

# Measuring research impacts

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AOP budgeted expenditure in 2006–07	\$450,000
Actual expenditure in 2006–07	\$358,544
Expenditure in 2005–06	\$709,307
Expenditure in 2004–05	\$408,624
Proportion of total ACIAR expenditure 2006–07	0.6%

\* Lower than previous years due to a tighter ACIAR budget position in 2006–07.

Key Performance Indicators	Performance 2006–07
Six assessments of completed projects will be commissioned and published in 2006–07	Seven projects or sets of projects were assessed with six assessments published.
Adoption studies of projects concluded in 2002–03 will be commissioned	Adoption studies were undertaken for seven projects completed in 2002–03 and a report published.
Clarification and estimation of the outcomes of new projects will be enhanced by assisting project proponents during the peer-review process of their proposals	Input was made to a range of project development activities. Examples include horticulture project development in Pakistan, rice and wheat cultivation in India, chalky rice at IRRI and fisheries projects in Vietnam.
Increase capacity of ACIAR staff and Australian and developing country researchers in conceptual and practical aspects of estimating research-induced poverty reduction	Input was made during project development and review meetings.
Develop closer links with partner country impact assessment groups and CG Centres	Partner country collaborative groups were established in the Philippines and Vietnam. Links with impact assessment groups at all CG Centres were established through SPIA and collaborative activities started with ICRISAT, CIFOR and ILRI.
Review past ACIAR bilateral projects for potential impacts to provide systematic basis for future impact studies	This was partly achieved with a database developed to systematically collect rapid impact assessment information. This will be continued in 2007–08 to give an expanded set, which will be used for future sampling.
Assess the capacity building impacts and synergies between ACIAR and ICRISAT projects	A case study for sorghum breeding was published in our Impact Assessment Series (IAS).

Key Performance Indicators	Performance 2006–07
Review ACIAR's China investments and potential areas for future mutual collaboration	A full review was not undertaken but a detailed review of eucalypt development in China was substituted and published as an IAS Report. Also, three China linkage projects were funded.
Review methodology used by ACIAR assessment activities and link to the activities of the Office of Development Effectiveness	Draft Guidelines for impact assessment practitioners were finalised. They will be used as a reference for the next 12 months, and then developed into a final published document.

## Position

The impact assessment (IA) activities of ACIAR are part of the Policy Linkage and Impact Assessment Program (PLIA). The purpose of this IA activity is to provide an important 'after the event' dimension to the comprehensive monitoring and evaluation (M&E) processes ACIAR has in place. These M&E processes are used to ensure that ACIAR's funds are used to support priority issues and are undertaken so that objectives are achieved and effective impacts result.

The IA functions include an important accountability role in providing key stakeholders with a clear measure of the returns on the funds ACIAR invests. ACIAR continues to expand the measures of these returns to include quantification of all 'economic' impacts, that is, financial, environmental, social and capacity building/stock of knowledge. In addition, the assessments are increasingly providing a basis for improving the research selection process by identifying lessons learnt from past activities and feeding them into the project development and selection process.

Emphasis is also placed on developing collaborative links with partner country, Australian and international groups undertaking similar activities to enhance ACIAR's effectiveness in this area. These collaborative links help improve the accuracy of the information used in assessing the

impacts of the research and also the effectiveness of the methodology used to quantify the returns on investment.

In all, seven projects or sets of projects were formally assessed this year. The impacts of these projects are summarised in the following table. The results continue to show that the research ACIAR supports achieves significant returns on the funds invested.

For the first time this year four of the seven assessments were chosen using a stratified random sampling process. This is the first time in ACIAR, and we believe probably anywhere, that projects for formal impact assessment have been chosen in this way. The sample was chosen as part of the Australian benefits study last year. Based on the original proposals, projects were stratified into those expected to have Australian benefits and those not. This year the benefits to all partner countries were assessed for this same random sample.

