Commercial breeding and the role of public R&D agencies

Presentation to

Australian Wheat Breeders Assembly

September 18th 2001

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It’s not a competition…

- *“Most of the global investment in agricultural research is now private…. The private sector and public research agencies must find better a way to work together – there is no choice. It is the only way forward.”*

- (Gordon Conway, Rockefeller Foundation, addressing chief executives of the major global agribusinesses and leaders of international agricultural research institutions, N.Y. July 2001.)

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What is driving structural change?

- Promise of ag-biotechnology
  - But long term, there are high risks
- Growth opportunities in the food sector
- Huge research & technology investment
- Ability to protect IP
  - proprietary rights in traits & breeding technologies
  - Plant Variety Rights

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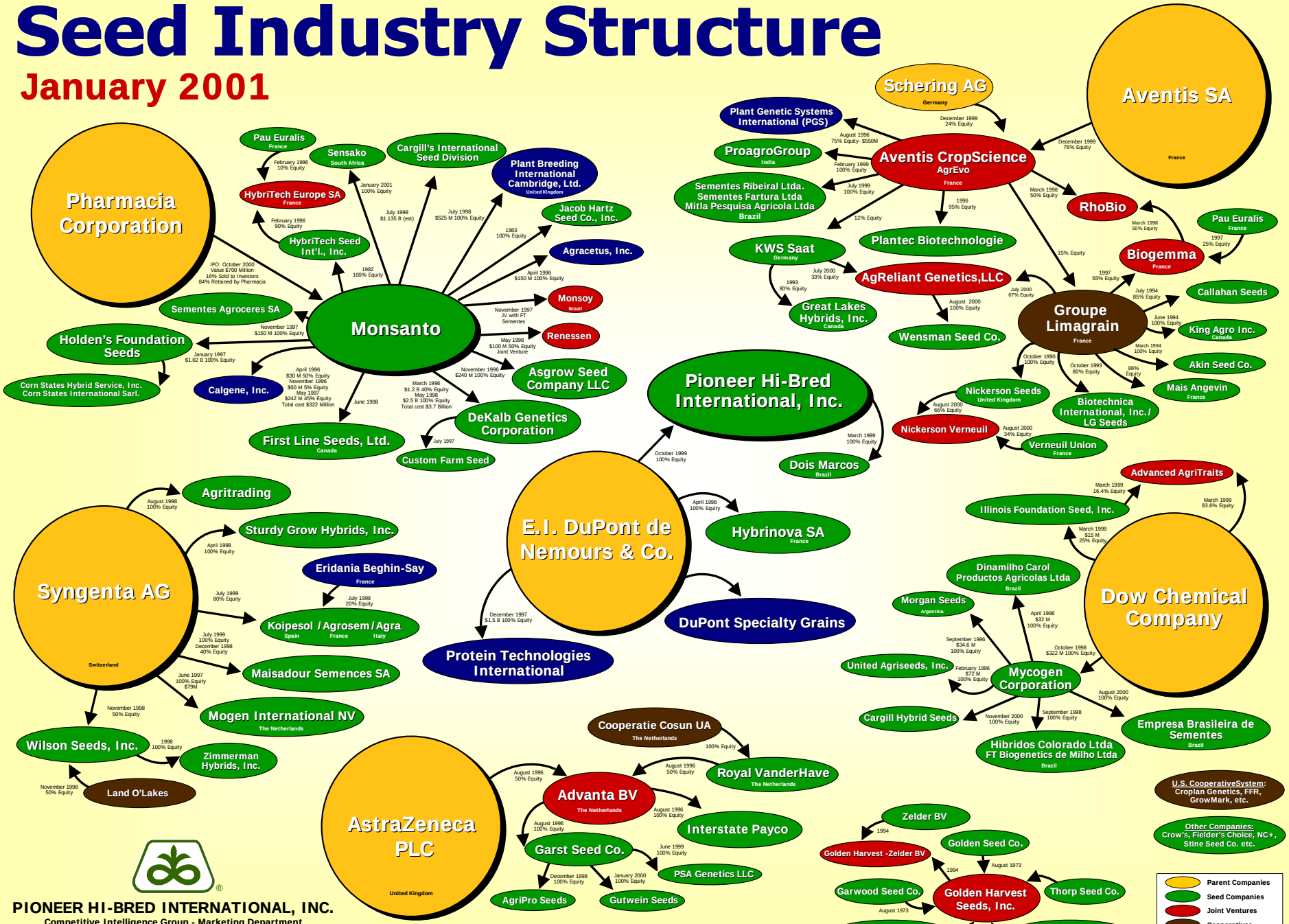
Seed Industry Structure

January 2001



PIONEER HI-BRED INTERNATIONAL, INC.

