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**The Sustainable Beef Profit Partnership Approach to the  
Adoption of New Beef Industry Technologies**

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## **The Sustainable Beef Profit Partnership Approach to the Adoption of New Beef Industry Technologies**

### **Abstract**

Technology adoption in the Australian beef industry has been low and slow compared to the intensive livestock and cropping industries. The principles of accelerated adoption provide an innovative solution to this problem. In the Beef CRC, Sustainable Beef Profit Partnership (BPP) members will meet regularly to measure their current performance, set targets for future productivity increases, and use a profitability framework to assess the potential impact of new technology. Capacity building and partnership outcomes will also be assessed. The BPP teams will be supported with appropriate tools and resources. 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; beef industry; profit; productivity; capacity; partnership.

### **Background**

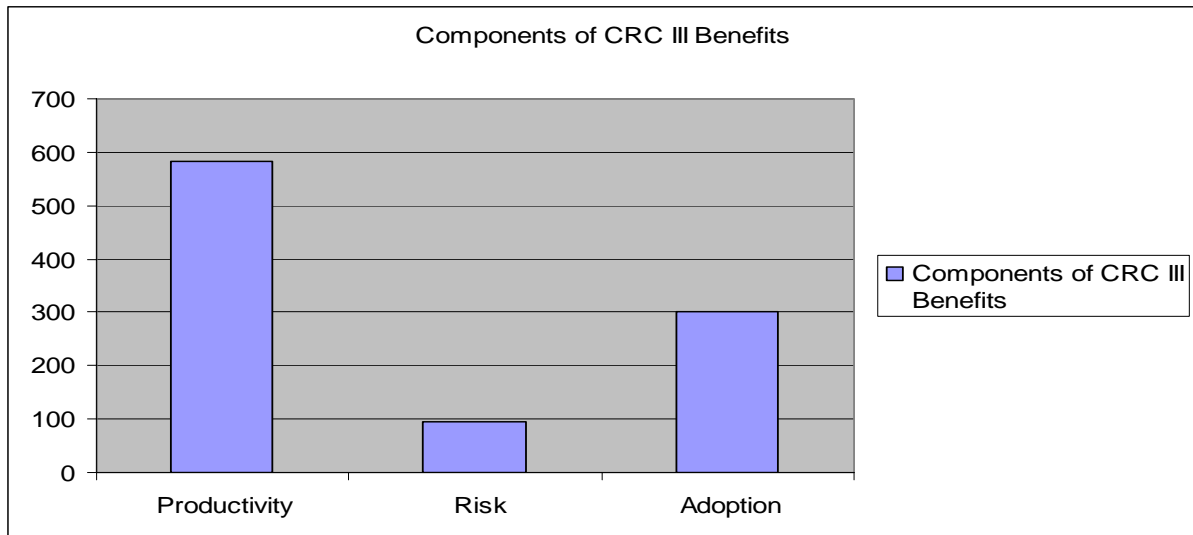
The economic benefits from the development of new agricultural technologies depend among other things on the speed with which the technology is developed, and the speed and extent to which the technology is adopted by the target market. Increasing attention is now being focussed on these components of the R,D&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 one of the four 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, reduced risk of failed R&D and enhanced adoption (Griffith et al. 2006; Griffith 2007). Although there are few formal measures, technology adoption in the Australian beef industry is thought to be slow and low compared to the intensive livestock and cropping industries, and one of the main reasons for the relatively low measured productivity growth rates (see also Mullen 2007).

In the renewal proposal, a formal “with-CRC” vs “without-CRC” scenario approach was developed and implemented. In the “with-CRC” case, higher investment levels due to the renewal of the Commonwealth CRC commitment 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 - a 5-year R&D lag, a 2-year adoption lag and a 35 per cent adoption ceiling, compared to a 7-year R&D lag, a 5-year adoption lag and a 25 per cent adoption ceiling. The results of simulation experiments with the economic model suggest 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, net benefits to the industry would improve by about \$300m (see Figure 1)(Griffith and Vere 2006). Of the total

expected benefit of around \$179m a year by 2012, some \$54m is expected to accrue from increasing the level and rate of adoption of new technologies.

