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Opportunities for the Australian sheep industry

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Abstract

The focus on sheep production, as opposed to 'wool' and 'meat' as separate industries, provides stability of income as prices for the two products vary independently. The Sheep CRC initiative of the e-sheep technology platform provides a practical basis for individual animal management and the potential to improve both labour productivity and product quality. An analysis of prices for wool, meat and wheat indicate the importance of product quality in the sheep industry as an achievable means of improving profitability. Given the compatibility of sheep production with cropping and cattle production it is seen as important component of Australia's rural economy for many years to come. Future development of the sheep industry should focus on quality improvement for wool and sheep meat to distance these products from commodity markets. It is also essential to transform sheep management through genetic development and application of new technologies to significantly improve labour productivity.

Introduction

The Sheep CRC was the first organization in Australia to integrate research on wool and meat with a 'single sheep' focus and also took the lead in the transition from flock management to individual animal management. These two elements were seen as essential to improving whole flock productivity and profitability through precision management. It is clear that this vision for change is not one that can be fulfilled within the seven year time-frame of a single CRC. After five years of activity it is appropriate to review our progress, predict what we will deliver and assess whether another CRC is needed or warranted.

Future of the sheep industry in Australian agriculture

Investment in the sheep industry by the Commonwealth government, via a CRC, is assessed against opportunities in other agricultural industries and against other sectors such as, manufacturing, medicine, information and communication technology, mining and the environment. It is therefore relevant to examine the place of the sheep industry in agricultural systems and its importance in the Australian economy. Is it an industry that should gradually be phased out or is it here for the long haul as an integral part of the national economy and vital to rural Australia.

Use of the majority of Australia's broad acre agricultural land is divided between sheep, cattle and cropping. Over the last 15 years there has been a steady decline in the proportion of land used for sheep production relative to cropping and cattle production (Fig. 1) suggesting decreasing importance of sheep production to Australian agriculture and the Australian economy. What are the reasons behind this trend? Is it likely to continue? Will it respond to further investment in research and development?

For most of Australia's history sheep and wool production have played an extremely important role in the national economy and contributed to the financial vitality of many parts of rural Australia. Sheep production (valued at \$4.4 b in 2003-2004) integrates with cattle production (\$6.7 b) and fits very well with broad acre cropping operations (14.3 b) as sheep contribute to stubble and weed control and while part of the grain harvest is often set aside for supplementary feeding. The mixture of

sheep, cattle and cropping also provides greater whole-farm financial stability and together contribute nearly 80% of the total value of agricultural commodities (\$36.9 b). There is good complementarity between sheep and cattle production since over the last 60 years there has been little correlation between price fluctuation for beef and lamb ($R^2 = 0.19$) or beef and wool ($R^2 = 0.18$) (ABARE 2004) so that having the two production systems assists to maintain more consistent income in the face of variable commodity prices.

The sheep industry therefore remains a vital component of the Australian rural sector and it is likely to remain so. However it is important to understand the reasons for declining number of sheep producers and a decline in the resources allocated to sheep production by many mixed farming operations. The following three factors appear to be recurring themes when discussing the question.

- Sheep production is generally regarded as having more risks and ‘hassles’ than cattle production or cropping. Potential problems requiring year-round vigilance and monitoring include: internal parasites, fly strike, pregnancy toxaemia, lamb losses, foxes and feral dogs. Included in the ‘hassles’ of sheep production are pressures from animal welfare groups regarding mulesing and live export. There is also increasing pressure to use less chemical treatment in managing internal and external parasites thus making it even more difficult to reduce the risks.
- Labour requirement, particularly for activities such as shearing, crutching and lamb marking, requires recruitment and management of labour together with consideration of insurance, training, occupational health and safety issues. Added to high labour requirement is the increasing costs of labour, and the fact there has been a relatively slow increase in labour productivity for sheep management.
- The protracted fall in wool prices, although not different from other commodities, is seen by many as a significant negative factor for the sheep industry (Ewing and Flugge 2005). Strong demand and high price for sheep meat have resulted in expansion in several sectors of the sheep industry but there has still been a significant overall decline in the number of sheep and sheep producers.

The increasing dependence on off-farm income for many farming families interacts with the higher labour requirements, ‘hassles’ and ‘low prices’ associated with sheep production. Activities such as cattle production where timeliness of management intervention is not as critical as in sheep production or cropping where activities can be scheduled well in advance are more suitable options for many smaller scale producers.

