Wheat breeding- will commercial breeders be different?

Commercial plant breeding and the role of public & industry funded R&D.

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"Most of the global investment in agricultural research is now private…. The private sector and public research agencies must find better ways to work together – there is no choice. " (Gordon Conway, Rockefeller Foundation, speaking to the chief executives of the major global agribusinesses and leaders of international agricultural research institutions.)

Summary

This paper is based on a presentation given 18 months ago to two national conferences; the Australian Wheat Breeder's Assembly and the annual conference of the Cereal Chemistry Division of the RACI. There is little evidence to suggest I should change any of the views presented then on the future of wheat variety development and commercialisation in this country. From the perspective of LongReach, a national wheat-breeding venture between AWB limited and Syngenta Seeds, there has been much only patchy progress since September 2001.

This presentation will revisit the key messages of that earlier presentation. These are:

- That the best interests of the Australian wheat industry and the nation are served by encouraging private investment in cereal variety breeding. Despite the changes in publicly funded breeding of the past 2 years, largely induced by the GRDC, Australia still lags behind other developed economies in the relative level of private sector investment in plant breeding, and the benefits this can bring to the sector. However, forces beyond the control of any of us guarantee this situation will not continue.

- That there is a clear difference between the capabilities and proper role and responsibilities of industry and taxpayer funded R&D agencies and those of the commercial breeding sector. The public agencies have a role in supporting private breeding companies, not competing with them, if the research and breeding sectors are to achieve the outcomes growers and end-users demand of us, and if we are to maximise the value of R&D investment. This will require a clarity of purpose from public and industry funded bodies, which has not always been evident.

- That the transition to a commercial wheat-breeding sector in Australia is both inevitable and desirable. A national approach to linking the private breeding sector and the public and industry funded agencies involved in grains R&D, operating on commercial principles, will make a valuable contribution to the Australian grains industry. Serious investment is needed to implementing the new molecular technologies and this means developing scale and efficiency in allocating scarce resources.

This paper is a report card on progress in these areas.

Some background

Wheat breeding in Australia has entered an era of rapid and fundamental change, driven by both global and domestic factors. Globally, the promises of biotechnology and the major private and, to a much lesser extent, public investments being made in this exciting field are already changing the nature and the players in the grain value chain. For the most part, the Australian grains R&D sector stands on the periphery of these sea changes, in large part because of the at best semi-commercial structures, which dominate the sector.

Ownership of germplasm and genetic intellectual property are becoming important issues for any serious grains agribusiness. Despite protests and resistance from some, owners of elite germplasm are increasingly able and determined to control other's access to their genetic material, just as they protect any of their hard-earned Intellectual Property.

Locally and internationally, reasonable claims to proprietary rights in seeds & seed genetics continue to be upheld in important legal jurisdictions such as the U.S. Court of Appeals. Meanwhile international treaties governing genetic resources protection and ownership continue to reinforce the proprietary rights of plant breeders, while still recognising the rights of farmers to save seed and protecting traditional owners from bio-piracy.

Australian wheat breeding has long been dominated by seven publicly funded breeding programs, working with germplasm adapted to their "home" regions. The private wheat-breeding sector has been insignificant here until recently. The broad acre cereal seeds market in Australia is, in the marketing jargon, immature, and this has been reflected by the lack of private investment in the sector, despite continuing withdrawal of public funds from cereal variety breeding.

The introduction of a strong Plant Breeders Rights Act in 1994 created for the first time the basis for a market for broad acre open-pollinated cereal varieties. Recent amendments to the Act (1999) enabled serious commercial investments in wheat breeding by providing breeding companies with the ability to capture royalties or patent-based revenue streams for germplasm and related IP. Significantly, around the same time the GPWA's Federal Court challenge to the Act was rejected.

These changes and the relative immaturity of the Australian market have encouraged overseas breeders to consider it as an opportunity to expand volumes outside their home markets. To be competitive in this emerging commercial environment, breeders must have the financial capacity and commercial structures which enable them to access elite and novel proprietary germplasm as well as the best traits and technology including biotechnology, with "freedom-to-operate" in food, feed and industrial crops.

Emerging strategic alliances

The foregoing describes factors enabling creation of a market-based structure for varieties, and explains why some breeding companies are entering the Australian market. However, there are more strategically important drivers prompting companies such as AWB, as a grain value chain manager, and Syngenta, as a developer and commercialiser of grain technology, to form strategic alliances such as LongReach Plant Breeders. AWB and Syngenta see the opportunities in Australia differently; while there is a need to foster a commercial approach, the real opportunities lie in applying world class breeding technology and germplasm to a quality conscious production and marketing base.

As a value chain manager, AWB must meet an increasingly sophisticated market for grain, with reliable access to supplies of quality grain to meet its customers' requirements. Genetics determines the potential for these quality attributes to be achieved. This in turn demands a rapid breeding response to a continually differentiating consumer market, i.e. output traits delivered in attractive production packages and a grain product managed through the supply chain to the customer's door.

The businesses of technology owners and value chain managers require that they exploit fully their capabilities and intellectual property. Research and technology based companies require a tightly managed path-to-market for their IP, so it can deliver value and generate revenue. This is best achieved through strategic alliances between chain "players" which require serious investment and a commercial structure which can deliver performance and accountability.

