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PART 1. INTRODUCTION

Paper 1. The Cooperative Research Centre for Beef Genetic Technologies and the "Accelerated Adoption through Sustainable Beef Profit Partnerships" Project

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Abstract. Technology adoption in the Australian beef industry has been low and slow compared to that in the intensive livestock and cropping industries. Adoption needs to be higher and faster to fully capture the benefits from new beef genetic and other technologies. The principles of rapid improvement and innovation, and accelerated adoption, provide an innovative solution to this problem. In the Beef CRC, Sustainable Beef Profit Partnership (BPP) teams meet regularly to assess their current performance, set targets for future productivity increases, and use a profitability framework to assess the potential impact of new technology in their beef businesses. Their thinking, decisions and actions are based on the principles and process of Continuous Improvement and Innovation (CI&I). Capacity building and partnership outcomes are also assessed for improvements and innovations. The BPP teams are supported with appropriate tools, technologies, resources and expertise. The information generated will be used to underpin the achievement of Beef CRC commercialisation outputs and profitability outcomes.

Keywords: Accelerated adoption; continuous improvement and innovation; rapid improvement and innovation; beef industry; profit; productivity; capacity; partnership; efficiency; effectiveness.

Background

The economic benefits from the development of new agricultural technologies depend, among other things, on the speed with which the technology is developed, and on the speed and extent to which the technology is adopted by end users in the target market¹. Increasing attention is now being focussed on enhancing these components of the RD&E process. In particular, in recent rounds of applications for new Cooperative Research Centre (CRC) funding, plans to commercialise scientific outputs into industry outcomes have been amongst the major assessment criteria.

The potential benefits flowing from renewed funding for the CRC for Beef Genetics Technologies (the Beef CRC) were estimated recently based on assumptions about improved productivity gains, improved consumer willingness-to-pay, reduced risk of failed R&D and enhanced adoption (Griffith,

Parnell and McKiernan 2006; Griffith 2008)². The improved productivity and reduced risk

outcomes fall into the following broad groups, each of which has an associated economic outcome:

- More cattle meeting market specifications for quality (more precise prediction of performance) → More Profit
- More efficient breeding cows and steers for grass and grain finishing → Reduced Costs
- Fewer sick cattle, welfare considerations and treatments → Reduced Costs, Greater Market Access
- Better turn-off rates → More Profit (or with reduced breeding herds ≡ Reduced Costs)
- Beef industry better equipped to meet the (changed) global beef landscape by 2012.

However, better animal production science is not sufficient to generate the total expected benefit of around \$179 million a year by 2012 if existing extension methods are retained. Although there are few formal measures,

¹ The terminology used is an important feature of this project. A Glossary provided in Paper 15 defines what we mean by specific words and phrases.

² A consolidated reference list is provided separately in Paper 14.

technology adoption in the Australian beef industry is thought to be slow and low compared to that in the intensive livestock and cropping industries, one of the main reasons for the relatively low measured productivity growth rates (see also ABARE 2008, Mullen 2007).

In the Beef CRC renewal proposal (Griffith 2008), a formal "with-CRC" vs "without-CRC" scenario approach was developed, implemented and evaluated. In the "with-CRC" case, higher investment levels due to the renewal of the Commonwealth Government's commitment to the CRC were assumed to result in higher rates of improvement in meat quality, higher rates of productivity improvement, higher probabilities of R&D success, and faster and higher rates of adoption relative to the "without-CRC" case. In particular, in the "with-CRC" case, a 5-year R&D lag, a 2-year adoption lag and a 35 per cent adoption ceiling were assumed, compared to a 7-year R&D lag, a 5-year adoption lag and a 25 per cent adoption ceiling for the "without" case.