Improving productivity and making sheep production easier – what has the Sheep CRC achieved?

Increased productivity and product quality appear to hold the key to accelerating development of the sheep industry. In this respect the most important achievement of the Sheep CRC has been to pioneer development of a platform for automated precision sheep management (e-sheep) that has the potential to transform both labour productivity and product quality. Of particular importance has been the CRC focus on integrated management for wool and meat, that is, a system that can cope with the complexity of managing all aspects of sheep production with less labour input and more attention to quality. Managing genetic improvement, parasite control, reproductive efficiency, stocking rate and nutrition, while at the same time focusing on wool and meat quality is extremely complex. Given this complexity and a labour input target of one person per 10,000 sheep it is difficult to see how any meaningful progress can be made without moving to a significant level of automation.

The e-sheep platform

Convergence of technologies such as the radio frequency identification (RFID), electronics (weighing, drafting systems), telecommunications (modem access to remote measurement/monitoring systems,

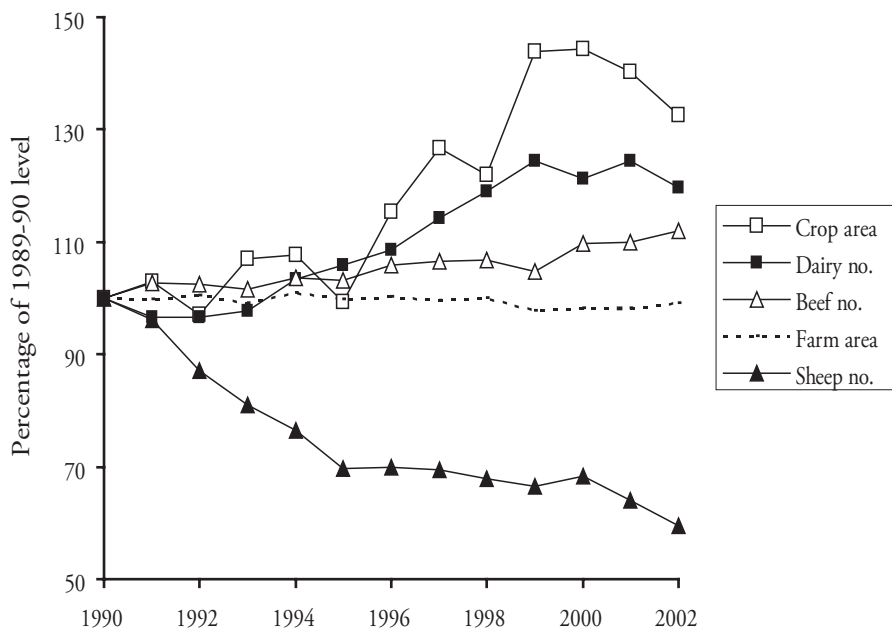


Fig. 1. Changes in Australian farm land use and livestock numbers since 1989-90. The data represents percentage values relative to the 1989-90 figures for crop or farm areas and livestock numbers (Australian Commodities 2002, ABARE)

internet capabilities (for real-time sharing of information) form the basis of the e-sheep platform that will enable transformation of sheep management. The CRC has already used these technologies to develop systems for automatic data collection and monitoring such as walk-through weighing and automatic drafting. These tools have been shown to increase labour productivity and have the potential to improve both land use and per head performance. The labour required for routine tasks such as weighing, recording animal identification and drafting can already be reduced by around 40% and it is likely that there will be further gains in productivity as the automated technology is adapted for managing animal health, supplementary feeding and grazing systems.

The CRC has also played a major role in developing decision support systems that help to make sense of the complexity of multiple measurements and many thousands of animal records in order to make effective decisions regarding selection and management of animals. Automation of data collection and drafting also provides a mechanism to capture the benefits of research that have been difficult to implement using manual techniques and flock-level decisions.

All indications are that the cost of the e-sheep enabling technologies such as RFID, weighing scales and drafting equipment will continue to fall and the reliability and that the power and versatility of hardware and software will continue to improve. These trends provide confidence that there is scope for continuous improvement of productivity in the sheep industry for many years to come.