**Figure 1. Components of the total estimated benefits from the with-CRC scenario (\$m)**



Following approval of the new Beef CRC, the estimated benefits from the business case proposal have become target outcomes for the CRC in the Commonwealth agreement. Given the current situation with adoption, the focus of 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 level of adoption of beef industry technologies. The challenge for the CRC team managing this commitment has been to design and implement an accelerated adoption project that has the best chance of meeting these targets.

In this paper, we provide an overview of the Beef CRC accelerated adoption project, the profitability framework used to assess the potential impact of new technology and provide a focus for action by beef businesses, the measuring, monitoring and evaluation strategy designed to assist the project meet its targets, and the reporting framework developed to collect and transmit the appropriate data. Finally, we speculate about how the BPP project will help achieve Beef CRC commercialisation outputs and profitability outcomes.

## Context and 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 target of \$179m in extra profit annually by 2012. We can confirm this view by examining recent productivity growth rates.

According to ABARE (2004), annual productivity growth in the Australian beef industry increased from around 1.4 per cent during the 1980s to 2.1 per cent during the 1990s. However this is still well below productivity growth rates in the cropping industries. Further, beef farms 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 southern Australia. Also, productivity growth has been closely related to size, with the largest third of beef farms enjoying strong

productivity growth, but the smaller two thirds having little or no improvement. With most of the large beef enterprises located in northern Australia, the suggestion is that beef extension in the south, and outside of the corporate sector in the north, is largely ineffective. A new way of doing things is required.

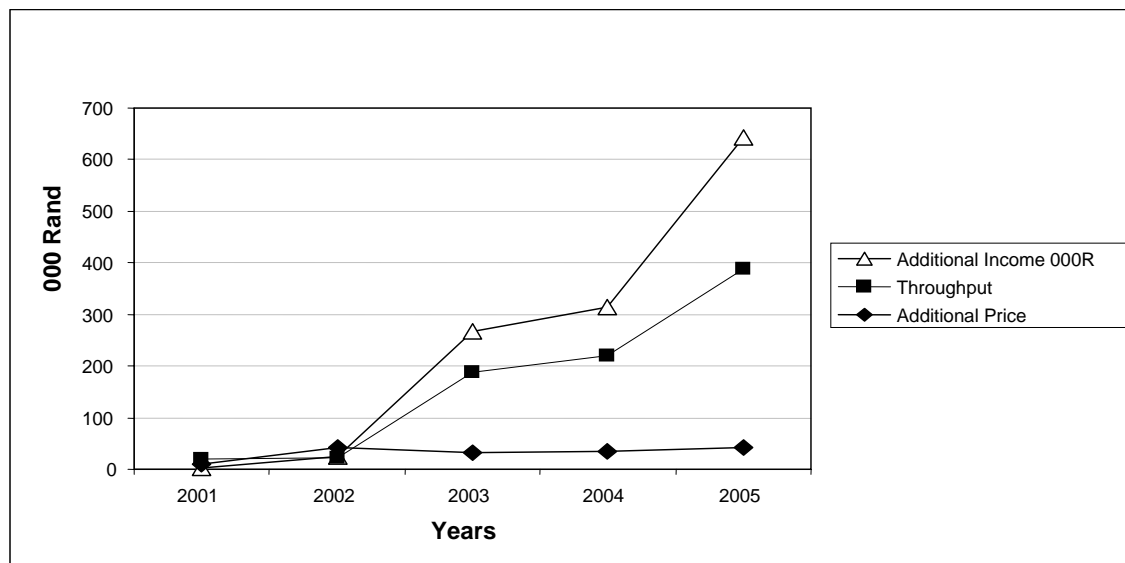
The key difference in the new approach is a clear focus on accelerated improvement, innovation and adoption projects instead of on general awareness activities. There is also a clear focus on building the capacity to understand and implement such an approach, on working within a partnership and network of partnerships framework, and on providing the tools that allow partners to measure where they are now and to monitor how their business practices have changed over time.

This type of 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.* 2007). This ACIAR-funded project had the specific aim 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 24 farmer teams were involved by 2005. A number of beef price and productivity 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 1.25 million Rand over the period 2001-2005 (see Figure 2). It is estimated that the BPP project increased profits to the subset of farmer teams that measured gross margins by 198,610 Rand over the period 2002-2005. If this same 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 620,645 Rand over the period 2002-2005. Thus, about half 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 2 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 Beef CRC “Sustainable Beef Profit Partnerships” (BPP) Project is designed to work in partnerships with beef businesses, value chains and the broader Australian beef industry to accelerate improvements, innovations and adoption and assist in meeting the overall CRC target outcome of \$179 million extra profit per year by 2012.

