

Reality bites: biotech innovation in South Africa

by Anton S Jordaan and Donrich W Jordaan

'Innovation' is quite the buzzword in South Africa's biotechnology environment. It is used to describe all kinds of policies and entities: the major funding agencies are the Innovation Fund and the four Biotechnology Innovation Centres, the Department of Science and Technology's long-term plan for building a knowledge economy is called the Ten-Year Innovation Plan, and even the overarching, national system of policies, organisations and institutions that support science and technology has been named the National System of Innovation.

But innovation is more than just a buzzword – it is official government policy. The central policy instrument concerning biotechnology in South Africa is the National Biotechnology Strategy (NBS)¹, which was officially adopted by Cabinet in 2001. The NBS aimed to create a “vibrant culture of innovation and entrepreneurship” in the field of biotechnology in South Africa. A key component of the strategy was the creation of several biotechnology innovation centres (BICs) that were to focus on “the creation of economic growth and employment through innovation” and use “both existing funds and new allocations [to] stimulate the creation of new intellectual property.”

The national government department responsible for the implementation of the NBS is the Department of Science and Technology (DST). Since the rollout of the NBS commenced, about a milliard rand of public money has been invested in biotechnology projects through the DST's funding agencies (the Innovation Fund, which predates the NBS, and the four BICs that were created as part of the implementation of the NBS).

But how successful have the DST and its funding agencies been in their clear, Cabinet-approved mandate to boost biotechnology innovation and create new biotechnology intellectual property?

An attempt can be made to answer this question by examining South Africa's biotechnology patenting activity over recent years. Patents are an internationally accepted primary indicator of innovation – especially in the biotechnology sector, as confirmed by the Organisation for Economic Cooperation and Development (OECD)²: “In no other field is the relationship between patent protection and the incentives to innovate so strong.” Burrone³ suggests five reasons for the high importance of patents for the biotechnology sector relative to other sectors:

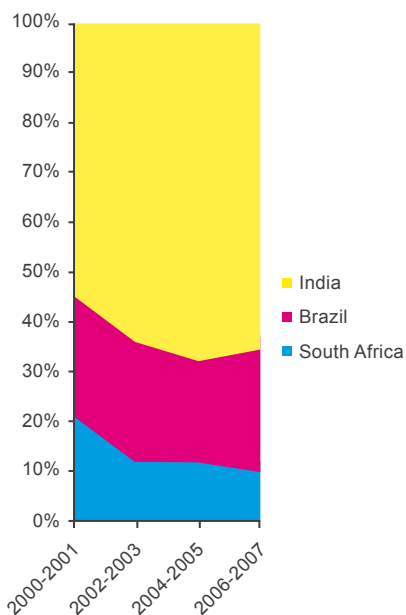
- a) Biotechnology is very research and development (R&D)-intensive, making the protection of R&D results a priority.
- b) The initial development of a biotechnology product is usually very costly, compared to the relatively low cost of imitation.



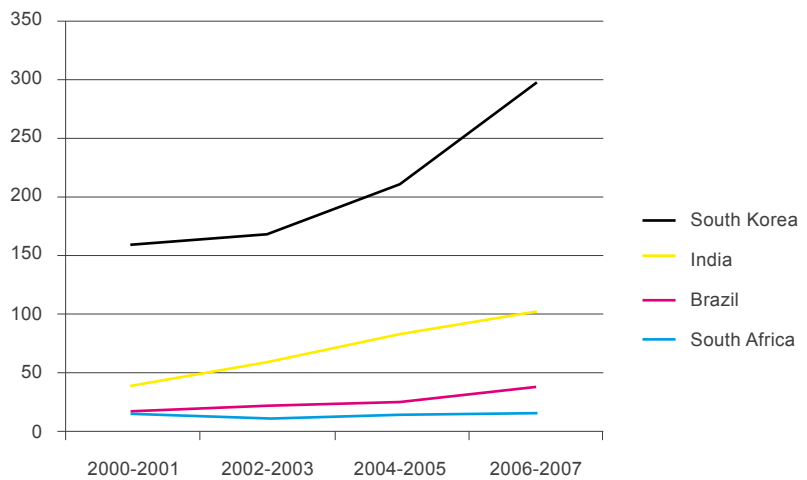
→ Anton and Donrich Jordaan, co-founders of Sylvean Biotech at the Innovation Hub.

- c) The biotechnology private sector is not only engaging in applied research, but also actively engages in basic research.
- d) Biotechnology patents often provide the basis for new venture creation.
- e) A patent is often a biotechnology company's final product.

In order to determine whether biotechnology patenting – and by implication, innovation – has improved in recent years since the adoption of the NBS and the founding of the BICs, the number of Patent Cooperation Treaty (PCT) patent applications by South African inventors was investigated to determine whether it has increased between 2000 (South Africa only acceded to the PCT on 16 December 1998 and implemented it on 16 March 1999) and 2007 (the most recent year for which reliable information is available). The number of PCT applications per year (according to priority date) that have at least one inventor with South



→ 2. PCT applications in the field of biotechnology according to priority date: IBSA countries (proportion of IBSA total).



→ 1. PCT applications in the field of biotechnology according to priority date: South Africa and comparative countries (annual averages).

African residence* was counted, and the results were compared with similar searches for a number of other developing countries.

Given the time lag between funding and patenting, does the period 2000–2007 allow sufficient time for the effects, if any, of the NBS to be seen? According to the *National Biotechnology Audit 2007*⁴, about a third of the ‘core biotech’ respondents indicated that their products or processes require three years or less to bring from initial development phase to market. Moreover, the BICs specifically prefer the ‘low-hanging fruit’⁵ that is near to market and typically limit the duration of their support to three years. Since the Innovation Fund was established in 1998 and the BICs commenced funding activity in 2003/04, there should surely be some signs of

increased innovation and patenting after three years, in 2006/07.