Better management to improve productivity and product quality

Sheep CRC analysis of national benchmarking data bases has identified management practices that have consistently produced increased productivity of over 5% per annum using conventional technologies. Extension of this information to a broader cross-section of producers is likely to have an immediate impact on sheep industry productivity and further gains are expected in conjunction with e-sheep technology. The CRC has also made significant progress in using the Grassgro program to analyse the timing of management events such as lambing and shearing times as well as stocking

rate decisions under different regional climatic conditions. These decisions are likely to improve productivity of land and livestock as well as accounting for better use of labour.

Genetic gain

Significant gains in labour and livestock productivity will come from genetic gain through selecting sheep that are both more productive and require less care and maintenance. A recent workshop involving MLA, AWI and the Sheep CRC examined constraints to sheep production and genetic selection when pursuing a number of parallel goals such as simultaneous meat and wool production. It was most encouraging that no impediments were identified that might limit genetic gain and no major negative correlations to prevent simultaneous selection. The CRC has completed a major analysis of genetic parameters including estimates of heritability and correlations between traits that will assist Sheep Genetics Australia (SGA) to provide accurate assessment of EBV. In developing tools for individual animal management the Sheep CRC has also pioneered ways of collecting individual animal data that allows low-cost assignment of pedigree information, measurement of new production traits such as lamb growth rates and simultaneous selection on wool and meat production phenotypes. More access to individual animal management is likely to accelerate genetic gain and make a further contribution to increased productivity. The combination of e-sheep technologies and SGA information on ram selection are likely to produce impressive gains in productivity. In addition the paper by Atkins et al. (2006) gives details of how genetic and phenotypic data can be combined to produce single generation and longer-term gains in flock productivity.

Better parasite management

One of the major risks and labour costs of sheep production is control of internal parasites. The Sheep CRC has made good progress in developing new diagnostic tests that will reduce the cost of parasite control. Accurate race-side or field measurement of parasite burden allows timely treatment of animals in need rather than blanket programs based on preset drenching times. Targeted parasite treatment also reduces the risk of developing drench resistance. Cheaper and quicker alternatives to egg counting are expected to contribute significantly to improved productivity.

Making sheep production easier

In addition to reducing labour requirements while increasing sophistication of sheep management it is likely that the e-sheep platform will play an important role in animal welfare and sustainable resource utilization. The walk-through weighing system provides a way to monitor mobs and individual animals that will help early detection of health and nutrition problems likely to improve welfare and reduce mortalities. Similarly early information that animals are no longer gaining weight on a pasture will reduce over-grazing. The early warning and monitoring will make a major contribution to the ease of running sheep.

Education and training for a modern sheep industry

A productive and innovative sheep industry relies on a well-educated and well-trained work force and the Sheep CRC has made a major contribution to re-invigorating this aspect of the industry. Investment in re-writing undergraduate lecture material has flowed on to the vocational sector and a range of scholarships have helped to attract a number of very talented young people to undergraduate and postgraduate study in the sheep industry. The success of this program has been greatly enhanced through cooperation with AWI, MLA and the AWTA through the Wool Education Trust.

Precision sheep production

While the e-sheep platform establishes the basis of a new generation of sheep management capable of accelerating productivity gains in the sheep industry and accommodating the complexity of integrated sheep management there is much that still remains to be done. Working with MLA and AWI, the

Sheep CRC has established proof-of-concept for certain applications of the e-sheep systems, and is making progress in defining proof-of-benefit. The major task ahead is to develop the technologies to the point that they are considered by all producers and industry groups as common tools in mainstream commercial production systems.

Why do we need another Sheep CRC?

It is clear that the sheep industry continues to make a major contribution to the rural economy and is an important component of broad acre agriculture in Australia. The major issues facing the industry are labour productivity and a protracted decline in the price of wool. By the end of the Sheep CRC we are confident that we will have laid the foundation for a new approach to sheep production based on precision management for both wool and meat with greater focus on the individual animal management. The e-sheep platform provides the technology and know-how that will contribute to improve labour productivity and the focus on sheep producing quality meat and wool reduces the impact of lower wool prices.

In reviewing opportunities and needs for a new CRC, representatives of a wide cross-section of the sheep industry agreed that the focus should be on transforming the sheep; the products (wool and meat); and management. Scope for transformation of these three key aspects of the sheep industry resides in the application of new genetic technologies to the sheep industry and applying precision production and processing techniques to improve efficiency and enhance product quality. These transformational themes reflect the optimism in the sheep industry for change and the confidence that there are now the tools and the technical expertise to support rapid development.