The results, which are shown in the table, provide an interesting snapshot. Clearly caution is required in drawing conclusions due to the very small sample size (four out of well over 1,000 projects). As might be expected the four research efforts display a wide spread in returns on the investments. One project on sorghum breeding has very high returns, nearly \$200 million; one on trade access for mangoes has medium returns with \$20.8 million; one on trees on salt-affected land has low returns with \$2.4 million; and the

Project(s) Description	Chosen via a random sample	Net present value of benefits (\$ million)	Benefit/cost ratio	Internal rate of return (%)
Improved Australian trees species in Vietnam	No	132.4	82.6	32.2
Mite pests of honeybees	No	68.4	17.2	27
Minimising the impact of fungal diseases of eucalypts in South-East Asia	No	65.2	29.5	23
Sorghum breeding and capacity building	Yes	199.5	100.7	28
Improved trade in mangoes in Thailand, the Philippines and Australia	Yes	20.8	4.8	26.7
Tree growing on salt-affected land	Yes	2.4	1.12	5.7
Flowering behaviour of mangoes	Yes	-5.3	0	0

last, flowering of mangoes, has had no final impact yet. Given the inherently risky nature of research this is an interesting result. Taken together as a research portfolio this group has a very high return on the funds invested. Even the project with no measurable impacts yet has contributed to the stock of knowledge on an important industry problem and further research funded by others could still solve this difficult problem. If it does, some of the benefits would be attributable to the ACIAR project.

The other three projects were chosen because they fitted other objectives and were felt to have had significant impacts. As is shown, all were found to have very high returns of the funds invested. The two forestry research activities in Vietnam were chosen to facilitate training for partner groups in Vietnam. The mites in bees research activity was chosen because it was an interesting set of projects with a mix of complex benefits which require more complicated methods to analyse the impacts.

During this year a major effort was also focused on including the complex area on quantifying the benefits from capacity building in impact assessment studies. Most research has an element of enhancing the capacity of the participating scientists to undertake future research and therefore deliver future impacts. They also usually add to the stock of knowledge which can

be crucial for achieving future impacts. However, by its nature, ACIAR's collaborative partnership mode of operation usually makes a significant contribution in this area.

Few have tried to quantify the benefits from this aspect of research activities because it is a complex area. This has meant that the returns to some activities may have been underestimated. ACIAR commissioned a major study to review this area and develop effective methodology for quantifying these benefits. This has been applied to three case studies. The results have confirmed prior expectations. The potential returns to capacity building can be an important part of collaborative research partnerships such as those supported by ACIAR. The studies show that, although often complex, when values are placed on these impacts, the returns can be substantial. Often these returns have not been included in studies of the direct impacts. Estimates for the three case studies ranged from NPV of \$82,000 (B:C ratio of 13:1) to nearly \$200 million (B:C ratio of 100:1).

## Achievements

### ***Impact assessment of capacity building and training: assessment framework and two case studies***

Capacity building and training are important aspects of most ACIAR-funded collaborative partnership projects. Until now impact assessment studies have not tried to quantify the benefits to this aspect of research activities. ACIAR, in collaboration with the ATSE Crawford Fund, supported this study to review the literature and applications on this issue and develop a suggested framework for quantifying the returns to this type of benefit. The report provides a comprehensive review of the issues and relationships associated with capacity building and additions to the stock of scientific knowledge. It then develops a framework for quantifying impacts. This framework is applied to two quite different case studies. These demonstrate that, even though it is complex and difficult, it is possible to estimate and attribute benefits to capacity building. It also shows that these returns can be significant. In the case of pigeon pea breeding in India it was found that the NPV of the capacity building aspects of the research was \$67.6 million with a benefit–cost ratio of 28:1 and an IRR of 23%. This was about half of the total benefits to the research activity. On the other hand, for a smaller, yet important, water management research activity in Vietnam, the capacity-building contribution was valued at \$82,800 with a benefit coast ratio of 13:1 and IRR of 28%. In this case, though, the benefits to the capacity building component were only about 0.5% of the total benefits to the research. The results were published as Impact Assessment Series Report No 44.