Competitive Intelligence Group - Marketing Department

http://phiweb/market/ci/default.htm

The Australian scene

- Global events are driving change
- Domestic changes are merely creating an environment
  - Continuing real reductions in public funds
  - PVR protection: We are a late-comer
  - “Immature” cereal seed & variety market
  - Measure is low private investment levels

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Development of plant breeders' rights

- 1961: International Convention for the Protection of New Varieties of Plants 1961
- 1961-1970: Introduction of plant breeders' rights legislation in states of Western Europe & UK
- 1970: USA Plant Variety Protection Act
- 1987: Australia Plant Variety Rights Act
- 1990: Canada Plant Breeders Rights Act
- 1994: Australia Plant Breeders Rights Act,
- 1999: minor amendments to PBR Act

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Landmark PBR & IP decisions

- 1994: Federal Plant Breeders Rights Act (minor amendments 1999)
- 1999: Franklin barley case begins in Federal Court
- 2000: High Court rejects challenge to PBR Act
- 2000: Pioneer wins decision in U.S. Court of Appeals on patentability of "*seeds and plants*

Encouragement for new entrants

- Introduction of an enforceable Plant Breeders Rights Act
- Ability to capture royalties or patent-based revenue streams
- Australian broadacre seeds industry perceived as “green fields”

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To compete, developers of commercial varieties will need..

- access to technology & traits, with commercial freedom-to-operate (FTO)
- financial capacity & strategic partners along value chain
- commercial structure
  - to protect IP
  - to manage costs & revenue

But there is no pot of gold at the end of the proprietary variety rainbow

Ag-Biotech companies

- **Certainty and minimum risk to IP**
- Rapid and cost-effective “path-to-market” to maximise commercial adoption of IP applications
- Revenue management

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Strategic alliances between chain players will be critical

- Land O'Lakes Co-op & Syngenta
  - Specialty corn products, food & feed
- Protein Technologies International & General Mills, Inc.
  - Soy-based foods

Alliances must deliver;

- Enhanced product development & supply chain management opportunities
- Rapid breeding response
- Attractive production features in robust varieties
- Rapid secure path to market for IP

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AWB as a value chain manager

- Product development & differentiation
- Demand for rapid breeding response
- Attractive production packages for growers
- Ability to manage product through the supply chain

The future

- Identify roles for commercial breeders and public-industry funded R&D
  - Deciding the fate of “impure” public goods
  - Distinct and complementary roles for private breeding companies and public agencies
- Need to protect the national interest
- Breeding-related activities with public benefit
  - Genetic diversity, germplasm enhancement
  - Disease management
  - Sustainability

Where to from here?

- Rapid change will continue and accelerate
- Private investment in cereal breeding & seeds will increase
- Long-term investment will require chain alliances & partnerships
- Public-industry & private sectors must define complementary roles in new paradigm

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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."* Walter P. Falcon. 24th International Conference of Agricultural Economists, Berlin, FRG.

- *"The impact of biotechnology and consumer demand changes on agri-marketers such as AWB Limited"* John. J. Woolfe, Paper presented to SIAA 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

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Speaker's Notes

Plant Breeders Rights, Seed Commercialisation and the Australian Grains Industry in the 21st Century

Wheat breeding in Australia has entered an era of rapid and fundamental change, driven by factors both global and domestic in nature.

Slide 1: Drivers of global structural change

Globally, the promises of biotechnology and the major private and, to a lesser extent, public investments being made in this exciting field are already changing the nature of, and the players in, the grain value chain.

The structural changes to which I refer have been the subject of numerous academic treatises. Interestingly, these studies do provide a reasonably accurate reflection of current strategic, commercial thinking in ag-biotechnology and value chain management businesses.