**Figure 2. Accumulated Income from the South African BPP project**

Some 50 BPP groups are being set up across the various beef production environments in Australia and New Zealand. The members of the groups will be encouraged to follow the project design described below and to measure and report their successes and failures. Each group will have access to a trained facilitator and specialist economic and other technical support as required.

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

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

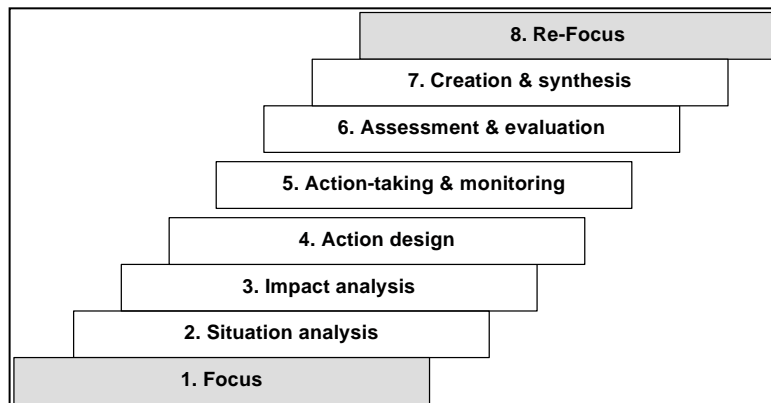
Following from the overall focus, the BPP project has specified the following target outcomes:

- 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.

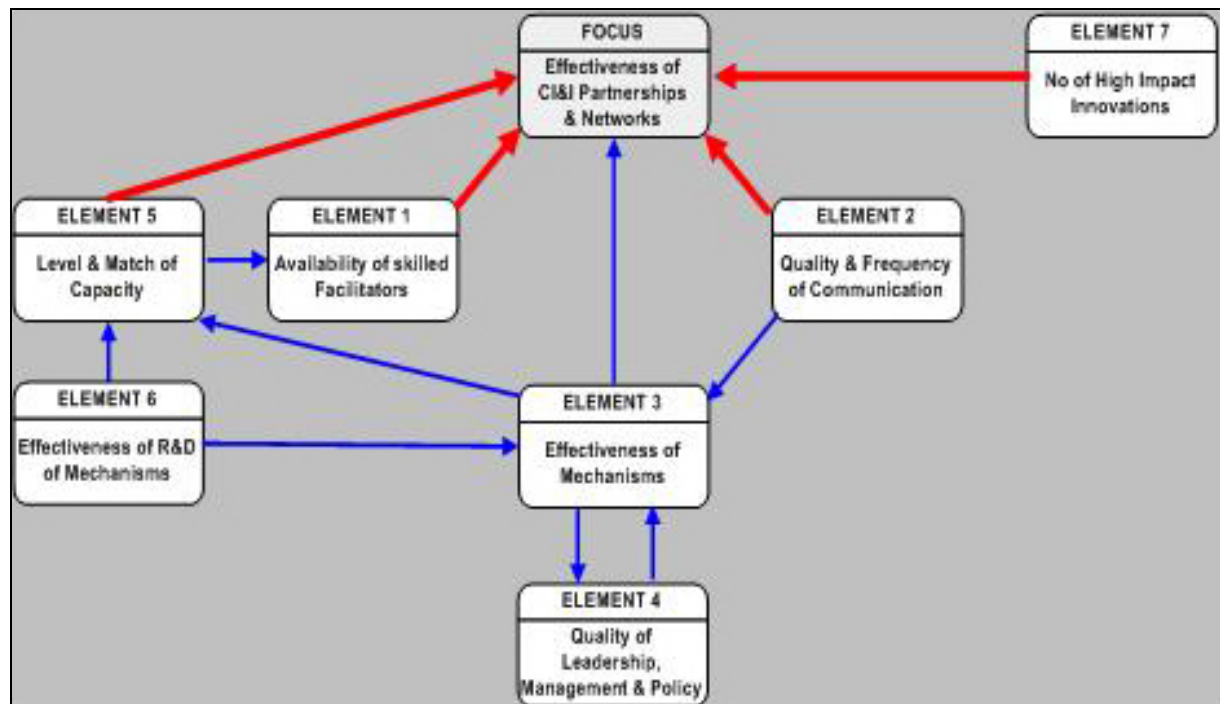
Three particular aspects of this project are noteworthy. First, to enhance the rate of improvements and innovations in BPP, the use of a clear shared process of continuous improvement and innovation (CI&I) is advocated (Figure 3). Each partnership is encouraged to adopt CI&I principles and practices to achieve improvements, innovations and adoption, and so assist in meeting the project focus and outcomes. This CI&I process is explained in more detail in the following section (see also Lindberg and Berger 1997, and various papers by Clark, Timms and co-authors listed in the references).