The results of simulation experiments with the economic model suggested that about one-third of the estimated benefits from the renewed Beef CRC could be attributed to enhancing the adoption process. That is, if the R&D and adoption profiles could be aligned with those assumed in the "with-CRC" scenario (a 5-year R&D lag, a 2-year adoption lag and a 35 per cent adoption ceiling), net benefits to the industry would improve by about \$300 million in net present value terms (see Figure 1.1) (Griffith and Vere 2006). Of the total expected benefit of about \$179 million annually by 2012, some \$54 million annually is expected to accrue from increasing the level and rate of adoption of new technologies.

Following acceptance of the new Beef CRC bid, the estimated benefits from the business case proposal have become target outcomes for the Beef CRC in the formal contractual agreement with the Commonwealth Government. Given the current situation with the level and rate of adoption in the beef industry, the focus by the Commonwealth on real industry outcomes and the value of the possible benefits, the new Beef CRC has made a strong commitment to accelerate the rate and raise the level of adoption of beef industry technologies. The challenge for the Beef CRC team managing this commitment has been to design and implement an accelerated adoption project that has the best chance of meeting these targets.

Industry Context and Overall Approach

The industry context is that current beef extension activity is not providing a sufficient catalyst for increasing the speed or level of adoption of new technologies. "Business-as-usual" will not assist in meeting the Beef CRC's profit target. This view can be confirmed by examining recent productivity growth rates calculated by the Australian Bureau of Agricultural and Resource Economics (ABARE). According to ABARE (2004), annual productivity growth across the whole Australian beef industry increased from around 1.4 per cent during the 1980s to 2.1 per cent during the 1990s. While this improvement is encouraging, it is still well below productivity growth rates in the cropping industries. Further, there are considerable regional and property size disparities. Beef properties in northern Australia achieved very high productivity growth (around 3.3 per cent), but no growth occurred in southern Australia (-0.5 per cent). Financial performance has thus improved in the north but deteriorated in the south. Also, productivity growth has been closely related to size, with the largest third of beef properties enjoying strong productivity growth, but the smaller two thirds having little or no improvement. Most of the large beef properties are located in northern Australia.

Measured rates of productivity improvement at a point in time are based on three factors – the "quality" of the improvements and innovations coming out of the science pipeline (the potential rate of productivity improvement), the average level of adoption of those potential improvements (the adoption level), and the length of time taken from when the improvements and innovations become available until the average level of adoption is reached (the adoption lag). With adoption levels widely reported as around 25 per cent, and adoption lags in the order of 5 years and longer, this means that:

- Either, just 1 in 4 science outputs are relevant and adoptable; or
- Just 1 in 4 cattle farmers find these products to be relevant and adoptable;
- Many cattle farmers who find these products to be relevant and adoptable wait and see before they actually adopt; and
- Therefore there is a huge waste in potential economic benefits not being realised due to low and slow adoption levels.

The strong implication is that the beef RD&E system in the south, and outside of the corporate sector in the north, has been largely ineffective, and that existing extension and commercialisation approaches (even if done well) are generating poor returns. A new way of doing things is required. The "Accelerated Adoption through Sustainable Beef Profit Partnerships" project is believed to be that new approach. Note that the project has been implemented in addition to traditional awareness and commercialisation approaches.

The project is based on implementing a Sustainable Improvement and Innovation (SI&I) Model. This model is described in detail in Paper 4, while the underpinning science behind the model and the key process used, Continuous Improvement and Innovation (CI&I) (Timms and Clark 2007, see also Lindberg and Berger 1997), is described in Papers 2 and 3 respectively. Each partnership is encouraged to adopt the steps of the CI&I process (Figure 1.2) to achieve improvements, innovations and adoption, and so assist in meeting the project focus and outcomes.

It is not simply the availability of new technologies that fuels economic growth and sustained productivity, but more the wise adoption, adaptation and application of those technologies (Queensland Innovation Council 2001). Thus, the project leadership team views the problem as one of improvement and innovation, rather than adoption. "Incremental" or "Continuous" innovation refers to any improvement made to existing products or processes (Innovation Summit Working Groups 1999). It takes place within existing infrastructures and builds on existing knowledge in existing markets without challenging underlying strategies or assumptions. On the other hand, "Radical" or "Discontinuous" innovation involves new ideas, developing or adapting new technology, or new ways of doing business (Innovation Summit Working Groups 1999). Such innovation depends on fundamentally different new knowledge in one or more dimensions of a product or service compared with what has come before, offering significantly different performance attributes (Miller and Morris 1999). Innovation may have nothing to do with the adoption of a new technology.