The sheep industry has access to an excellent and diverse technical support infrastructure through departments of agriculture, Universities, CSIRO and private sector advisors. Coordinating the efforts of these various groups is now widely recognised as a most effective way to achieve meaningful research outcomes and adoption of new technology. There is, however, a cost or investment to achieving this benefit that many individual organizations are reluctant to make. The role of the Commonwealth in providing resources to achieve the synergy of cooperation between researchers and with industry is a good fit and a good investment. Vere et al. (2005) estimated that the Sheep CRC will produce a benefit for the Australian economy equal to over five times the Commonwealth investment. Further analysis of the benefit of the CRC program

Value in changing product quality

Unlike many estimates of productivity, improved productivity for both wool and meat should include improvement in product quality particularly when such improvements are achieved without increased inputs. Fig. 2 reflects the importance of quality and the effect of improved quality on product price. While it is change in profit that influences most farm business decisions, it is only productivity, not prices, that can be systematically improved through innovation and management.

As indicated earlier the outlook for sheep meat and wool is considered to be better than for beef and grains. This is a bold statement and warrants discussion. While wool and sheep meat have been handled as textile and food commodities for many years there is conclusive evidence that they can be transformed by breeding, management and processing so that they reach niche markets where they are valued as high-value specialty products rather than commodities. Wool and sheep meat make up very small proportions of the textile and meat markets and small changes in their demand can produce big price changes. As previously discussed the diagram in Figure 2 includes quality with quantity as factors contributing to productivity and revenue. Is this justified?

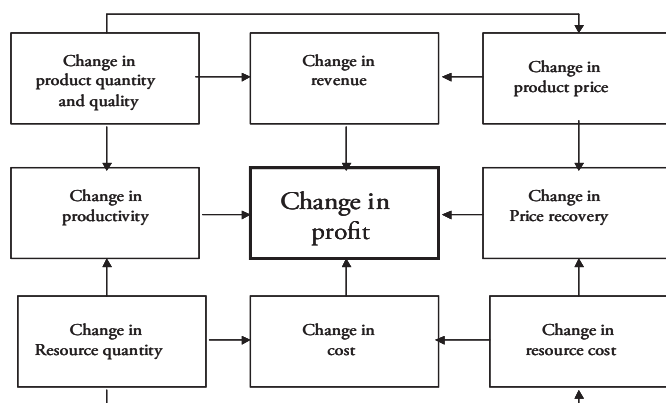


Fig. 2. Summary of the relationship between productivity, price recovery and profit (adapted by Rowe and Atkins 2004 from Tangen, 2002).

Improvement of product quality to create new market opportunities involves considerable effort in breeding and management without necessarily increasing the amount of product per head, per unit of labour or per hectare of land. The question is therefore, to what extent finer fibre diameter and larger, leaner lambs allow wool and sheep meat to compete in elite textile and food markets and can improved quality achieve a sustained improvement in value? Many wool producers who have gone to considerable effort to reduce fibre diameter have been disillusioned to find that having made considerable progress towards this goal, the anticipated price premiums for finer wools have been largely eroded—apparently by over-supply. On the other hand lamb producers meeting specification for larger and leaner product have been well rewarded. Good communication and clear signals through the supply chain are critical in defining product quality.

Over the last 50 years there has been a relentless decline in prices of all Australian crop and livestock products. At the same time costs of inputs have steadily risen and the declining terms of trade have balanced where possible by increased productivity and/or reduced profitability. Fig. 3 (a) shows the price trends adjusted for CPI to 2005 dollars for wheat, beef, wool and sheep meat. The average decline over the last 50 years in the real price of wheat and wool has been around 4% per annum. Over the same period the decline in the price of lamb and mutton has been around 1.8% and for beef the rate of decline has been around 1.5% per annum.

In the case of beef and crop production, Australia is a relatively minor producer in large global commodity markets in which prices are declining consistently and show no sign of turning around. Although Australia has successfully positioned its beef production in an elite market in terms of food safety, product authenticity and quality, it is likely that major South American producers such as Brazil and Argentina will, in time, be able to compete on an equal basis with Australia. It is also likely that once the US and Europe overcome present issues with BSE and implement systems for livestock tracking that match or exceed Australian standards, these countries will enjoy equal access to markets currently dominated by Australia. In cereal production, Australia competes with a number of countries and prices are often artificially determined through various forms of subsidy that keep prices low and create further risk and uncertainty. In the long term Australia is likely to continue to compete with the rest of the world in low margin, price competitive commodity markets for crop and beef production.