Second, 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-wide approach to coordinating and managing the various CI&I partnerships, the linkages between them and their linkages with the broader beef industry. This system is depicted in Figure 4.

**Figure 3. The eight steps of Continuous Improvement & Innovation designed to achieve improvements and innovations for impact on profit now, and in the future**



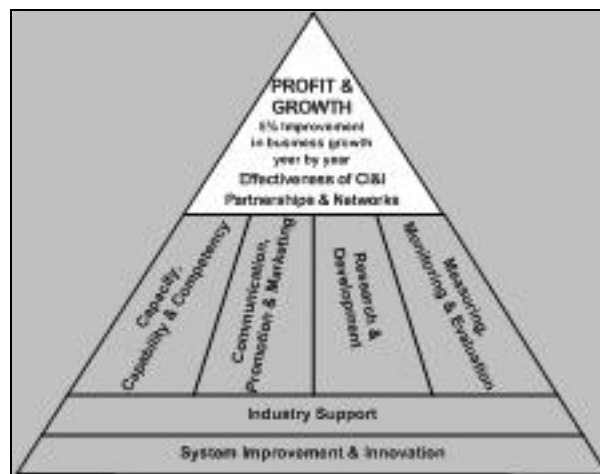
**Figure 4. The BPP system map**



Third, as part of implementing this system approach, the BPP project has designed a number of formal strategies (Figure 5). There are four principal strategies that will each individually contribute to ensuring the effectiveness of the CI&I partnerships and networks in achieving the focus of the project:

- Capacity, capability and competency - To ensure partners and industry are equipped and supported to achieve and accelerate improvements and innovations for sustainable impact on business profit and industry growth;
- Communication, promotion 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;

**Figure 5. Six strategies to ensure effectiveness of CI&I partnerships and networks for beef business profit and growth**



- Research and development - To improve, discover and create more effective and efficient mechanisms (theory, models, methods, tools) to achieve accelerated improvement and innovation; and
- Measuring, monitoring and evaluation - To ensure partners and industry are able to demonstrate achievements and obtain feedback and support to contribute to achieving further improvements and innovations.

There are also two more general strategies that provide broad system support:

- Partnership and industry support – To achieve momentum and institutionalisation of the CI&I process during and after the project; and
- System management and improvement –To ensure CI&I principles are applied to all elements, strategies, processes, methodology/mechanisms, human infrastructure and the project system as a whole.

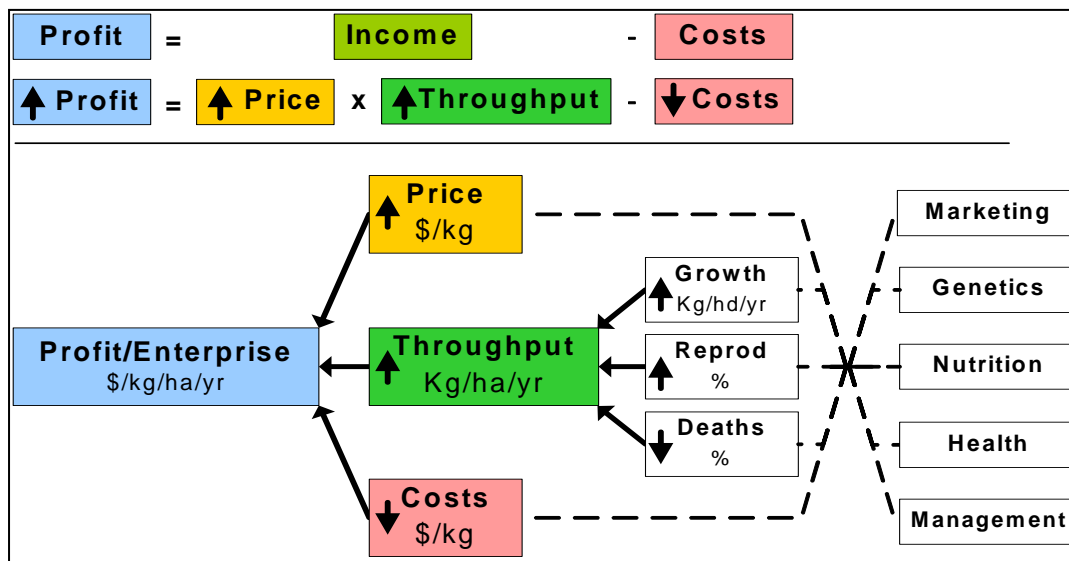
The Measuring, Monitoring and Evaluation Strategy and the associated reporting and support framework are explained in more detail later in the paper.

