Proc. Assoc. Advmt. Anim. Breed. Genet. ***17****: 167-174*

EFFECTIVE VALUE CHAIN PARTNERSHIPS ARE ESSENTIAL FOR RAPID ADOPTION OF BEEF GENETICS TECHNOLOGY

P.F. Parnell

NSW Dept. of Primary Industries, Beef Industry Centre of Excellence
JSF Barker Building,Trevenna Road, University of New England, Armidale, NSW 2351, Australia

SUMMARY

The directional flow of genetic material from the beef seedstock sector through the beef value chain provides the opportunity for efficient multiplication and dispersion of benefits from the adoption of genetics technology. In order to realise this opportunity it is essential that the different sectors of the industry work together in partnership to provide the necessary market signals, incentives, motivation and associated rewards from the application of genetics technology.

This paper reviews the essential elements of effective partnerships among businesses and organisations across the beef industry focused on harnessing improvements in profitability through the adoption of genetics technology. It is concluded that there is considerable scope to further enhance the co-ordination of the beef value delivery chain through the establishment of new partnerships, and improvement of existing partnerships, to provide a more favourable environment for the realisation of the benefits from the application of genetics technology. A genetics technology adoption roadmap is needed to provide focus for identifying and addressing the barriers to the adoption of genetics technology, and to develop a clear set of strategies, responsibilities and actions to capture opportunities for future improvement. This roadmap will need to consider the role of the design, establishment and maintenance of effective partnerships that facilitate the communication of the genetics value proposition and associated market signals across the value delivery chain.

INTRODUCTION

The dispersed and segmented structure of the beef industry complicates, and often impedes, the process of technology adoption. However, the directional flow of genetic material from the seedstock sector through the beef value delivery chain provides the opportunity for efficient multiplication and dispersion of benefits from the adoption of genetics technology. In order to realise this opportunity it is essential that the different sectors of the industry work together in partnership to provide the necessary value propositions, market signals, incentives, motivation and associated rewards from the application of genetics technology. There are numerous examples of successful relationships among businesses within and across different segments of the beef value delivery chain working together for mutual benefit. However, significant opportunity still exists to further harness the potential benefits arising from the adoption of genetics technology through the establishment of more effective industry partnerships.

Hammond (2006) argued that the beef industry as a whole needed to take greater responsibility for its genetic improvement by more effectively managing the appropriation of benefits across sectors. He suggested that an effective system of value-based marketing and more appropriate capacity building for each sector and production environment was required. This worthy objective can only be achieved if there is an effective mechanism for businesses in each segment of the industry to realise the value proposition offered by genetic improvement.

Adoption

Lanning (1998) described the value proposition of a business as "the entire set of resulting experiences that an organisation causes its customers to have. This includes the resulting value to immediate customers and the value to customers further along the chain". For the beef industry, the value proposition offered by genetics technology is the resulting impact on the determinants of profitability for businesses in each segment of the value delivery chain. Genetic improvement has the distinctive characteristic that investments in one segment of the chain (i.e. the seedstock sector) will potentially generate a range of different, and sometimes conflicting, value propositions for other sectors of the chain. Lanning (1998) proposed that "businesses and industries needed to develop and execute clear strategies for not only on how to deliver profitable value to their customers, but also how best to communicate the range of value propositions for each customer in the value delivery chain". Due to the dispersed and fragmented structure of the beef industry the delivery and communication of the value proposition offered by genetics technology requires effective partnerships among participants of each segment. This paper reviews the essential elements of effective partnerships among businesses and organisations across the beef industry focused on harnessing improvements in profitability through the adoption of genetics technology.