Wool

Real prices for wool have declined at a rate similar to wheat (around 4% per annum) (Fig. 3 c) as it competes with synthetic fibres and cotton in global commodity markets for textiles. There have been

two short periods of very high wool prices since the 1950s (1970/71 and 1985/86) but there is no indication of any change to the long-term decline in real price of wool even although average fibre diameter has decreased significantly over the last 20 years. Unfortunately the diameter of cotton and synthetics has also decreased during this time and wool is still competing with these fibres in similar textile markets. Therefore without a change in the way that wool is used and marketed it is unlikely that there will be a sustained increase in price.

It is important that the properties unique to wool are exploited in high-value markets that do not expose it to competition from other fibres and textiles. Next-to-skin woollen garments appear to fit this category, and there is much that can be done to select animals capable of producing wool suitable for this new market. The AWI initiative, Merino Super Soft (AWI, 2004), recognizes this opportunity and technologies developed by the Sheep CRC will contribute to precision sheep management and segmentation of the flock that will be required for production of wool that meets tight specifications for high value new niche markets.

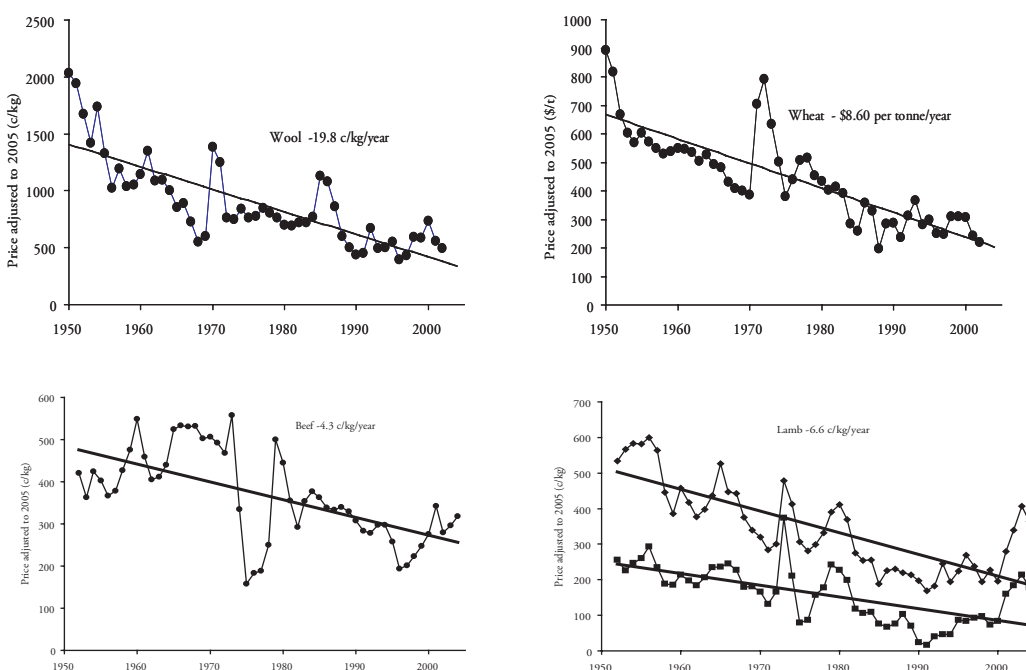


Fig. 3. Declining prices for prices of wheat, beef, wool, lamb and mutton since 1950. Prices have been adjusted to 2005 dollars based on consumer price index. ABARE 2004.

Lamb and mutton

Although at first glance it may appear that prices for lamb and mutton have also declined consistently from 1950 to 2004, it is clear that this is true only until 1990 (see Fig.4). During the 14 year period from 1990 to 2004 prices for mutton and lamb have been steadily increasing at over 12 c/kg/year. The turnaround in prices of lamb and mutton is a very significant achievement. Reasons for the increasing prices of lamb and mutton appear to be different for the two products.

Changes in the lamb industry started in the 1990s when a thorough analysis identified what consumers wanted – leaner cuts, larger carcasses and consistent product. Through long term strategic planning, largely led by Ian Johnsson, Rob Banks and Gerald Martin, the lamb industry set about meeting these requirements through sophisticated genetic selection, improved nutrition, best practice processing and innovative product preparation. The consistency of lamb eating quality has improved over the last 10 years (see Pethick et al. this conference). Lamb is now widely regarded as a high-quality

gourmet experience and customers are prepared to pay accordingly. Demand for this consistently high-quality product appears to be increasing even as prices increase. In this high-quality market segment, removed from the commodity trade, it is essential that lamb meat quality keeps improving in terms of all consumer requirements eating quality, healthy food and product authenticity.