## **The BPP process**

This CI&I process described in Figure 3 above helps all partners to scope, analyse, prioritise, achieve, report and support improvements and innovations, and promote the adoption of actions, methods and technologies that have greatest benefit. The process also helps re-focus thinking and action further improvements and innovations. Each partnership is encouraged to meet at least every 90 days to follow the CI&I steps described in Figure 3.

One of the key assumptions underpinning this process is that beef producers are interested in increasing profit. This assumption is the basis of the overall BPP project focus, and it is encouraged to be the focus for action of individual partners as well (see Figure 6). A number of economic analysis decision support tools such as gross margin budgets, whole farm budgets, cost of production calculators, etc are offered to the groups to assist in deciding on priorities for action and to monitor the financial implications of these actions at regular periods in the future.



**Figure 6. A simple profit driver tree**

### The BPP Measurement, Monitoring and Evaluation Strategy

Given the overall project objectives and the lack of suitable alternative mechanisms, there is a demonstrated need for effective and efficient Measurement, Monitoring and Evaluation (MM&E) mechanisms to ensure partners and industry are able to demonstrate achievements and obtain feedback and support to contribute to achieving further improvements and innovations within 90-day or 180-day timeframes. There is also a demonstrated need for productivity and profitability, industry capacity, and partnership and network focuses and outcomes to be measurable and achievements to be provable.

Based on these needs, the specific focus of the MM&E strategy is to ensure partners and industry are able to demonstrate achievements and obtain feedback and support to contribute to achieving further improvements and innovations within 180-day timeframes.

The target outcome for this strategy can be broken down into three specific outcomes that match the sub-outcomes of the overall project:

- To design and implement effective and efficient MM&E mechanisms that will demonstrate rapid and measurable improvements in productivity, profit and growth;
- To design and implement effective and efficient MM&E mechanisms that will provide feedback and ensure a supportive network of rewarding partnerships contributing to accelerated industry growth; and
- To design and implement effective and efficient MM&E mechanisms that will ensure that partners and industry are equipped to achieve sustainable improvement and innovation.

Each of these outcomes has a set of key performance indicators that can be measured and monitored (Table 2 below) (see also ISNAR 2003).

The MM&E part of the BBP project is therefore responsible for providing training in the economic tools used by the partners, for designing and implementing a monitoring system to

provide feedback to partners, and for designing an evaluation system that will demonstrate rapid and measurable improvements in productivity, profit and industry growth. The MM&E team will also report and assess their performance against the strategy KPIs, outcomes and focuses, and will aim for continuous improvement and innovation in strategy activities.

### The BPP Reporting and Support Framework

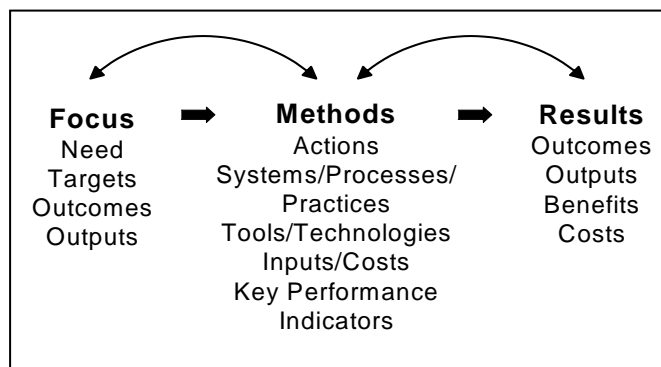
The reporting and support framework outlined here is a component of the MM&E Strategy. This framework is designed to help accelerate the rate of improvements, innovations and adoption for impact on sustainable profit and growth in beef businesses, groups, partnerships, value chains and the broader Australian beef industry, as specified in the project focus and target outcomes. However, there are two specific purposes of reporting and support in BPP.