### ***Development of sustainable forestry plantations in China: a review***

In China the forestry sector is a major contributor to economic growth. The development of fast-growing high-yielding plantations for wood production has made a significant contribution to this sector, especially over the past 20–30 years. Eucalypts species have played an important role in this development and ACIAR has supported a significant research activity in this area for some time. Past impact assessment studies have shown that the returns on this investment have been extremely high. However, to achieve the development success that has been achieved takes more than just the research activities which have identified substantial potential productivity gains. This report assembles the full story on the development and expansion of eucalypts in China and highlights the importance of collaboration and coordination of a wide range of efforts by many organisations to achieve this growth. It highlights the complexities of this process and therefore the difficulties of attributing the



substantial gains to the community in China from this success. The results were published as Impact Assessment Series Report No 45.

### ***Mite pests of honey bees in the Asia-Pacific region***

Mite pests are one of the major production constraints facing the apiary industry throughout the world. In most countries the mites are present and have a significant impact on productivity and production costs. In Australia, the only country in the world without these mites, quarantine strategies are a major issue. ACIAR has funded research on these important pests for about 15 years. The outcomes of this research have made a significant contribution internationally to a better understanding of the mites, especially varroa, and their host conditions. The outcomes of the research are a good example of the mutual benefit nature of ACIAR's collaborative research model. Research on a major pest for ACIAR partner countries which is also a major threat to Australia can result in a significant breakthrough, which was not as likely if the research was done in isolation in each country. The entomological expertise from Australia, working in partnership with local experts in different environments where pests are prevalent, provided a major breakthrough in understanding. This then resulted in the development of some simple control measures for smallholder beekeepers and, also, some important new strategies to improve significantly quarantine procedures. The scientific contribution of this work has also been significant. One of the papers from this work is the third most cited paper of all papers produced by CSIRO. This impact assessment study highlights the significant benefits which can be gained for both Australia and partner countries from collaborative research. In this case, due to the significance of the threat and relative size of the industry, the benefits to Australia are very large. On the other hand the benefits in the partner countries accrue to the poorer smallholder sector. The NPV of the benefits to all countries were \$99.9 million with a benefit–cost ratio of 25:1 and an IRR of 30%. The results were published as Impact Assessment Series Report No 46.

### ***Improved Australian tree species for Vietnam***

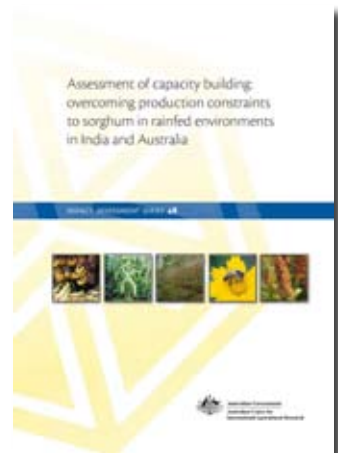
Australian tree species are being used extensively throughout the world because of their fast growth rates and adaptability to many (harsh) environments. While there is often some controversy regarding extensive use of these 'exotic' species, there are many cases where they have resulted in substantial growth for developing countries and effective replacements for degradation of native forests. ACIAR, from its earliest days, has had a regular set of projects which have undertaken a



substantial amount of research into these tree species in many areas. One important area has been to support the assembly of information about the wide range of species and especially the diversity of material within even these groups. Even where a particular species has been grown for some time the wide range of genetic material that is available within even individual sub-species, can lead to substantial improvements in productivity and product quality. This study looks at the impact on Vietnam of some of these research activities. It shows that, through adaptation, significant improvements in productivity can be achieved through selection of provinces which are best suited to different environments. This was especially the case for this research when this selection was combined with the introduction of improved methods of establishing seed production areas, seedling seed orchards and clonal seed orchards; very high levels of adoption were found. This has been assisted by the government introducing new regulations requiring nurseries to be licensed and seed sources to be certified. The returns on the research investment are shown to be very high, with estimates of the net present value of benefits of around \$130 million, a benefit–cost ratio of 83:1 and an IRR of 32%. This is consistent with similar impacts in other countries for this area of forestry research. The results were published as Impact Assessment Series Report No 47.