Compared to existing awareness activities and technology pipeline approaches, the key difference in this view of the world is a strong commitment to:

- having a clear focus on accelerated improvement, innovation and adoption projects instead of on general awareness of technology activities;
- designing and managing the project based on scientific theories and evidence;
- understanding the importance and empowering nature of the needs, motivators and drivers for improvement and innovation;
- building the capacity to understand, implement and sustain such an approach;
- working within a partnership and network of partnerships framework; and
- providing the tools that allow partners to measure where they are now and to monitor how their business practices, processes and systems have changed over time.

Two concepts embedded in this list of differences that contribute directly to achieving "accelerated" improvement, innovation and adoption are *rapid improvement and innovation*, and *rate and scale of impact*. These concepts can be jointly represented in Figure 1.3.

If the line labelled "growth" measures aggregate industry returns from a R&D project over time, then at any point in time those returns can be measured as the number of improvements or innovations made during that time, multiplied by the average financial impact of those improvements or innovations. If the CI&I process is working effectively, the returns from that particular point in time are locked in, and new opportunities are explored for further improvements or innovations (either existing partners making further improvements or new partners coming into the process). That is the concept of rate and scale.

The other part of the diagram is the placement of the "growth" line towards the left or the right. If the project is slow to deliver an outcome, then there will be a period of some years where few or no improvements will be made and/or where little or no impact will be evident. Aggregate industry returns will be slow to begin and slow to accumulate. Low year by year growth of profit is generated by a low number of improvements made per year, a low impact of each improvement, and by not achieving rapid change. In this case, the growth line will tend towards the bottom right of the diagram (the bottom panel of the Figure). If however the project is designed to deliver an outcome quickly, then there will be no lag or only a short lag before improvements will be made and impacts will

be evident. Aggregate industry returns will be quick to begin and quick to accumulate. High year by year growth of profit is generated by a high number of improvements made per year, a high impact of each improvement, and by the rapid achievement of change. In this case, the growth line will tend towards the upper part of the diagram (the top panel of the Figure).

The CI&I approach has been widely used to good effect in other sectors of the economy, especially in manufacturing (Bessant et al. 1994; Chapman and Hyland 1997; Hyland et al. 2000; Robinson 1991) and in health (Ovretveit 2005). However, the approach has not been widely applied in the agricultural sector, especially in the developed world.

One recent example is the Beef Profit Partnerships (BPP) project in South Africa (Nengovhela et al. 2007; Madzivhandila et al. 2008). This project was part funded by the Australian Centre for International Agricultural Research to achieve sustained improvement in profit per beef enterprise, per year, in a growing number of enterprises, communities and regions, in two provinces in northern and north western South Africa. Fifteen farmer teams commenced in the project in 2001 and 28 farmer teams were involved by 2006. A number of beef price and productivity key performance indicators (KPIs) were set and routinely assessed and recorded within each team. A subset of farmer teams also routinely calculated and recorded gross margins for their beef enterprises.

Based on the recorded data, it is estimated that the BPP project increased revenue to the emerging farmers involved in the teams by more than 1.95 million Rand (R) over the period 2001-2006 (Figure 1.4). The average was over 16,000 R per farmer team per year. It is estimated that the BPP project increased profits to the subset of farmer teams that measured gross margins by more than 236,000 R over the period 2002-2006. The average was almost 7,500 R per selected farmer team per year. If this same average improvement could have been achieved by all the farmer teams involved in the BPP project, the estimated improvement in gross margin across all of the teams would sum to almost 800,000 R over the period 2002-2006. Thus, about 40 per cent of the additional revenue estimated to be attributable to the BPP project would be expected to be retained as additional profit to the participating farmers. Apart from the aggregate benefits, the other aspect of the project evident from Figure 1.4 is the

acceleration of benefits over a short period of time. Given this evidence, and evidence from similar projects in other agricultural and non-agricultural settings, this general approach was chosen for the Beef CRC.

