

# **EVALUATING THE PERFORMANCE OF COLLABORATIVE RESEARCH AND DEVELOPMENT ACTIVITIES**

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## **ABSTRACT**

Collaborative research and development (R&D) activities involve researchers working closely with industry, community and/or other stakeholders to address a range of research problems. The trend toward collaborative research is evidenced by the launch of the Australian Cooperative Research Centre (CRC) Program in 1990, and similar programs internationally. Despite the trend to increased levels of collaborative research, a systematic analysis of the positive and negative features of this form of research has not been undertaken to date.

Case study analysis of several collaborative research activities undertaken by the Cooperative Research Centre for Sustainable Sugar Production (CRC Sugar) has identified a number of positive and negative features of collaborative research. In particular, aspects associated with administration, process and outcomes are of interest. A framework to evaluate the performance of collaborative research activities systematically will be developed based upon case study findings and the results of a survey of stakeholders in CRC Sugar. Principles from economics, management and sociological disciplines will be integrated to produce an eclectic, holistic evaluation framework. It is envisaged the study will enhance understanding of the value of collaborative research. Furthermore, the development of a framework to evaluate the performance of collaborative research activities is expected to benefit researchers, stakeholders, funders, and research managers, and allow them to improve the efficiency and effectiveness of collaborative research activities.

## **KEYWORDS**

research evaluation, collaborative research, sugar, Co-operative Research Centre (CRC), performance evaluation

## **1. INTRODUCTION**

The purpose of this paper is firstly to highlight the need to investigate the value of collaborative research within the agricultural and natural resource sector, and secondly to present some initial ideas for an eclectic framework to evaluate collaborative research.

Within this paper, the term collaborative research is clearly defined. An overview of the historical development of collaborative research within scientific systems, and specifically within agricultural and natural resource systems is provided. Techniques available and used to evaluate agricultural and natural resource research activities are presented, and the need to evaluate collaborative research using an eclectic framework is highlighted. Key findings of case study research undertaken to date are presented, and important features of collaborative research projects to include within a holistic evaluation framework are presented. Directions for future research are presented.

## **2. COLLABORATIVE RD&E**

Research, development and extension (RD&E) activities involving researchers working closely with industry, community and/or other stakeholders is the definition of collaborative research adopted in this study. Collaborative research at the project or activity level is the focus of investigation.

The advent of collaborative research within the agricultural and natural resource sector is linked with the emergence of farming systems research in the 1960s. Farming systems research recognised, among other things, that the relevance of research to stakeholders could be increased by including farmer participation in the research process (Collinson 2000). Dillon (1976) highlighted the limitations of reductionist scientific functioning, which involves dissecting phenomena into more basic parts, and analysing these parts as independent entities. The value of a systems approach was highlighted by (Dillon 1976), whereby phenomena to be explained were viewed as part of the larger system. The traditional linear approach to innovation, which assumes research leads to development, development to production, and production to marketing, was challenged by farming systems research principles introduced in the 1960s.

Worldwide, policies to encourage collaborative research have developed over the past decade. Godin and Gingrass (2000, p. 65) in a study of the impact of collaborative research on academic science stated ‘...governments have actively promoted through diverse policy mechanisms greater collaboration and exchange between universities, businesses and governments’. The Cooperative Research Centre (CRC) Program was launched by the Australian Commonwealth Government in 1990 with the objective to strengthen long term collaboration between research organisations, and between these organisations and the users of research, in order to obtain greater benefits from Australia’s investment in RD&E (Mercer and Stocker 1998). The Cooperative Research Centre for Sustainable Sugar Production (CRC Sugar) was established in 1995 and led to growth in the collaborative form of research within the sugar industry. Parties to CRC Sugar include industry organisations from the growing and milling sectors, RD&E organisations, and universities. Collaborative research is promoted

within the sugar industry by other RD&E funders and providers such as the Sugar Research and Development Corporation (Sugar Research and Development Corporation 2000).

### **3. RESEARCH EVALUATION**

A plethora of literature exists on evaluation approaches, and a wide range of evaluation approaches have been developed and documented over the past few decades (Dart, Petheram et al. 1998). Various means of categorising evaluation approaches has been undertaken within the evaluation literature. Owen and Rogers (1999) identifies five forms of evaluation based upon the purpose of the evaluation, as listed below.

Form 1: evaluation for impact assessment

Form 2: evaluation for program management

Form 3: process evaluation

Form 4: evaluation for design clarification

Form 5: evaluation for program development

Within the agricultural and natural resource sector, and indeed within the sugar industry, evaluation of research activities is commonly undertaken from an economic perspective. Economic evaluation is used to determine the impact of investment in a particular RD&E activity and a range of economic research evaluation techniques have been developed (Alston, Norton et al. 1999; Horton, Ballantyne et al. 1993). Economic techniques such as benefit-cost analysis, are categorised as impact assessment studies. The economic impacts of the research are evaluated and the social and/or environmental effects taken into account if they can be measured readily. The outputs (research results) and outcomes (impact of the research results) of the research are therefore the focus of economic research evaluation techniques. Economic criteria are useful in resource allocation, priority setting, and impact assessment and several economic evaluations have been undertaken of Australian sugar industry RD&E (Agtrans Research and eSYS Development 1998; Agtrans Research and eSYS Development 2000).