Ownership of germplasm and genetic intellectual property are important issues for any serious grains agribusiness with an eye on its future. Major global agribusiness corporations have been assembling breeding and seed companies with private collections of elite germplasm over the last decade.

Slide2; Global Seed Industry Structure Jan 2001

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Their reasons for this flurry of mergers and acquisitions are straightforward and relate entirely to business growth and achieving returns on significant historical investments in technology development in conditions of managed risk.

These global businesses are increasingly able, and determined to control access to their genetic material, just as they protect their hard-won biotechnology IP. In recent times, reasonable claims to proprietary rights in seeds have been upheld. For example, in January 2000, Pioneer Hi-Bred International (Dupont) won a decision on the patentability of seeds and plants from seeds in the U.S. Court of Appeals.

It has been a popular sport in some quarters to lay the blame for the significant changes now occurring in the domestic wheat breeding scene at the feet of the GRDC. However, if we look dispassionately at the situation, it is easy to argue that the structural changes in the domestic plant-breeding have been driven more by developments beyond our shores – and our influence - although domestic factors have also been important in creating an environment which is enabling change to occur.

Slide 3: The Australian scene: Global events are driving domestic change

The interaction of these domestic influences is more complex than conventional wisdom suggests. Australian wheat breeding has long been dominated by 7 publicly owned breeding programs, working with discrete germplasm, well-adapted to each program's

"home" region. The private wheat-breeding sector has been insignificant in Australia until quite recently, with a mere1% of total national investment in the early 1990s, rising recently to perhaps a little over 5%.

At face value the broad acre cereal seeds market in Australia should be ripe for private investment. It is still considered an immature market by analysts and significantly by some off-shore seed companies. However, continuing real reductions in public funds for cereal variety breeding, in the absence of other environmental change, did not attract significant private investment into Australian winter cereal breeding.

Slide 4: The development of Plant Breeder's Rights.

However, the introduction of a strong Plant Breeders Rights Act in 1994 created, for the first time, a fundamental plank for the development of a market for proprietary open pollinated winter cereal varieties in Australia.

Slide 5: Landmark PBR & IP decisions

The history of PBR has been characterised around the globe by ongoing change and amendments to treaties and nation-state legislation, reflecting the political and socio-economic importance of plant patents and the development of legislative responses to changing business practices.

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Slide 6: IP Protection has encouraged new entrants

Recent amendments to the PBR Act have enabled serious consideration of commercial investments in wheat breeding to occur by providing breeding companies with the ability to capture royalties or patent-based revenue streams for germplasm and related IP. Significantly, the recent High Court challenge to the Act, by the WA & Queensland state governments and subsequently the Grain Pool of WA, failed.

These changes, coupled with the "green fields" perception of the Australian market - the "immaturity" I spoke of earlier - have encouraged some international breeders to seek to expand into Australia. NZC&FR was one of the first off-shore breeders to pick up on this opportunity and has been part of a 3-way contract for cereal variety development with AWB and Heritage Seeds for the past 6 years. Others are following close behind and you are probably aware of several independent start-up companies, including the AWB-Syngenta Seeds venture.

Slide 7: To be competitive, breeders now need:

The emergence of these new entrants means much greater competition in a rapidly emerging commercial environment. History will count for little and breeders will now need the financial capacity, commercial structures and management to make them attractive partners to owners of elite, novel germplasm from around the world. The same characteristics will also be needed to access genetic traits and breeding technology, with "freedom-to-operate"

commercially - not just in research - in food, feed and industrial crops.

I have described some of the factors enabling the creation of the environment for a market for varieties here, and explains why some breeding companies are now entering the Australian market.

Slide 8: Ag-biotech Coys need

But let us be very clear; contrary to popular belief, there is no pot of gold at the end of the variety rainbow. The seed industry is cyclical and margins are highly variable. PBR and patent law merely offer investors the opportunity and certainty in law which allows them to develop a business which can pay its way. Unless big agribusiness has more strategically important drivers than royalty revenues in mind, it is difficult to see a business-case for their investment in cereal breeding.