Focus, Outcomes and System Map of the BPP Project

The formal name of the Beef CRC project is "Accelerated Adoption through Sustainable Beef Profit Partnerships", but it is usually shortened to the Beef Profit Partnerships or BPP project. It was designed so that the Beef CRC would work in partnerships with individual beef businesses, enterprises, value chains and the broader Australian beef industry to accelerate improvements, innovations and adoption and assist in meeting the overall Beef CRC target outcome of \$179 million extra profit per year by 2012.

A large number of BPP partnerships are being set up across the various beef production environments in Australia and New Zealand (see Paper 12). The members of the partnerships are encouraged to follow the project design described in subsequent papers and to measure and report their successes and failures. Each partnership has access to a trained CI&I facilitator and CI&I resources and tools, and specialist economic and other technical expertise and support as required.

The BPP project has specified the following shorter-term focus, which all partnerships are encouraged to adopt:

- To achieve an additional 5 per cent improvement in annual business profit among Beef Profit Partners within two years.

Following on from this overall focus, the BPP project has specified the following target outcomes:

- Rapid and measurable improvements in productivity, profit and growth;
- Supportive network of rewarding partnerships, contributing to accelerated industry growth; and
- Partners equipped to achieve sustainable improvement and innovation.

In addition to differences in the overall approach noted above, but flowing from them, several aspects of the implementation of this project are noteworthy.

First, to assist in implementing efficient and effective mechanisms that will achieve the target outcomes in the context of the CI&I

process, the BPP project has developed a system model to manage the project as a dynamic system for achieving the BPP target outcomes on regional, state and national scales. This system model and its key elements are depicted in Figure 1.5. It is described and explained in Paper 4.

Second, as part of implementing this system approach, the BPP project has designed six key integrated strategies to ensure BPP project target outcomes are achieved in partnership (Figure 1.6):

- Partnership and network support – To ensure effective partnerships, networks and social architecture, and to achieve momentum and institutionalisation of the CI&I process during and after the project;
- Capacity, capability and competency – To equip all BPP partners, teams and networkers with the knowledge, skills, resources and support to achieve and sustain beef business and industry improvement and innovation for impact on profit, productivity and growth year by year, and to fulfil their functions and roles in the BPP project;
- Communication, information and marketing – To ensure all partners have a shared vision of the project (system, focus, methods etc), and that the partnership network and industry are adequately informed of the project achievements, and share and promote improvements and innovations;
- Measuring, monitoring and evaluation – To ensure partners and industry are able to demonstrate achievements and obtain the feedback and support necessary to contribute to achieving further improvements and innovations;
- Research and development – To improve, discover and create more effective and efficient mechanisms (theory, models, methods, tools) in order to achieve accelerated improvement and innovation; and
- Project system improvement and innovation – To ensure regular and frequent improvement and innovation of the design, leadership and performance of the project system and its component elements, and to manage the interaction between the project system and the broader meta-system.

These strategies are described and explained in Papers 5-10 inclusive. The reporting and support framework that is associated with the Measuring, Monitoring and Evaluation Strategy is described in Paper 11.

Third, there is an explicit emphasis on *rapid* improvement and innovation. That is, beef business and value chain partners should choose focuses for action that have a range of lengths of run (the length of time necessary to make and observe changes) so that some positive results become evident in the short term as well as in the medium and longer terms. Associated with this emphasis is advocacy of frequent and regular reporting and feedback sessions such that the momentum for change in the short term is reinforced and supported.

Another noteworthy aspect of the BPP project that is different from most other extension projects is an explicit recognition of the concept of *rate and scale* of improvements and innovations. That is, the aggregate economic value of new improvements, innovations and adoptions is derived from the benefit arising from each individual change, multiplied by the total number of changes (either number of businesses making changes or the number of changes made in each business). Both the concepts of rapid improvement and innovation, and rate and scale of improvements and innovations, are described in more detail in Paper 3.