#### Reporting and Support in BPP CI&I Partnerships

The objective of this type of reporting and support is to enable BPP partners (beef business managers, local groups, regional networks, facilitators, network leaders, specialists and researchers) to benefit from the improvements and innovations that occur by developing and sharing reports; supporting reports; and evaluating and promoting the rapid adoption of successful improvements and innovations through Beef Profit Partnerships.

Reporting and support is efficient, stimulating and rewarding when clearly focused. Figure 7 shows how reporting and support is focused on highlighting the relationship between targets (focus), methods used and results achieved. In this way BPP partners discover which actions, methods and technologies achieve best results, AND which are less valuable. This enables further improvements and innovations.

**Figure 7. The value of ensuring a target focus, clearly identifying the actions, methods and technologies used to achieve and promote rewarding results**



The timing of reporting and support is critical to success and should occur at least every 90 days to enhance the rate of improvements and innovations. BPP facilitators and network leaders lead reporting and support in a simple effective way. The Reporting and Support Framework for BPP CI&I Partnerships (see Table 1 below) provides a set of Critical Success Factors (CSFs) and Key Performance Indicators (KPIs) to focus reporting and support on achieving the BPP targets.

In Table 1 below is an example of how the Reporting and Support Framework for BPP CI&I Partnerships can be used. Suppose the focus of one of the partners was to “Improve

reproduction rates from 70% to 80% in the commencing breeding season.” Following the steps in the CI&I process, the partner would be encouraged to report to the rest of the group on progress toward achieving an outcome from this focus. In the first 90-day meeting, the partner would be encouraged to report on how they undertook their situation analysis: for example – “I identified specific data on the reproductive performance of my herd, and I identified the alternative inputs, tools & technologies that might help me meet my target.” Then the partner would be encouraged to report on how they undertook an impact analysis and developed an action plan: for example – “I used a gross margin calculator to compare the alternate actions, tools & technologies, and I chose a particular option for these reasons...”.... Then... “I developed a plan to implement my selected actions, with descriptions of KPIs, tools & technologies, and I designed a recording system so that I could compare the results when they occur with those of current practice.”

In subsequent 90-day meetings, the partner would be encouraged to report on their Action & Monitoring, Performance Analysis & Evaluation, and Creativity and Re-focussing steps. For example – “I used a checklist of actions, tools & technologies, and a chart of progress with KPIs.” Etc.

### ***BPP Project Performance Measures***

The objective of this second type of reporting and support is to measure and monitor the actions and outcomes occurring in the BPP CI&I partnerships, to evaluate and promote the rapid adoption of successful improvements and innovations through the whole BPP network and across the beef industry, the Beef CRC and the wider community, and to support further improvement and innovation in beef businesses. Thus, this aspect of the reporting framework is closely linked with the Reporting and Support Framework for BPP CI&I Partnerships, in that it uses and extends the information provided by partners to highlight at a broader level the relationship between targets, methods used and results achieved. It also provides one conduit to the broader beef industry for the discoveries that are made in BPP groups about which actions, methods and technologies achieve best results, and which are less valuable.

As with BPP CI&I Partnership reporting, project reporting should occur at regular intervals (every 180 days at least) to enhance the rate of improvements and innovations, and should be lead by BPP facilitators and network leaders.

The Reporting and Support Framework for BPP Project Performance Measures (see Table 2 below) provides a set of KPIs related to achieving the BPP project targets.

In relation to the first target outcome “Rapid and measurable improvements in productivity, profit and growth”, it is important to have as accurate a picture as possible of the productivity and profitability status of the beef business before the BPP CI&I process begins, so that the achievements of the BPP partnerships can be accurately measured and communicated. Two data forms have been designed that are an adjunct to the overall reporting framework shown in Table 2. The first (Table 3 using an example) provides a framework for recording the initial benchmark data of individual partners, while the second provides a framework for recording ongoing changes in business practices and outcomes as and when they occur.

