

## RESPONDING TO INCREASED DEMANDS FOR ACCOUNTABILITY - THE ROLE OF BENEFIT-COST ANALYSIS IN RESEARCH INVESTMENT DECISIONS

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*Summary.* Increasingly high standards of accountability to their stakeholders have resulted in the rural research and development corporations (RDCs) investigating methods to better evaluate research projects prior to investment, to improve the investment decision making. Benefit-Cost Analysis (BCA) has been utilised by other investment agencies and has been adopted by the GRDC as one of its tools for assisting portfolio investment decision making, with all new applications requiring a BCA from 1995. The GRDC recognises the limitations that arise using BCA for investment analysis of agricultural research projects, in particular, problems valuing resources where sustainable production is a parameter. BCA is increasingly being requested by the Corporation's stakeholders. The GRDC is moving towards improving the efficacy of BCA by improving understanding of the methodology, in particular, valuation of parameters and uniformity of the BCA methods used in its assessment. BCA will become increasingly important, both in pre-investment decision making and in project evaluation.

### INTRODUCTION

Stakeholders in the GRDC are grain growers, represented by the Grains Council of Australia, and the Commonwealth Government. The Government stakeholder has recently undertaken several external reviews into the effectiveness of RDCs. One recommendation that has been made, repeatedly, is that RDCs introduce investment analysis techniques to develop better information about the commercial and financial results achieved (2, 8).

These demands, combined with increased competition for the research investment dollar, have resulted in more rigorous accountability standards for research investors. The GRDC is, therefore, reviewing its accountability measures and investigating methods for improving investment decisions.

The GRDC has already undertaken BCA for some of its portfolio (4). However, this was done *ex post*. Such analysis gives no indication of how the project performed compared to expectations at the time of investment. To assist in pre-investment decision making the GRDC recently introduced *ex ante* benefit cost analysis for all new projects. Limitations of the BCA, results of such analysis for GRDC projects thus far, and future directions for the GRDC's use of BCA are discussed.

### DISCUSSION

BCA is widely used as a decision making tool, particularly in financial markets (6, 10). Aid agencies, such as the World Bank, use BCA techniques for investment decision making and to assess performance of each investment (12, 14).

The World Bank and other organisations have adopted a standard BCA method, based on that described by Little and Mirrlees (7), with various modifications. This involves identification and valuation of benefits and costs over time and discounting them to present day value. Commonly, the result is expressed as a Benefit:Cost (B:C) Ratio (the discounted benefits divided by the discounted costs). This method provides the standard conceptual framework for investment appraisal of research projects, however, it has many difficulties in application. These difficulties arise whether a formal or informal appraisal is undertaken.

These include failure to identify costs and benefits, problems in quantification of these parameters and valuation difficulties. Difficulties encountered in valuing intangibles, non-market goods, and indirect benefits and costs are discussed in more detail by Gittinger (3) and Sinden and Worrell (11). Identification of costs and benefits is a complex issue requiring clear understanding of the system and judgement of multiple criteria, including how a community may value the resource. Valuation of parameters is inherently

difficult, particularly where natural resource issues are considered, for example, the cost of land degradation.

The complexity of the analysis is significantly increased when environmental impacts and irreversibilities are considered (12). A further limitation is that the BCA output is usually a single number giving no indication of the riskiness of the project. More recently, the advancement of computer software has allowed multiple sensitivity analyses to be undertaken, with the output being a range of possible B:C ratios. The range of B:C ratios gives some indication of the riskiness of the project.

Benefits of BCA include improved focus of the project, which occurs because of the necessity for researchers and investors to clearly identify their goals. This focus allows the investment decision makers to consider if the project matches the goals and strategic direction of the industry. A further advantage is the necessity to, as practically as possible, identify all of the parameters of the system, their interactions and possible effects on the larger environment. This adds in focussing the project and in determining factors to be measured.

Given the intrinsic weaknesses of BCA and the increased importance of economically sustainable development in the GRDC portfolio, the efficacy of using BCA as a tool for decision making may be questioned by some. However, there is not yet, and there may never be, a fully developed alternative that allows comparison of projects for investment.

The GRDC has eight criteria for decision making, as listed in its 1995-96 Information Paper. The BCA is an attempt to formally integrate these criteria (13). The GRDC's BCA guidelines were developed by White (13) following consultation with the GRDC's top eight research providers.

BCA information was distributed to the GRDC's Regional Panel members together with the research proposals. The Panels prioritise research projects for their region. Following the 1995-96 budget the usefulness of the BCAs to these panel members was surveyed by White (13). Preliminary results indicate that incorporating the BCA into the proposal was considered to have improved the focus of project proposals. This improved focus would/should have assisted the Panels to determine if the project fell within the GRDC's stated objectives. Further to this, the commentary provided by researchers in explaining the BCA assumptions and data assisted in determination of project merit. However, the numerical inputs and outputs were considered questionable. This affected the perceived value of the numerical output by panellists. Often the panels did not agree with the assumption made in undertaking the BCA. Finally the panellists expressed the opinion that there was poor use of the scenario analysis.