A final noteworthy aspect of the BPP project design is an explicit commitment to undertake ongoing R&D of both project methodology and project operations. R&D of specific project methods and processes (such as those listed for example in Table 3.1), also called R&D *in* the system, is covered in the Research and Development Strategy (Paper 8). R&D of the whole project system, also called R&D *on and for* the system, is covered in the System Improvement and Innovation Strategy (Paper 5).

Other descriptions of the design and implementation of the BPP project for different audiences are given in Clark et al. (2007) and Griffith et al. (2007).

Conclusions and Expectations

The newly refunded CRC for Beef Genetic Technologies has the ambitious target of increasing the level of adoption of new beef industry technologies from 25 to 35 per cent, and of decreasing the R&D and adoption lag by five years. These targets are part of the overall focus of the Beef CRC on generating \$179 million in extra profit annually by 2012. Current beef extension activity is not providing a sufficient catalyst for increasing the speed or level of adoption of new technologies, so a new approach is required. In this paper, a very brief background to and overview of the Beef CRC project

"Accelerated Adoption through Sustainable Beef Profit Partnerships" has been provided. It is believed that this project offers the required new approach.

applications or adaptations of this model in other industries and regions.

In subsequent papers in this special edition, the main elements of the project and how it is organised and managed are described. Finally, the opportunities such a project presents to beef businesses and value chains to improve their economic performance are discussed, the achievements to date are reported, and some speculation is canvassed about how the BPP project will help achieve Beef CRC commercialisation outputs and profitability outcomes. Note at this stage that the material presented here represents the views of the project leadership team as of late June 2008 – the SI&I model and the way it is implemented in this project is being continually improved as more becomes known about what is working well and what is not.

Figure 1.2 above shows the eight major steps of the CI&I model that we have asked beef businesses and value chains to use in order to make improvements and innovations in their businesses. As outlined in following papers, we use exactly the same process to make improvements and innovations to project design and management. But we can also use exactly the same process to report our project in this special edition. Thus, Paper 1 is the Focus, Papers 2-4 are the Situation Analysis, Papers 5-11 are the Impact Analysis, Action Design and Action Taking, Paper 12 is the Assessment and Evaluation, and Paper 13 is the Creation and Synthesis.

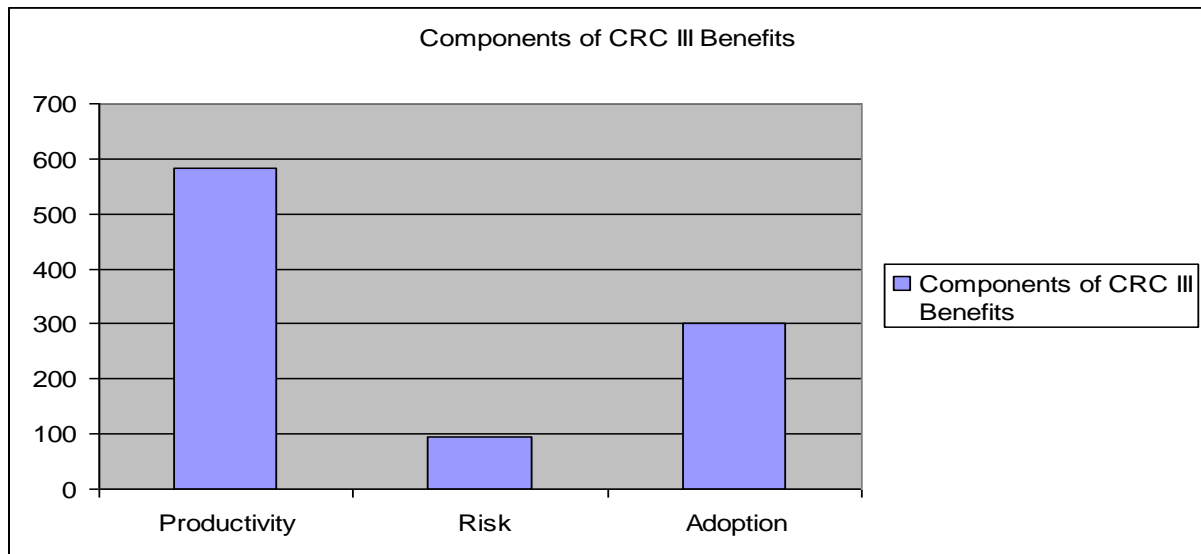
Many BPP groups have started already, benchmarking their current profitability and productivity variables and discussing and selecting group focuses of interest and individual focuses for action. Our expectation is that more groups will follow suit and that over the next year or so we will have real evidence of progress towards meeting our project targets. We are committed to reporting this evidence in future papers in this and other journals.