## **Conclusions and Expectations**

The newly refunded CRC for Beef Genetic Technologies has the ambitious target of increasing the level of adoption of new 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 to generate 179m in extra profit annually by 2012. However, 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 financial target. A new approach is required.

The Sustainable Beef Profit Partnerships project offers that new approach. Based around a continuous improvement and innovation model, the key differences are:

- focussing on accelerated improvement, innovation and adoption projects instead of on general awareness activities;
- building the capacity to understand and implement 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 practises have changed over time.

The BPP Project has committed to achieving an additional 5 per cent improvement in annual business growth among Beef Profit Partners within two years by setting up around 50 BPP CI&I partnerships across the country. As part of that commitment, a number of strategies have been developed that will each individually contribute to ensuring the effectiveness of the CI&I partnerships and networks in achieving the focus of the project. An industry support team is being put in place, and a number of postgraduate students and outside experts have been engaged through the R&D strategy to improve, discover and create more effective and efficient theories, models, methods, and tools to achieve accelerated improvement and innovation.

Some BPP groups have started already, benchmarking their current profitability and productivity variables and discussing and selecting a focus for action. Our expectation is that more groups will follow suit as seasonal conditions improve in many parts of Australia, and that within six months we will have some evidence of progress towards meeting our project targets. We are committed to reporting this evidence at future AARES conferences and elsewhere.

Ultimately, we expect to be able to develop and present diagrams like Figure 2 above that demonstrate the accumulation of economic benefits due to the Sustainable Beef Profit Partnerships project, and the value of this approach to encouraging the adoption of new technologies in the Australian agricultural sector.

**Table 1. Reporting and Support for BPP CI&I Partnerships (Example)**

Date: .....

**BPP State and Regional Partnership, Leaders and Facilitators**

State & Region \_\_\_\_\_  
 BPP Group/Team Name \_\_\_\_\_

Regional or State BPP Network Leader \_\_\_\_\_  
 BPP Group/Team Facilitator/Leader \_\_\_\_\_

**BPP Business Productivity, Profit and Growth Improvement Focuses, Steps and Results**

BPP Code <sup>1</sup>	Productivity or Profit Focuses <sup>2</sup> /Themes	Situation Analysis	Impact Analysis	Action Plan	Action & Monitoring	Performance Analysis & Evaluation	Creativity & Re-Focus
	Improve <b>reproduction rates</b> (RR) from 70% to 80% this breeding season	Identified specific RR herd data, inputs, available tools <sup>3</sup> & technologies <sup>4</sup>	Used Gross Margins (GMs) of possible actions, tools & technologies to compare options. Chose an option for these reasons...	Developed a plan to implement new RR actions, with descriptions of KPIs, tools & technologies; & to compare the results with those of current practice	Used a checklist of actions, tools & technologies, & a chart of progress with KPIs.	Evaluated the impact of the new RR actions, tools & technologies on improving reproduction rate & profit by calculating actual GMs & compared the results to those obtained using old practices tools & technologies.	Created ideas for further increasing profit & developed new SMARTT Focus using the following tools...
	Reduce <b>cost of production</b> (COP) from \$0.90/kg LW to \$0.52/kg LW while maintaining price, & throughput by January 2008	Identified specific grazing herd data & inputs & available tools & technologies	Used Gross Margins (GMs) of potential grazing actions, tools & technologies to compare options. Chose an option for these reasons...	Developed a plan to implement the new grazing actions, with descriptions of KPIs, tools & technologies; & to compare the results with those of current practice	Used a checklist of actions, tools & technologies, & a chart of progress with KPIs.	Evaluated the impact of the new grazing actions, tools & technologies on reducing cost of production & increasing profit by calculating actual GMs & compared the results to those obtained using old practices tools & technologies.	Created ideas for further increasing profit & developed new SMARTT Focus using the following tools...

**Support Required:** Specialist to answer specific questions about Reproduction Rate improvement, and optimising Cost of Production from grazing. Business management input on how to improve efficiency of achieving targets

.....  
 .....  
 .....