TRANSFORMING GENETICS TECHNOLOGY INTO PROFITABLE INNOVATION

A key aspect of the adoptability of any technology is the ease in which it can be integrated into the business environments of individual enterprises involved in the value delivery chain. It is only after technology is effectively integrated into business environments that it can be considered as profitable innovation (Howard, 2006). Genetics technology is a classic example of a potential "enabler of innovation" that can contribute to long-term continuous and incremental improvement in profitability and business growth. However, just like any other technology, it requires effective integration into the various business environments in the value delivery chain. Genetics technology needs to "compete" with other technology for inclusion in the innovation portfolio of a business or industry. Due the medium-long term profitability impact of genetics technology its effective utilisation requires individual decision makers, and the beef industry as a whole, to develop a vision of the future production and marketing environment that will exist when the outcomes from adopting the technology are realised. This makes the adoption of genetics technology even more challenging compared to other "competing" investment opportunities with short-medium term outcomes. It also emphasises that the transformation of genetics technology into profitable innovation requires effective long-term partnerships and collaborations among businesses and organisations across the value delivery chain. Loose, informal arrangements are less likely to succeed in maintaining long-term focus and momentum. A key message for genetics R & D developers and funders is to ensure that the value propositions of their technology outputs address real (future) customer needs, and that the technology can be effectively and efficiently integrated into a value delivery chain. In addition, they need to address the human capacity needs required for the effective transformation of the technology into business environments and the mechanisms required for transmission of the value propositions and price signals across the value delivery chain.

THE ROLE OF EFFECTIVE PARTNERSHIPS IN TECHNOLOGY ADOPTION

A range of "adoption" strategies or models have been proposed for achieving "transfer of technology" from R & D developers to agricultural businesses. Black (2000) concluded that no single "extension" approach was likely to be sufficient by itself. He argued that "despite the criticisms of linear top-down technology transfer (or diffusion) models, there is still a need for access to reliable technical information,

just as there is a need to provide for active participation by producers in research and development processes (i.e. participatory bottom-up approaches)". In addition, he contended that "one-to-one exchange and advice, whether from producer to producer, or from professional adviser to producer (and vice versa), will continue to be important" (Black 2000). The common feature across all adoption models is that their success ultimately depends on the establishment of effective collaborations and partnerships among technology providers, technology users and their customers.

Following Rounthwaite and Shell (1995), an effective partnership exists "where two or more bodies determine to work together to mobilise and co-ordinate their combined experience, skills and roles, in an agreed joint mission with a clearly identified common purpose within which the issue(s), goal(s), problem(s), need(s), or service(s) can best be addressed (often through synergy) by working together rather than separately". A key determinant of the success of partnerships focused on technology adoption is the degree to which partners have a shared understanding and vision of the value proposition associated with the technology and of the necessary actions required to achieve the technology outcomes (Abel *et al.* 1998). Vanclay (2004) argued that "adoption is not an automated response to information provided by extension. Rather, it is a deliberate decision in response to a consideration of a wide range of issues. Information that is transmitted via extension is evaluated against other information, knowledge and beliefs held by each individual". He suggested that "credibility and legitimacy of technology can be enhanced through the establishment of long-term partnerships between technology providers and users, where mutual trust and reputation is built up over time through multiple communications, interactions and transactions". Again, this is particularly important with respect to genetics technology due to its relatively complex nature, the long time lags associated with the realisation of returns from investment, and the variety of potential beneficiaries across the value delivery chain. Greater investment and commitment is required by the beef industry to build the necessary social and business infrastructure necessary for rapid transformation of genetics technology into profitable innovation. A reassessment is necessary of the relative emphasis on R & D of "hard" technology compared to the investment into "soft" technology associated with adoption and innovation, such as the social and structural aspects related to the design, establishment, leadership and conduct of effective long-term partnerships.

THE BEEF GENETICS VALUE DELIVERY CHAIN

A schematic representation of the beef genetics value delivery chain is shown in Figure 1. At one end of the chain, R & D providers and funders develop new genetics technology and knowledge which is transformed either directly by the developers and/or by commercialisers into genetic tools (e.g. Estimated Breeding Values, $Index Values, DNA markers) and breeding strategies for potential use by the seedstock breeding sector. Individual producers within the seedstock breeding sector utilise these tools and strategies to pursue their particular breeding objectives. They produce genetic material (bulls, semen, embryos) for sale to other seedstock breeders, and bulls for sale to beef producers in the commercial breeding sector. Bull purchase decisions by producers in the commercial breeding sector are influenced by the requirements of their particular production environments and the product specifications of their target markets. Steers and surplus females produced by the commercial breeding sector are either finished (fattened) for slaughter by the breeder, or sold to a backgrounder, finisher or feedlot to be grown out and finished for slaughter. Ownership of animals may change several times along the supply chain from birth to slaughter. Following slaughter, the meat processors sell carcase beef or boxed cuts of beef to distributors and exporters who in turn supply retailers and the food service sector for sale to beef consumers.