Ultimately, we expect to be able to develop and present diagrams like Figure 1.4 above that demonstrate the accumulation of economic benefits due to the Sustainable Beef Profit Partnerships project and the value of this approach encouraging the adoption of new technologies in the Australian agricultural sector.

We invite feedback from interested readers, and offer our assistance and support for

Appendix

Figure 1.1: Components of the total estimated benefits from the with-CRC scenario (\$m net present value)



Source: Griffith and Vere (2006)

Figure 1.2: The eight steps of the Continuous Improvement & Innovation process designed to achieve improvements and innovations for impact on profit, now and in the future

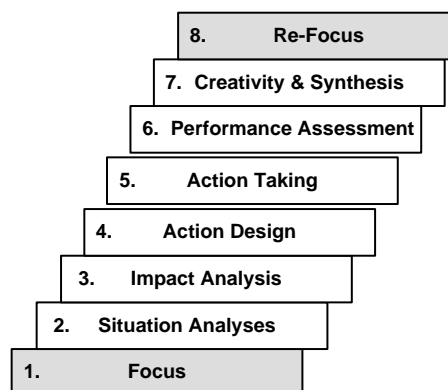


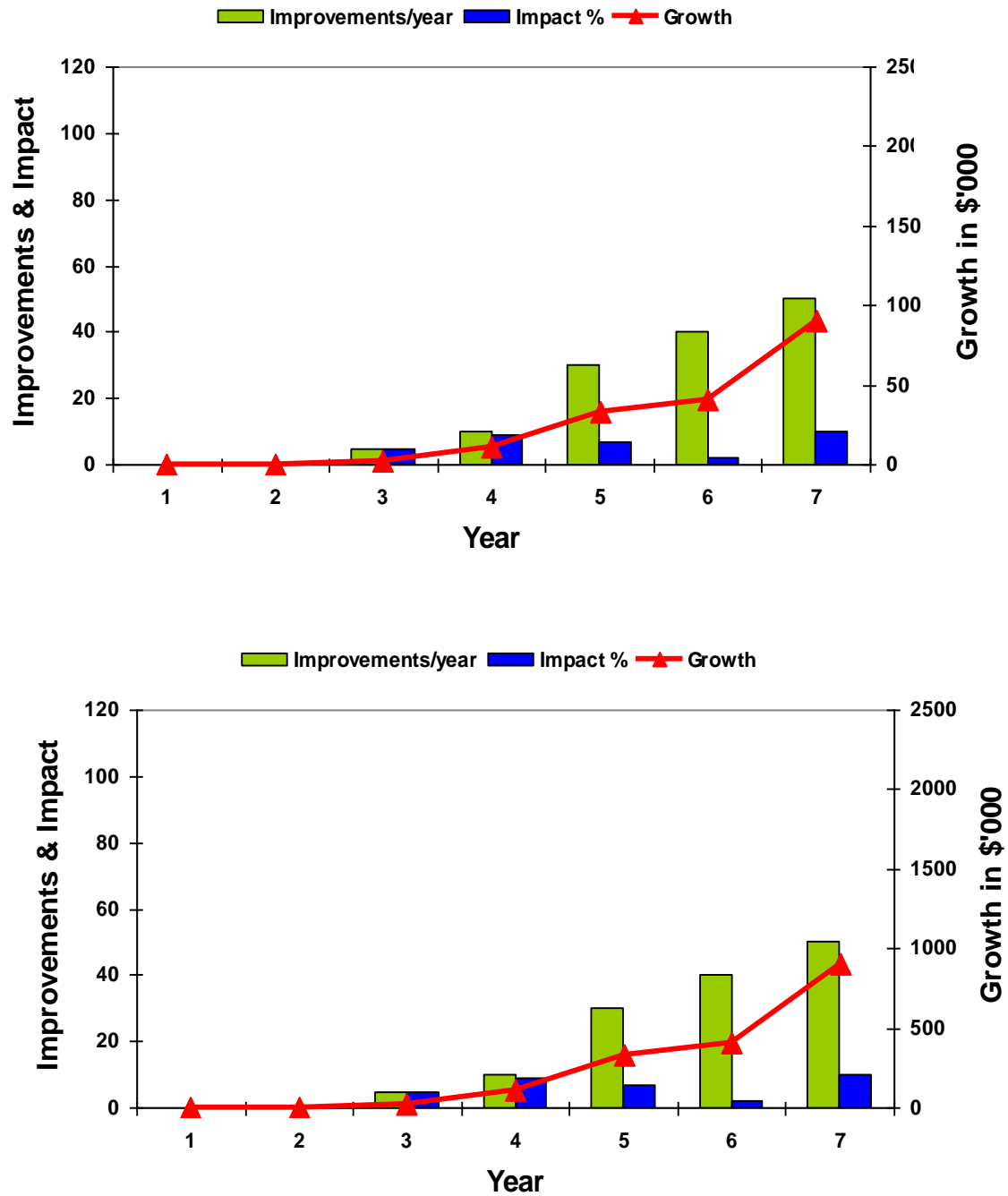
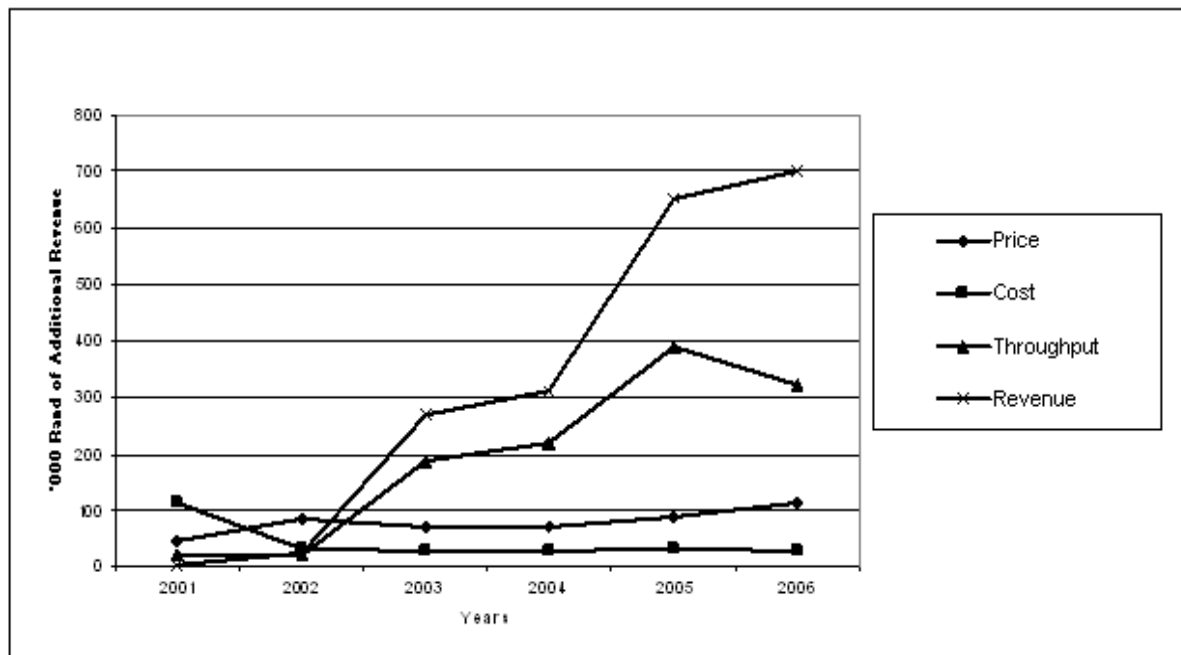
Figure 1.3: Rapid improvement and innovation, and rate and scale of impact