The results of the patenting analysis are shown in the accompanying graphs. In absolute terms, the number of South African biotechnology PCT applications increased with a single application in the period 2006/07 (31 applications) relative to the period 2000/01 (30 applications). This effective stagnation should be compared with the impressive growth rates experienced by other developing countries such as India (165%), Brazil (124%) and South Korea (88%) over the same period (see Figure 1).

The degree to which South Africa is falling behind is clearly illustrated if South Africa’s biotechnology PCT applications are represented as a proportion of the IBSA (India-Brazil-

* The date ascribed to each patent application was the priority date, instead of application or publication date, since the priority date is closer to the actual time of invention.

PCT applications were used instead of granted patents, since the time lag between application and issuing of biotech patents is unpredictable and can often be several years. Granted patents would therefore not reflect recent inventions. PCT applications, on the other hand, are normally published 18 months after the priority date.

Because of international mobility of researchers, inventor residence is a more reliable indicator of the country in which the research was performed or conceived than inventor nationality. Even so, the number of South African patents is likely to be a slight overestimation.

South Africa) total (see Figure 2). South Africa's slice of the IBSA biotechnology pie has dropped with a shocking 53% in the period 2006/07, relative to the period 2000/01. While South Africa was virtually on par with Brazil at the turn of the century, Brazil now has more than double of South Africa's number of biotechnology PCT applications per year – only seven years later. This, despite the South African taxpayer's milliard rand investment in biotechnology.

These results, while disappointing, would not be entirely surprising to South African biotechnology entrepreneurs. Since shortly after their founding, the BICs have blatantly disregarded the NBS – the very strategy that gave birth to them. For example, the NBS clearly highlights the importance of public funding for proof-of-concept studies in start-up biotechnology companies; in direct contrast, the CEO of BioPAD publicly stated in 2008 that BIC funding should not be used to support early-stage R&D in the private sector. Apparently the DST's funding agencies were allowed to divert from the (Cabinet-approved) NBS and make up alternative policy-on-the-go. This policy-on-the-go also results in embarrassing policy double-talk: South Africa's official report submitted to the OECD Country Review of the South African National System of Innovation⁶ stated that “the Innovation Fund... caters for applications ranging from the proof-of-concept phase,” while the Innovation Fund itself stated on its website that “the Innovation Fund provides grants to fund the end-stage research process...”

This policy creep at implementation level away from the comprehensive entrepreneurial support envisioned by the NBS is compounded by grindingly slow processes, inefficient communication, unreliable project evaluation, risk averseness, and vested interests by academia that are

in competition with private enterprise. In short, entrepreneurs experience the funding agencies as having a profoundly innovation-unfriendly culture that is in utter dissonance with the NBS's vision of a “vibrant culture of innovation and entrepreneurship.”

The attitude of the funding agencies is an extreme version of a general problem identified by the recent OECD report on innovation in South Africa⁷.

A few quotes from the report will suffice:

“A major gap in current innovation policy is indeed the lack of comprehensive support to innovation in SMEs [small and medium enterprises].”

“...too much focus on the role of public R&D-performing institutions. This may have obscured important issues, in particular... the central role of business enterprises in generating and implementing innovation...”

***The obvious solution has already been suggested by the OECD's report:
“Bring business enterprises much more centrally into the map of the innovation system both as generators and implementers of innovation and as creators of human resources for innovation.”***

This is, of course, easier said than done. The NBS also made this suggestion, but it was ignored by the funding agencies in implementation. There is evidently a clear need for strong political will to ensure the actual implementation of a genuine pro-entrepreneur, pro-innovation approach.

The DST is currently in the process of establishing a new funding instrument, the Technology

Innovation Agency (TIA), into which the Innovation Fund, the BICs, as well as other DST entities, will be incorporated. This offers an opportunity for the DST to start afresh and to establish a true partnership with biotechnology entrepreneurs. However, only time will tell whether TIA will take the decisive action that is necessary to rescue South African biotechnology from the stagnant bog in which it is currently foundering. 📌

References

1. DST. (2001). *A National Biotechnology Strategy for South Africa*. [Online] Available at: http://www.dst.gov.za/publications-policies/strategies-reports/reports/dst_biotechnology_strategy.PDF.
2. OECD. (2002). *Genetic inventions, intellectual property rights and licensing practices*.
3. Burrone, Esteban. (2006). *Patents at the core: The biotech business*. [Online] Available at: http://www.wipo.int/sme/en/documents/patents_biotech.htm.
4. DST. (2008). *National biotechnology audit 2007: Biotechnology use and development in South Africa*. [Online] Available at: <http://www.dst.gov.za/publications-policies/strategies-reports/National%20Biotech%20Audit>.
5. Trythall, Roger. (2006). *South Africa's biotech industry*. [Online] Available at: <http://www.virtusclin.com/news.php?id=43>.
6. National Advisory Council on Innovation. (2006). *The South African National System of Innovation: Structures, policies and performance*. [Online] Available at: <http://www.naci.org.za/OECD/OECD%20Report%2021Aug.pdf>.
7. OECD. (2007). *Review of South Africa's innovation policy*. [Online] Available at: http://www.oecd.org/document/20/0,3343,en_2649_34273_39294676_1_1_1_1,00.html.

Anton and Donrich Jordaan are co-founders of Sylvean Biotech, a biotechnology company situated at the Innovation Hub in Pretoria. Anton is a geneticist; Donrich is a serial entrepreneur with interests in technology companies in South Africa and the United Kingdom. Donrich is also a research associate of the Intellectual Property Law Research Unit of the University of Cape Town.