Communication with scientists, many of whom considered the application of BCA difficult, revealed an opinion that the necessity to focus on the considerations listed in the 1995-96 Information Paper as a guide to completing the BCA (5) was beneficial in project planning. This is reflected in the improved focus expressed by the Panel members.

There are several consequential challenges that need to be encompassed by the research industry, including research investors.

Researchers need to further their knowledge of the systems in which they are operating and the effect of their system on other systems, such as the agricultural system on the social system. This can be achieved by further scientific research into the specific systems of each discipline whilst recognising the interaction of the systems. This approach, often called holistic resource management (9), requires use of multi-disciplinary teams (i.e. scientists, economists, sociologists etc). These teams need to work together towards better quantification and valuation of benefits and costs.

Research investors need to review and improve BCA guidelines to simplify their use, and move towards standardised software to ensure that the BCA tool is adequately presented to the decision maker.

The GRDC is moving towards addressing some of the challenges by introduction of uniformity of BCA techniques through standardising Project Applications on computer disks which include the BCA analysis. While the diversity of the portfolio has made standardisation difficult, uniformity improves the usefulness of the analysis to the decision maker. The GRDC is also moving towards increasing the understanding of the BCA by those assessing potential projects for investment.

The GRDC is funding various projects to improve BCA techniques and to improve knowledge of the system. An example is the joint GRDC/LWRRDC project *Review of long term agronomic experiments* which is examining the role of BCA for assessing this type of project, and valuation of contribution to knowledge of sustainability which arises from these projects. There are also various projects looking at sustainable rotations and systems analysis.

## CONCLUSIONS

Increased accountability means that methods of determination of the benefits of projects for portfolio investment decisions are more critical. BCA is one tool available which, despite its weaknesses, is becoming more widely used and will be increasingly important in assisting decision making to the GRDC. Therefore, the BCA tool must be refined over time, familiarity with its use must increase and scientists must work with economists to achieve this goal.

Multi-disciplinary teams involved in research project design, together with *ex ante* BCA, should improve the focus and strategic direction of the project seeking investment. This allows the investment decision maker to clearly identify whether the project is within the strategic direction of the industry.

Projects to improve the knowledge of the system and the interactions with other systems are attracting investment and this trend is likely to continue. Collaborative research involving multi-disciplinary teams is likely to produce well designed projects with better BCA.

Projects to improve BCA methodology are also being undertaken. It is necessary that scientists become more familiar with BCA and its use to ensure that the BCA of their project displays the potential of the project to research investors. Use of BCA is also valuable in project design and planning.

The GRDC is committed to using BCA to assist in analysis for strategic investment, review of its investment portfolio. The information obtained will be further assessed and refined and used to provide updated BCA guidelines for GRDC projects with the aim of improving the resulting BCAs for investment analysis. The BCAs will also be used in *ex post* assessment of project performance. However, qualitative parameters and peer review will remain important in project assessment by the GRDC which recognises the holistic nature of the agricultural system.

Finally, *ex post* evaluation of projects and comparison with the *ex ante* BCA will become an increasingly important tool in reviewing performance of research.

## REFERENCES

1. Anderson, J.R. Dillon. J.L. and Hardaker, J.B. 1997. Agricultural Decision Analysis. (Iowa State Univ. Press: Ames).
2. Australian National Audit Office. 1993-94. Audit Report No. 38, Efficiency Audit, p. xxv, Dept. of Primary Industries and Energy, Rural Research and Development Program. Aust. Govt. Publ. Service, Canberra.
3. Gittinger, J.P. 1982. Economic Analysis of Agricultural Projects, 2nd Ed. (Johns Hopkins Uni. Press: Baltimore, USA).
4. GRDC, 1992. Gain for Grains, Vol. 1-4. Grains Research and Development Corporation, Canberra.

5. GRDC. 1994. Information Paper 1995-96 pp. 1-3. GRDC, Canberra.
6. Levy, H. L and Sarnet, M. 1984. Portfolio and Investment Selection: Theory and Practice. (Prentice Hall: New York).
7. Little, I.M. and Mirrlees, J.A. 1974. Project Appraisal and Planning for Developing Countries. (Heinemann Educational Books: London).
8. Lovett, J.V 1996. Evolution and accountability in the GRDC. Proc. 8th Aust. Agronomy Conf., Toowoomba, Jan 30-Feb 2, 1996.
9. Savory, A. 1988. Holistic Resource Management. (Gilmour Publishing: Harare).
10. Schmid, A.A. 1989. Benefit Cost Analysis: A Political Economy Approach. (Westview Press: Boulder).
11. Sinden, J.A. and Worrell, A.C. 1979. Unpriced Values: decisions without market prices. (Wiley Press: New York).
12. Van Pelt, M.J. 1993. Sustainability-oriented project appraisal for developing countries. Thesis, Wageningen.
13. White, B. 1995. Quantifying Research Benefits - The GRDC Initiative. Aust. Inst. Agric.Sci. Research Forum. AIAS, Melbourne.
14. World Bank, 1991. Annual Review of Project Performance Audit Results. Operation Evaluation Department, World Bank, Washington D.C.