Slide 9: Emerging strategic alliances between ag-biotech and the food sector

And there are sound strategic reasons for this sort of investment. Companies AWB, as a grain value chain manager, and Syngenta, as a developer and commercialiser of grain technology, are forming strategic alliances because they have identified opportunities and issues far more critical to sustaining and developing their businesses.

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Slide 10: AWB as a value chain manager

There is a growing need for AWB, as a value chain manager, to achieve ever more sophisticated differentiation of wheat, enabling us to lock in product which will meet end-user demand and provide long-term sales premiums. As all breeders know, the intrinsic qualities that enable this product differentiation are genetic in origin. In turn, this ever more discriminating consumer market demands that AWB has access to a rapid breeding response which can deliver output traits in varieties which offer growers an attractive production package, and provide a guarantee that the desired product will be managed through the supply chain by AWB.

On the other side of the equation, all global biotechnology companies have seen the opportunities for expansion of their businesses through much greater engagement with the food sector. Implementation of the strategy has varied greatly between companies – some have been badly burnt, particularly with the GM issue - but expect to see more of this as time goes on as the logic is compelling.

To achieve this integration with the food sector, the ag-biotech players require a path-to-market for their IP, for which substitute the breeding and seed company, which will deliver the product and capture some of the revenues. The path must be rapid, cost effective and be able to protect IP, germplasm and technology.

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Both technology owners and value chain managers need to exploit fully their respective capabilities and intellectual property in complementary arrangements. Alliances of this type require serious investment.

Alliances of this type are now commonplace in other developed economies. Land O'Lakes, a national, farmer-owned food and agricultural cooperative in the USA, and Syngenta Seeds have formed a joint venture to develop and market specialty corn products for animal feeds and consumer-food markets. Dupont's subsidiary Protein Technologies International and General Mills, Inc. are collaborating in developing and marketing Soy based foods. In Canada, there are several major alliances coming together between the provincial pool and elevator operators, ag-biotech owners and seed companies.

I want to touch briefly on the implications for relationships between the key links in the grains value chain, from breeder, seed marketer, financier and marketer through to end-user.

It is not difficult to envisage how the relationships between the commercial players in the grains industry will continue to develop to take best advantage of new output trait and dedicated supply opportunities.

It is not so simple to identify appropriate fit for public and industry funded R&D, particularly in the field of cereal quality. Private-public partnerships already exist in cereal breeding Australasia,

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although not yet in the form or with the degree of sophistication which has evolved in other developed economies.

There are areas of pre-commercial breeding, in discovery and /or high-risk research, which are appropriate investment targets for public& industry funds, but this will require some realignment of public research agencies roles and the scope of the work they undertake. Thes boundaries between private benefit and public good are unclear – and perhaps for this reason, economists describe them with the quaint term "impure public goods"….

Slide 11: The fate of "Impure Public Goods" – a question of babies and bathwater

In the transition to a competitive market, some breeding-related activities need to be kept in "public" hands because of the need to protect or enhance the national and/or public interest.

Public and industry support can be readily justified for research in areas such as rotations, sustainability, farm management and training of scientists and breeders. Cereal disease management is an area where some private breeders may under-invest. The maintenance of genetic diversity and germplasm enhancement, upstream of the commercial breeding sector, is also highly desirable from a national perspective.

It is relevant to ask where publicly funded cereal quality R&D fits in this emerging private sector environment. Its outputs are, if not private, at least impure public goods. Traditionally the public

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breeding programs have engaged in this type of work. I have no answer to this question, but in leaving it for you to ponder, I do note the increased attention being paid to processing quality of germplasm in the CGIAR institutions, which are clearly public benefit bodies.

Slide 12: What can we expect?

Rapid change in the seed & variety-breeding sector, including M&A on a global and local scale, will continue. There will continue to be a rapid decline of public investment in areas of cereal breeding where private benefits can be apportioned. Australia lags well behind other developed economies in the relative level of private sector investment in cereal breeding but the necessary changes to the legislative environment have occurred and forces beyond the control of any of us here today will guarantee this situation shall not continue into the future.

For all the reasons I have outlined today, the best interests of the Australian wheat industry and the nation are served by encouraging the inevitable rapid transition to a commercial wheat-breeding sector.

Slide 13: 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

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