<sup>1</sup> Business address and details including cattle numbers, herd structure and breed  
<sup>2</sup> SMARTT Focuses for impact on productivity, profit & growth KPIs  
<sup>3</sup> Examples of tools are: Breeding objectives; Gross Margins; Action Plans; KPI Charts  
<sup>4</sup> Examples o technologies are: Genetic tests; Nutritional products; Vaccines

**Table 2. Beef Profit Partnerships – Project Performance Measures**

**Date:**

**Focus:** To achieve an additional 5% improvement in annual business growth among Beef Profit Partners within 2 years.

**Target Outcome 1 - Rapid and measurable improvements in productivity, profit and growth**

<b>KPIs measured every 180 days</b>	<b>Results</b>
1. Price - \$ / kg	Focuses, actions, tools & technologies & charts of KPIs linked to the BPP target outcome KPIs
2. Throughput - kg / ha	
3. Costs - \$ / kg	
4. Profit - \$ / ha (per product, enterprise or business)	
5. Business Growth - % increase in profit	
6. Relevant productivity KPIs (e.g. growth, reproduction %, death %)	
7. Profit & productivity improvement in other enterprises	

**Target Outcome 2 - Supportive network of rewarding partnerships, contributing to accelerated industry growth**

<b>KPIs measured every 180 days</b>	<b>Results</b>
1. Number & type of partners	Number of business managers, industry leaders/facilitators, specialists & researchers in the regional BPP network
2. Number & value of BPP activities	Number & type of BPP meetings. Scores of value (average & range out of 10). What liked & why; wot not liked & why
3. Number & value of communications & resources	Number & score of value for kits, brochures, newsletters
4. Number of improvements & innovations shared	Number of improvements reported
5. Value of the BPP network	% of meeting attendance. Feedback on BPP

**Target Outcome 3 – Partners equipped to achieve sustainable improvement and innovation**

<b>KPIs measured every 180 days</b>	<b>Results</b>
1. Number & description of improvements & innovations implemented	Reports on Action & Monitoring
2. Number of improvement opportunities evaluated	Reports on Performance Analysis & Evaluation
3. Improved knowledge & skills of concepts, methods, tools & technologies	Reports on what individuals have learnt & changed that they did not know or do before
4. Number of concepts, methods, tools & technologies created, used &/or improved	Reports on new ways of assessing & managing the concepts like ‘throughput’, new products etc.

**Support Required:** Specialist input on creating new products, ventures & practices for efficiencies

**Table 3. Individual Partner Data Collection Form – Initial Benchmarks Example**

**Partnership Name:** Northern Tablelands NSW **Partner Name or ID:** ARM01  
**Facilitator Name:** John Smith **Date information collected:** 1/12/2006  
**Type of Beef Business:** Heavy Feeder Steers (Self replacing) 200 Cow herd. Cows calve in August and September, heifers joined to calve at 2 years of age. Heifers are sold as weaners at 9months, steers sold at 18 months 440-450 kg (lw.), suitable for entry into feedlots. British breed.  
**Type of Production System (climate, pastures, breeds, resources, etc):** *Climate:* high rainfall with a summer dominant pattern, cold winter conditions limits pasture growth April through October. *Pastures:* Fescue/Phalaris/white or sub clover 316 ha, available to beef cattle. *Breeds:* Hereford and Angus.  
**Resources:** Part of Merino wether/beef grazing farm business, quoted land resource available to beef enterprise. Owner- manager operated by husband & wife approx 50% of time, casual labour employed at peak time for Merino wether enterprise.  
**Focus for Taking Action:**

**Reasons for Taking Action:**

Cattle activity	Number of cattle in this activity	Number of Ha allocated to this activity	Number of these cattle sold last year	Average weight for these cattle (kg)	Price received for these cattle (\$/kg)	Gross margin for this activity (\$/kg)	Cost of production (\$/kg)	Reproduction performance	Mortality	Growth rate
Heavy feeder steers (SR)	200 cows	500				\$1.25/kg lw (no pasture cost)	\$1.79/kg lw	84% weaning rate	2% adults 5% calves	(steers 9mo wean to 18 m.o) 0.76 kg lw/day
- steers			81	448 kg lw	\$1.70 kg/lw					
- heifers			33	205 kg lw	\$1.65 kg/lw					
- cull female			42	450 kg lw	\$1.30 kg/lw					
- cull bull			2	900 kg lw	\$1.35 kg/lw					

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