Figure 1.4: Accumulated additional revenue from the South African BPP project

Source: Madzivhandila *et al.* (2008)

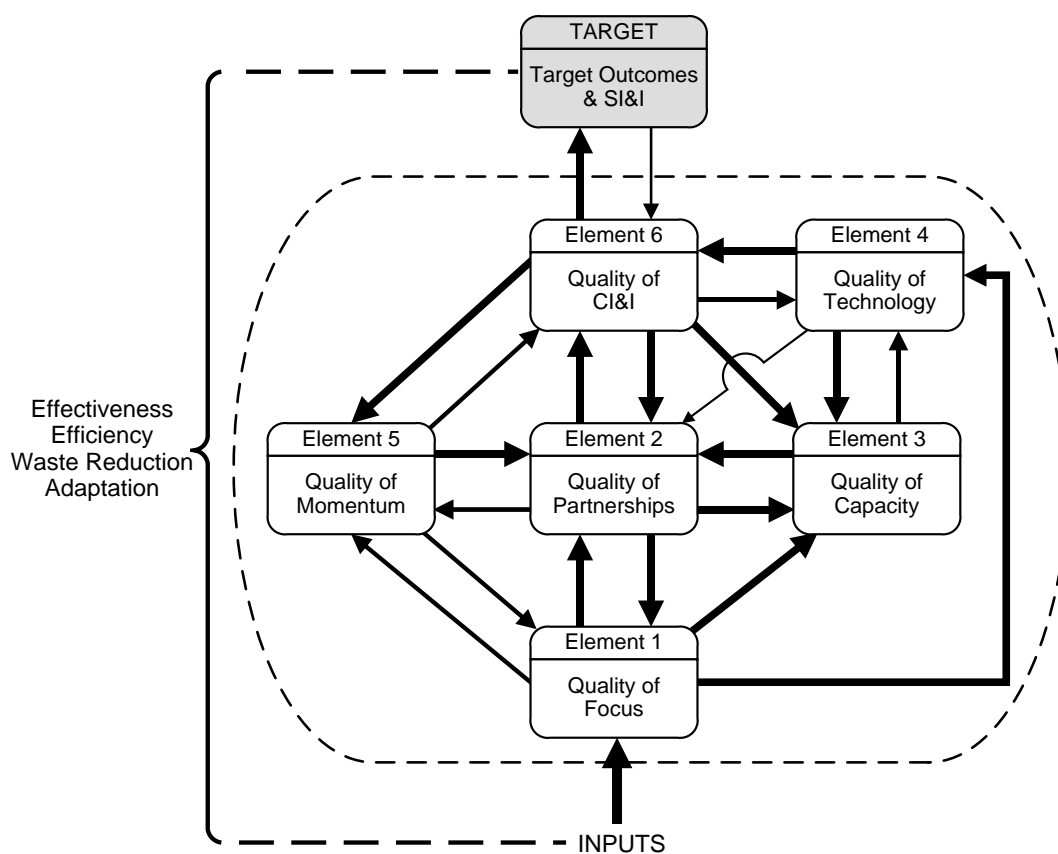
Figure 1.5: A map of the BPP project system model

Figure 1.6: Six strategies to ensure effectiveness of CI&I partnerships and networks for beef business profit and growth