In addition to research evaluation from an economic perspective to assess impact, evaluation of collaborative research activities from a managerial perspective is undertaken by activity or project leaders during the research process. Various theories and frameworks have been developed to facilitate efficient and effective management at the project, program, and organisational level such as Bennett's Hierarchy (Chamalar, Coutts et al. 1999) and the Balanced Scorecard approach (Kaplan and Norton 1996). However, in practice, the monitoring and evaluation, and day-to-day management of collaborative research activities appears to be determined by the individual activity leader. The effectiveness of management at the activity or project level varies across activities. This aspect of collaborative research projects will be investigated further in the survey of sugar industry stakeholders.

A gap in knowledge exists regarding the wider, holistic value of collaborative research at the project or activity level. There is a need to develop an eclectic framework to evaluate the positive and negative features of both the process and

impact of collaborative research activities. This need has been highlighted in the literature as evidenced below.

*“...it is widely assumed that collaboration in research is ‘a good thing’ and that it should be encouraged” (Katz and Martin 1997 p.1)*

*“But there is a question that has been infrequently asked: is there a dark side to collaborative research?” (Goldstein 2000)*

*“Unfortunately, at present there is no means of systematically appraising all the costs and benefits of collaboration, and therefore no way of establishing whether the benefits do actually outweigh the costs.” (Katz and Martin 1997 p. 17)*

#### **4. CASE STUDIES**

Exploratory case study analysis of two CRC Sugar RD&E activities is continuing with the aim of identifying features of collaborative research activities that contribute to its efficiency and effectiveness.

The first case study was the CRC Sugar “Dam Ea\$y” research activity. A multi-disciplinary team of researchers is working with canegrowers and extension agents in the Bundaberg region to develop a decision support model to determine the economic returns to growers considering investment in on-farm water storage for irrigation purposes. The second case study was CRC Sugar activity 1.3.4 “Interactive farm scale survey of acid sulfate soils in NSW canelands”. This research activity involved researchers working in collaboration with the NSW Sugar Milling Cooperative and growers to achieve self regulation of its management of acid sulfate soils in the Tweed, Clarence and Richmond River catchments of northern NSW.

A list of features of collaborative research activities influencing the efficiency and effectiveness of the activity has been developed from the case study findings. This list is not yet finalised, and includes the following:

- transaction costs
- social capital
- funding issues
- communication
- administration, managerial and organisational skills
- links between researchers and industry/other stakeholders
- adoption of research outputs
- exploitation of synergies
- intellectual property
- characteristics of participants – expertise, personality, organisational culture

The list of features can be categorised as influencing the following stages of a collaborative research activity:

- administration and management,
- process, and

- outputs and outcomes.

Some features influence more than one stage of research activity.

## **5. FUTHER RESEARCH**

Further research to be undertaken within the current study includes a survey of CRC Sugar researchers, extension experts, industry representatives, research fund administrators and other stakeholders. The survey results will add to the case study findings and aid the prioritisation of key features of collaborative research activities contributing to efficiency and effectiveness.

Additional research associated with the two case study projects will be undertaken. Application of existing evaluation approaches from the economic and management disciplines such as benefit-cost analysis and Bennett's Hierarchy to the two CRC Sugar case study research activities will be undertaken to explore the contribution existing methods can make to answering . Features of collaborative research projects found to be significantly contributing to the efficiency and effectiveness of this mode of research to be included in an evaluation framework will be identified.

An eclectic framework to evaluate the administration and management, process, and outputs and outcomes of collaborative research activities will be developed drawing upon the case study findings, the survey results, and existing evaluation approaches documented in the literature.

## **6. SUMMARY**

A significant amount of funds are invested in RD&E activities in Australia, and in particular, in collaborative RD&E. Collaborative research has been actively promoted over the past couple of decades as a desirable method of undertaking research, although an objective assessment of the positive and negative features of this research method has not been undertaken.

Existing economic evaluation techniques focus on evaluating the outputs and outcomes of research. Managerial evaluation techniques focus on monitoring and evaluating the research process. A framework incorporating principles from economics, management and sociological disciplines for the evaluation of collaborative research activities will be developed based upon case study findings, existing evaluation approaches, and results of a survey of sugar research stakeholders. Knowledge will be contributed regarding the overall value of collaborative research. Further, the development of a framework to evaluate the performance of collaborative research activities is expected to benefit researchers, stakeholders, funders, and research managers, and allow them to improve the efficiency and effectiveness of collaborative research activities.

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