Adoption

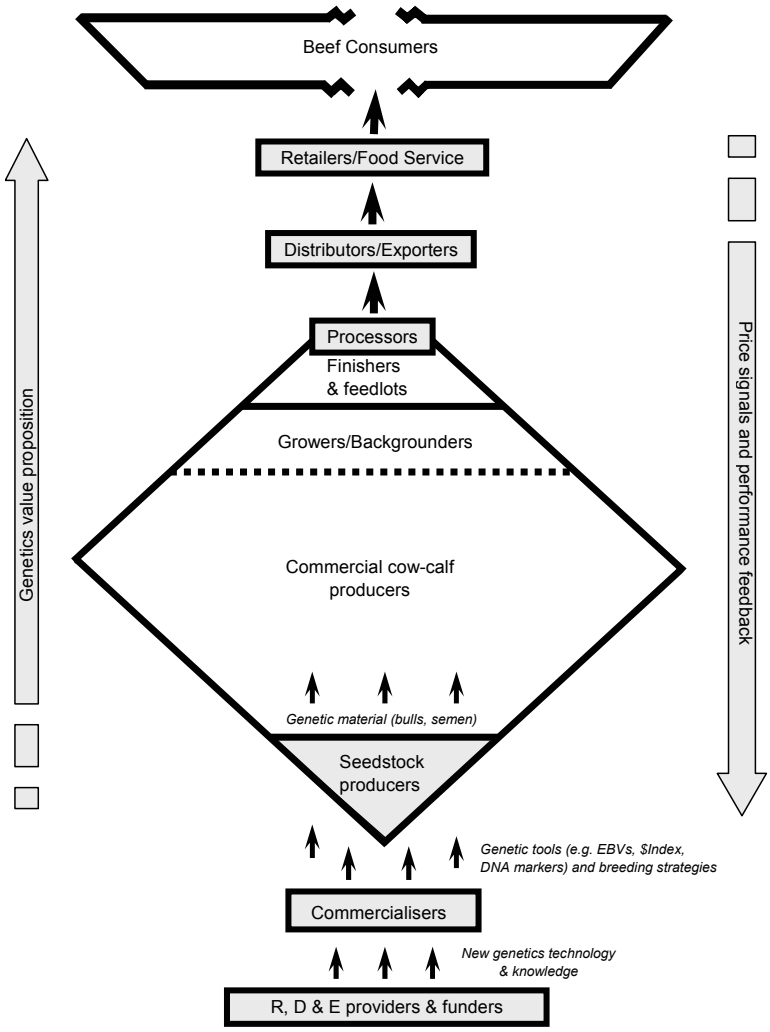

Figure 1. The beef genetics value delivery chain

In a segmented industry the achievement of profitable innovation across the value delivery chain through technology adoption is determined largely by the effectiveness of the communication of value propositions and associated price signals through the chain. Other key factors include the confidence of the value chain participants in the impact of the technology, the ease of integration of the technology into individual businesses, and clarity of the resulting benefits to individuals from adopting the technology.

There have been several initiatives to enhance "through chain co-ordination" in the Australian beef industry through the establishment of more effective vertical alliances, co-operatives and partnerships e.g. Marketlink, Storelink, BeefNet (VCG 1997; MLA, 2000). Despite this work, there is still considerable scope to further enhance the co-ordination of the beef value delivery chain through the establishment of new partnerships, and improvement of existing partnerships, to provide a more favourable environment for the realisation of the benefits from the adoption of genetics technology.

