followed by refinement to shelf products), should take place in Australia. For example, to position itself as a global natural products based pharmacopeia, Australia needs to do more than discover biodiversity with human health applications. It must also implement methods for long term sustainable supply of natural compounds, cost efficient extraction and purification, and refinement to final shelf products (ie pills in bottles).

There are impediments to realising this potential, and there remains a need to resolve access to bioresources, develop regional R&D support, develop strategic alliances with international industry, and provide assistance with commercialisation.

Access to bioresources, and benefit sharing:

While we do not need to look outside Australia for diverse raw marine materials, development will sometimes mean international collaboration and access to such material is often at best, jurisdictionally

complex and difficult. Some resource management agencies within Australia have withheld AIMS' access for collections over concerns that their own entitlement to a share of benefits is not adequately protected. Also, difficulties in obtaining export permission for biodiscovery research samples has impeded AIMS' ability to utilise facilities and expertise overseas through international collaborations. Importantly, uncertainty caused by this lack of clarity over an ability to access (direct and indirect through export) Australia's bioresources has weakened commercial confidence in biodiscovery research as a desirable R&D investment target in this country.

This situation and resulting lost opportunities have been widely acknowledged, and a range of fora have been convened to address access and benefit sharing issues during the last decade. (eg the Commonwealth State Working Group on Access to Australia's Biological Resources and the Commonwealth Interdepartmental Committee on the same topic). Most recently, Biotechnology Australia has committed resources to resolution of policy and procedures for access and benefit sharing in Commonwealth areas. AIMS is hopeful that workable solutions which facilitate access, protect the interests of all parties, and maximise opportunities for Australia will eventually be found. However, the issues are complex and far reaching (extending into Australia's international obligations), and despite the urgency of a resolution, overall progress is frustratingly slow. In the absence of a Commonwealth position, AIMS has developed its own policy and procedures to facilitate biodiscovery research and is currently close to finalising an agreement with the Queensland State Government. It is suggested that this will form a useful model for subsequent access and benefit sharing policy.

Need for regional core strategic R&D support:

The biodiscovery process takes the raw material of biodiversity in nature through a long term and multidisciplinary value adding process. Optimum commercial investment opportunities are usually only available after significant value adding has taken place and a product type and several leads have been identified. Core strategic research at the 'raw material' end of the spectrum (eg development of lead identification methods) is essential in order to come up with marketable R&D projects, and needs to be supported from 'public good' type science funds.

While various government initiatives have recently committed significant funds to core strategic biodiscovery research in major centres, regionally based capabilities remain relatively unsupported. Townsville hosts a substantial biotechnology R&D capability which is currently under-utilised due to insufficient core strategic research support.

With respect to marine biotechnology, regional investment in R&D is strategically vital because the raw materials predominantly occur in regional areas. The opportunity to fast track R&D from initial discovery to methods for sustainable primary production and product refinement is maximised in regions of close proximity to the resource. It is also likely that optimal location for economic full scale production will be in regional Australia.

Strategic International Partnerships:

International collaborations can provide access to significant industrial funding, facilities, and expertise that is unavailable in Australia. While international opportunities can thus increase the success of biodiscovery research programs, they should be utilised in ways that maximise the opportunity for Australian intellectual property development in any commercial discovery. This can be achieved through true scientific collaborative partnerships, scientific exchange programs, and technology transfer. Agreements that feed Australian biodiversity samples into wholly offshore biodiscovery research programs, in return for an access fee or a share of post-production monetary benefits, should be avoided in favour of agreements that promote Australian intellectual property development. Through the capture of IP, Australian industry is then in a position to identify and benefit from value adding opportunities.

In addition to self-investment within Australia to develop an inherent R&D capability, Australian biotechnology institutes must develop strategic alliances with international partners which recognise that they too, are investing in Australian value adding. Such ideal international partnerships are feasible, as there is currently a global realisation in countries with high biotechnological capabilities (which tend to be non-biodiverse nations) that investment in countries from which they source bioresources is mandatory.

Commercialisation and Technology Transfer:

Australia's impressive track record in scientific discovery is not matched by its record in commercialisation of the results. This fact was highlighted at the California – Australia biotechnology industry partnering meeting, in San Diego in May 1999. Part of the problem is due to the scarcity of Australian companies willing to invest in biotechnology (less than 0.2% of Australian companies are directly involved in R&D). Because of this difficulty and limited research funding from Government, many leading Australian scientists have been forced to pursue careers and opportunities outside Australia (the "brain drain"). Many Australian scientists now living in the United States have advanced expertise in marketing their discoveries in the US, by far and away the worlds most significant biotechnology market. At the San Diego meeting, many indicated that they would be willing to collaborate with Australian researchers or provide advice on research development and commercialisation in the US, providing some of the obstacles which limit international exchanges are reduced.

Overall, there is no single factor responsible for the low proportion of Australian ideas and technologies taking the next step towards significant commercial development. Australia has quality research and business sectors (in isolation) but both could benefit from assistance in developing strategies for effective technology transfer to industry and commercialisation, through education of investors and the financial sector. If this can be achieved then a healthy biotechnology sector will transform into a booming industry, capable of stimulating inventors and investors alike.