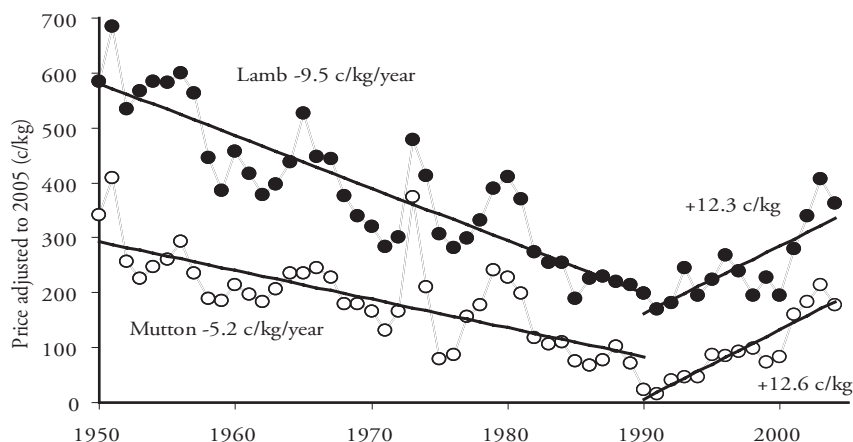


Fig. 4. Changes in prices for lamb and mutton (adjusted for CPI to 2005 dollars) for the periods 1950 to 1990 and from 1990 to 2004. The lines show linear regression best fit for the different periods and products. ABARE 2004.

Improvement in mutton prices started soon after Roger Fletcher established a state of the art abattoir sheep abattoir in 1987 that was able to prepare and market sheep products to defined markets throughout the world adding value to every component of the carcass. The change from exporting whole frozen carcasses to the current situation where carcass and co-products are broken down and shipped as specialist products for each particular market, marked the transition from the commodity meat market to a series of higher value niche markets. The process has required meticulous definition of market requirements and quality assurance in supplying what each customer demands.

World exports of lamb and mutton are principally from Australia and New Zealand. On the other hand demand for lamb and mutton is spread across many different markets. Therefore unlike cereals, beef and other agricultural commodities, trade in sheep products is subject to fewer risks of fluctuating world production, trade/quarantine barriers and subsidies that have a major influence on prices of grain and beef. Research and development can ensure that both wool and sheep meat are high-quality, high-margin, products for low volume 'niche' markets. There is very little chance that Australia can achieve this status for other broad acre products such as grain and beef and as such sheep production has a very important role as a long term alternative to cropping or beef cattle production. With the long term prospect of highly valued products in the form of sheep meat and wool it is essential that sheep management is made easier, cheaper and more enjoyable so that it regains its logical place beside cattle and cropping in Australia's broad acre agriculture.

Linking quality with precision management

Quality needs to be objectively measured, managed and communicated throughout the supply chain so that the producer can respond to, and be rewarded for, meeting specifications of value to processors, manufacturers and consumers. Automated data collection and real-time sharing of information between producer and the supply chain will help to provide clear signals for quality attributes that can be influenced by genetic selection and management decisions.

From the experience with mutton and lamb it appears that it is well within our grasp to significantly improve profitability of the sheep industry by focusing on and delivering the quality required by consumers. With tools for individual animal management and improved rate of genetic gain we can target transformation of the products as well as the production systems in order to increase profitability through better quality and productivity.

Conclusions

The current Sheep CRC has developed a mechanism for implementing changes to the sheep industry through the e-sheep platform and has demonstrated a number of examples where the new approach will improve labour productivity and product quality. The final 18 months for the Sheep CRC will concentrate on delivering the outcomes and ensuring that the basic tools are well understood and used by industry. They will be important building blocks for developing a new CRC for the Australian sheep industry. Opportunities for the new CRC application are based on transformation of wool and sheep meat, to ensure that they are well separated from the commodity markets, and transformation of the sheep and its management to improve ease of management and labour productivity. These ambitious goals are within the grasp of the modern sheep industry and ideal targets for a new Sheep CRC.

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