Hammond (2006) noted that whilst industry-wide economic evaluations of the return on investment in breeding and genetics R & D show very healthy outcomes the appropriation of benefits to the seedstock sector was insufficient to cover the costs of generating rapid genetic improvement for the industry while remaining profitable. Corrigan and Parnell (2005) examined the degree of performance recording of various traits in seedstock herds of the major beef breeds in Australia and found that the levels of complete recording were suboptimal for achieving rapid genetic progress. Similarly, Banks (2005) pointed out that despite the excellent range of genetic tools and knowledge available, the industry-wide rates of genetic improvement lag well below what was possible. He argued that this is partly a problem of coordination effort across many diverse interests, and that unless it is addressed, this problem will likely be exacerbated in the future by the increasing complexity of genetics technology. Freer *et al.* (2003) identified that the primary constraints to adoption of beef genetics technology included the lack of "proof of profit" drivers, the lack of follow-up (assistance with adoption) after exposure to awareness programs, the difficulty of extension in a diverse and fragmented industry, and the decline in extension capacity of the R, D & E providers.

The following examples indicate the importance of effective partnerships involving participants in various sectors of the beef genetics value delivery chain:

R, D & E providers and funders. Successful partnerships among R, D & E providers and funders with commerialisers and seedstock breeders has been a key factor in the development and application of the world-leading BREEDPLAN beef genetic evaluation system. Hammond (2006) reflected on the past success of the collaborative partnership arrangements between Meat and Livestock Australia (MLA), the Animal Genetics and Breeding Unit (AGBU), the Agricultural Business Research Institute (ABRI), state departments of agriculture, various breed associations, and pioneering breeders, in the design, development and implementation of the BREEDPLAN system (Graser *et al* 2005) and its important enhancement, BreedObject (Barwick *et al.* 1992; Barwick and Henzell 2005). Hammond (2006) noted that a key factor in the success of the industry adoption of the BREEDPLAN technology was the informed extension expertise provided by departments of agriculture to co-ordinate and support national field uptake of the system. Subsequently, some breed associations also contracted highly experienced extension expertise to support uptake of this technology. More recently, MLA has developed partnerships with ABRI and several breed associations to establish BREEDPLAN extension and support services in both southern Australia (Southern Beef Technology Services) and northern Australia (Northern Beef Technology Services).

The various phases of the Beef Co-operative Research Centre (Beef CRC) over the past 12 years has provided an excellent model for the power of partnerships between R & D providers, funders (including industry and government) and key industry bodies in the development and application of genetics technology (Burrow and Bindon 2005). The current CRC for Beef Genetic Technologies has a major focus on the development of novel molecular genetic tools. The Beef CRC will need to develop secure partnerships with key industry commercialisers, including DNA diagnostic testing providers, ABRI and breed associations to ensure rapid industry adoption of the resulting outputs. The Beef CRC has funded a

large project that utilises the principles of effective partnership design to establish a Beef Profit Partnership network involving beef businesses and selected supply chains across Australia and New Zealand focused on achieving sustainable impact on business profit and industry growth (Clark *et al*. 2007). It is anticipated that the establishment of a culture of innovation across the Beef Profit Partnership network will contribute to the development of an industry environment that will accelerate the transformation and integration of CRC-derived genetics technology into beef businesses as well as enhancing the adoption of other relevant technology.

Commercialisers. Partnerships between seedstock breeders and ABRI through their involvement in the National Beef Recording Scheme and membership of breed associations has facilitated the collection and processing of the necessary pedigree and performance data required for genetic evaluation. Providers of diagnostic services for DNA and physiological markers have facilitated the uptake of these tools through partnerships with individual breeders and breed associations. Semen marketers have played an important role through partnerships with seedstock breeders to disseminate and multiply superior genetic material.

Increased competiveness, loss of market share and increased costs of implementing efficient information technology services has challenged the long-term commercial viability of some breed associations. In order to remain relevant into the future breed associations will need to adapt to the changing needs of their members and ensure that they contribute real value to the genetics delivery chain. An important continued role will be the need for reliable and cost-effective operation of data management and information technology services to support genetic evaluation and improve the breeding decisions of their members.

Seedstock breeders. The role of seedstock breeders is to utilise genetic tools and information to implement effective breeding programs to satisfy the needs of the commercial breeding sector and their customers further along the value delivery chain. Successful seedstock producers understand the need to develop long-term partnerships with their customers and to become "full service genetic providers" rather than simply bull merchants (Ritchie 2001). This involves understanding and fulfilling the individual needs of their customers and assisting them to take full advantage of the genetic potential of their livestock.