Such alliances are now commonplace in other countries. Several years ago, Land O'Lakes, a national, farmer-owned food and agricultural cooperative in the USA and Syngenta Seeds formed a joint venture to develop and market specialty corn products for animal feeds and consumer-food markets. Dupont's Protein Technologies International (PTI) and General

Mills, Inc., announced plans to collaborate in developing and marketing varieties for soy foods. Other arrangements exist between milling companies and breeders, often with 3rd parties involved in logistical management, eg the contract production system between the UK bakeries group Warburton and the CWB.

Public research & private breeding- jobs for all?

While I am convinced that the future of cereal breeding lies in the commercial sector, there remain many areas of pre-commercial, discovery or high-risk research, which are appropriate areas for investment of public & R&D Corporation funds. The need to refocus the role of public research agencies and the scope of the work they undertake seems obvious. In this period of rapid transition, it is understandable that some publicly funded research providers are yet to clearly define the boundaries where activities cross the line between public benefit and private good. This will not continue indefinitely as the result is sub-optimal allocation of limited public resources, crowding out of private investment and delivering less satisfactory outcomes for the industry.

Once distinct and complementary roles for private breeding companies and public research agencies are understood and accepted, it is easy to envisage areas of interdependence and cooperation. Private-public partnerships already exist here, although not yet at the level of sophistication which has evolved in the US, Western Europe and the UK.

In the transition to a competitive market, there are some activities, which should be kept in "public" hands, and whose outputs should be available to all bona fide players in the industry under reasonable commercial terms. These include services and areas of grain science and technology, which protect or enhance the national and public interest. An example is the (hoped for) outputs of the multi-million dollar Plant Functional Genomics Centre being constructed at Adelaide University. We expect the results of that Centre's work will be readily available to all – "free to air" – to be developed by whoever is capable for the benefit of the grains industry.

Public and industry support can be justified for this sort of pre-commercial research, or in potential market failure areas such as rotations, sustainability, farm management and training of scientists. In the 2001 paper, we raised the issue of support to cereal disease control, which will always be a high priority for Australia's wheat industry. We argued that maintenance and enhancement of institutions such as the National Cereal Rust Control Program based at Sydney University-Cobbitty was a priority and it is gratifying to see the program now evolving with GRDC support into the ACRCP.

The maintenance of genetic diversity through "pre-commercial" investment in enhanced germplasm upstream of the commercial breeding sector is also highly desirable from an industry and a national perspective.

Independent evaluation of field performance of general release varieties is also desirable but is currently an area of some dispute. The current CVE & CVT arrangements in WA, Queensland and NSW do not meet the widely accepted guidelines for competitive neutrality and transparency, and this needs to be dealt with soon if growers in those states are to benefit fully from increased private investment in breeding.

Conclusion

So how are we going? In 2001, we said that the sector, public and private, would be judged by five criteria. These are whether there is:

- Efficient and timely delivery of robust varieties with qualities that the market demands,
- Timely and rapid response to emerging production and market issues,
- appropriate use of limited public resources,
- rewards to breeders for good management and innovation and
- Evidence of public and private sectors working together for the benefit of the industry.

The first two criteria cannot yet be assessed, as there are few genuine commercial breeders in Australia. However, we can comment on progress in the latter three.

Since 2001, in response to pressure from GRDC, there have been some changes with the creation of corporatised entities from the publicly funded breeding programs. But does a change of name and a new organisational structure alter the strategic intent and commercial imperative to perform?

The GRDC, state, and federal governments are supporting these new organisational arrangements, begging the question– would scarce industry and taxpayer R&D dollars be better spent in other ways? I don't believe we have yet got the model or the mix right although the ACRCP is a step in the right direction.

What about reward for innovation and good management? Varieties subject to Plant Breeders Rights and End Point Royalties are in the minority so we are yet to see what proportion of growers will be willing to pay a fair commercial rate for superior grain genetics. I detect some pockets of resistance in some areas but perhaps we need to see more commercial varieties in the field before we will really know.

Examples of the sort of productive public-private interactions we see in other countries are as yet rare, although as the pace quickens and the pressure on public funds grows, we are bound to see more. The new corporatised organisational structures face additional pressures to meet the transparency and competitive neutrality demanded of their commercial counterparts.

Despite limited progress in developing public agency-commercial breeder links, these are exciting times and there are great opportunities for both private and public sector participants, provided we are clear about our respective goals and roles.

Background reading:

"Public sector germplasm in a privatising world." Paul W. Heisey, Chittur S. Srinivasan, and Colin G. Thirtle. USDA-ERS Agriculture Information Bulletin No. 772. 22 pp, August 2001

"Globalising germplasm; barriers benefits & boundaries."
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"The impact of biotechnology and consumer demand changes on agri-marketers such as AWB Limited" John. J. Woolfe, Paper presented to Seeds Industry Association of Australia Conference Biotechnology Forum, Adelaide August 2001.

"Structural changes in the global seeds industry – implications for Australia" Consultant Report to GRDC, by SG Heilbron Pty Ltd & Agri-Focus Pty Ltd. Report prepared for the GRDC, 2000