The results of a survey of major seedstock breeders in Australia conducted by Corrigan and Parnell (2005) found that the need to reduce per unit costs of production was considered to be their key challenge for the future. Clearly, it is likely that the seedstock breeders would be unwilling to invest in expensive genetic technology in the future unless they can be convinced of the resultant economic benefit to their individual businesses. The survey respondents generally rated traits expressed in the breeding herd higher than end-product traits as important for the future profitability of their customers. This is likely to be at least partially due to the inadequacy of market signals to reward emphasis on genetic improvement in end-product traits. It also indicates that seedstock breeders will be reluctant to adopt new genetics technology aimed at end-product traits (e.g. DNA markers for meat quality) unless they are confident that this will not have any adverse affect on traits of importance in the breeding herd.

Barwick and Henzell (2005) reported the increasing use of multi-trait selection indexes in seedstock herds in Australia and associated evidence for enhanced rates of genetic gain in traits affecting beef industry profitability. They pointed out that the breeding objective addressed in a BreedObject-derived selection index is the breeding value for profitability accruing across the entire value delivery chain. The production system is modelled as if it were vertically integrated, recognising that the overall genetic merit of any animal is determined by its impact on profit across all sectors of the industry. Corrigan and Parnell (2005) found that many seedstock breeders still tended to rank traits expressed in the commercial

breeding herd sector (e.g. feed efficiency, fertility, calving ease maternal productivity) of higher importance than end-product traits. Further, numerous seedstock breeders surveyed by Corrigan and Parnell (2005) questioned the accuracy and relevance of BreedObject-derived selection indexes and indicated frustration about the inadequacy of market signals to reward genetic improvement in end-product traits. Clearly, more effective "through-chain partnerships" are required to encourage seedstock breeders to place greater focus on genetic improvement in whole industry profitability.

Commercial breeders. Long-term partnerships between commercial breeders and their customers (i.e. finishers, feedlots and/or processors), ideally through mutually beneficial strategic alliances, are necessary to achieve effective transmission of market signals associated with the production of genetically improved livestock. On a global scale, the most effective and long-term alliances and partnerships involving commercial breeders have been "through-chain alliances" involving differentiated branded beef products (e.g. Certified Angus Beef; US Premium Beef; Certified Australian Angus Beef; Banksia Beef). In the future, implementation of more effective value-based marketing will be a key driver for achieving more direct reward for genetic improvement of end-product performance.

Growers, backgrounders, finishers and feedlots. Partnerships in these sectors are focused on obtaining consistent supply throughout the year of livestock that have the characteristics to meet the product specifications of the processors and the supply chain. Achievement of long-term commitment and loyalty from suppliers requires transparent pricing mechanisms and suitable rewards for superior performance. Partnerships with producers in the commercial breeding sector built on value-based payment systems linked to quality differentiation, and the provision of performance feedback information will be key drivers in the future that will ultimately influence breeding decisions and the use of genetics technology.

Processors, retailers and beef consumers. These sectors are far removed from genetic technology developers, commercialisers and seedstock breeders in the beef genetics value delivery chain. However, unless the value proposition of genetic improvement reaches this end of the chain then there is ultimately no net benefit from the application of genetic technology to improve end-product quality or consistency. Involvement of these sectors in "through-chain partnerships" built on a foundation of supply co-ordination, value-based marketing, differentiated end-products and performance feedback is necessary for generating demand for genetic improvement through the value chain.

BEEF GENETICS TECHNOLOGY ADOPTION ROADMAP

MLA has recently addressed the challenge of "efficiently and effectively streamlining the coordination of the beef genetics value chain" as part of their 5-year National Beef Genetics Strategic Plan (2007-2012) to increase the rate of genetic improvement in the national beef herd (R. Woolaston, pers. comm.). MLA's leadership in pursuing this initiative is appropriate as it is the national body representing the interests of the whole Australian beef industry. It is suggested that this element of the MLA Strategic Plan needs inputs and agreement from the various bodies and individuals representing each sector of the beef value delivery chain. The development of a "whole of industry" genetics technology adoption roadmap would provide a focus to identify and address the barriers to adoption, and to develop a clear set of strategies, responsibilities and actions to capture opportunities for future improvement. This roadmap would improve the beef industry's ability to apply new technology more cost effectively through enhanced collaborative arrangements and sharing of knowledge. It is suggested that the roadmap would need to emphasise the role of the design, establishment and maintenance of effective partnerships that facilitate the communication of the genetics value proposition and associated market signals across the beef value delivery chain.

Adoption

CONCLUSIONS

Considerable potential exists for enhancing the benefits from the application of genetics technology through the establishment of more effective partnerships among business and organisations involved in the beef genetics value delivery chain. The relative investment into R, D & E of "hard" genetics technology compared to the investment into building the necessary social and business infrastructure to transform genetics technology into profitable innovation needs to be re-assessed by the beef industry.

A genetics technology adoption roadmap is needed to provide focus for identifying and addressing the barriers to the adoption of genetics technology, and to develop a clear set of strategies, responsibilities and actions to capture opportunities for future improvement. The roadmap will need to consider the role of the design, establishment and maintenance of effective partnerships that facilitate the communication of the genetics value proposition and associated market signals across the value delivery chain.

REFERENCES

Abel, N., Ross, H., Herbert, A., Manning, M., Walker, P. and Wheeler, H. (1998) *Mental Models and Communication in Agriculture*, RIRDC Publication no. 98/140, Rural Industries Research and Development Corporation, Canberra, ACT.

Banks, R.G. (2005) *Aust. J. Exp. Agric.* **45:**1033.

Barwick S.A., Fuchs, W, Davis, G.P. and Hammond, K. (1992) *Proc. Aust. Assoc. Anim. Breed. Genet.* **10**:565.

Barwick, S.A.and Henzell, A.L. (2005) *Aust. J. Exper. Agric.* **45**:923.

Black, A.W. (2000) *Aust. J. Exp. Agric.* **40**:493.

Burrow, H.M. and Bindon, B.M. (2005) *Aust. J. Exper. Agric.* **45**:941.

Clark, R., Griffith, G., Madzivhandila, P., Nengovhelac, B.P., Parnell, P.F. and Timms, J. (2007) *Proc. 16th International Farm Management Congress (In Press)*. Cork, Ireland. 15th -20th July 2007.

Corrigan, L and Parnell, P.F. (2005) In: *Australian Beef – The Leader ! The Impact of Science on the Beef Industry*. Armidale, NSW 7-8 March 2006. p 81.

Freer, R.E., Nicol, D.C. and Upton, W.H. (2003) *A National Beef Genetics Extension Foresight Plan. A Report to MLA from the National Beef Genetics Extension Team.* Second Edition, March 2003.

Graser, H.U., Tier, B., Johnston, D.J. and Barwick, S.A. (2005) *Aust. J. Exper. Agric.* **45**:913.

Hammond, K. (2006) *Aust. J. Exp. Agric*. **46**:183.

Howard, J. (2006) *Changing Paradigms. Rethinking Innovation Policies, Practices and Programs. A Study of Innovation in Australian Businesses*. Report to the Business Council of Australia. January, 2006.

Lanning, M.J. (1998) *Delivering Profitable Value. A Revolutionary Framework to Accelerate Growth, Generate Wealth and Rediscover the Heart of Business*. Capstone Publishing Ltd., Oxford, UK.

MLA (2000) *BeefNet Alliance Handbook. Guidelines for forming and operating effective beef alliances.* Meat & Livestock Australia. Sept., 2000.

Ritchie, H. (2001) *Proc. 32nd Beef Improvement Federation Annual Research Symposium*. p145.

Rounthwaite, T. and Shell, I. (1995) *TQM Magazine* **7**:54.

Vanclay, F. (2004) *Aust. J. Exp. Agric.* **44**:213.

VCG (1997) *The Role of Alliances in the Australian Meat Industry.* A Report to the Meat Research Corporation. The Virtual Consulting Group. April, 1997.