***Assessment of capacity building: overcoming production constraints to sorghum in rainfed environments in India and Australia***

ACIAR has continued to focus some of its impact assessment studies on this capacity-building aspect of research outcomes. The study reported here is part of this emphasis. In addition, ACIAR has started to use random samples of projects as the basis for selecting the impact studies it undertakes. It started this process last year with its study of the benefits to Australia from ACIAR-funded research. Then it chose five research activities for assessment in that study. This year, impacts of all benefits, not just to Australia, from this same random sample of projects were assessed. This study is particularly interesting. A preliminary assessment of the project review documents suggested that the project did not achieve any of the originally intended impacts. However, more detailed impact assessment investigation revealed that the project uncovered some new sorghum plant material which was of considerable benefit to Australia. This has subsequently led to a variety being developed through other Australian funding. Furthermore, it was found that although no new varieties were developed in India from the original work, the project did enhance the capacity of the Indian collaborators in some new areas of research techniques. This enhanced



capacity facilitated successful application for funding from other sources. The subsequent research activity has led to new varieties which are about to be released. The study concludes, through interviews with various people within the research system, that it is appropriate to attribute a small share of this impact to the capacity-building activities of the original ACIAR-funded project. The total returns which were attributed to both indirect effects are found to be significant with a net present value of benefits of around \$199 million and a benefit–cost ratio of 100:1. The study illustrates two interesting points. First, a random sample can identify impacts of projects which were otherwise not expected. In this case a project was chosen which it was not felt had had any impact. Second, the capacity-building part of at least some projects can provide substantial returns to the invested funds. The results were published as Impact Assessment Series Report No 48.

### ***Minimising the impacts of fungal disease of eucalypts in South-East Asia***

A range of eucalyptus species are grown in large areas throughout the world. This has been happening for over 100 years. However, in the last 30–40 years the area grown in plantations and in smallholder lots has increased substantially. Because of Australia’s knowledge and expertise in many areas of research on these species, ACIAR has always funded a range of projects in this important area. Part of the reason for the popularity of these trees has been a relative lack of pests and diseases when they are introduced into new environments. With these substantial increases in areas and numbers will always come an increased risk that pests and especially diseases will be introduced or local pathogens will adapt to attack the trees. In the 1980s there was a severe leaf blight epidemic in south-east and central Vietnam which severely reduced growth rates and deformed crowns and main stems of trees. This threatened the future of eucalypts. Less severe symptoms were also observed later in Thailand and north Queensland. The project assessed in this study: increased the knowledge of the disease; developed effective screening methods for selecting resistant trees; developed management strategies based on resistant species, provenances or clones; and established within-country expertise in all areas. It focused on Vietnam and Thailand. The study found that, because of the project, there is now genetic material with enhanced disease resistance available to growers in all countries. There is also capacity to manage a disease outbreak in both Vietnam and Thailand. High-risk regions were identified through climatic modelling, so surveillance is now more effective. In addition, information of the importance of disease management has been provided to growers, especially for the plantation sector.



Adoption has been substantial through certification of the new plant material in Vietnam and collaboration with private plantations in Thailand. The impact assessment analysis shows that the return on investment has been very high with a net present value of benefits of over \$65 million, a benefit–cost ratio of 30:1 and an IRR of 23%. The results were published as Impact Assessment Series Report No 49.

### ***Improved trade in mangoes from the Philippines, Thailand and Australia***

During 2006–07, ACIAR used a small random sampling approach to choose four projects for the majority of its impact assessment studies. This report provides the results of the impact assessment for two of these sampled projects. Both projects related to the mango industry in the Philippines, Thailand and Australia. However, one looked at an issue related to on-farm production by developing a better understanding of flowering to even out production cycles. The other considered technologies to facilitate trade by developing new methods of treating fruit to meet quarantine requirements in export markets. The results of the impact assessment studies were mixed. One project activity has generated some significant impacts and the returns to the research were found to be high. The other did not generate any direct impacts for farmers. These results raised some interesting issues. The mango flowering project chose an area which is a major issue for farmers and the industry in all countries. Like many perennial tree crops, mango yields vary on a biannual basis. In other industries, with similar production characteristics, research has resulted in management strategies which have enabled farmers to effectively even out production. This is, however, a relatively complex area, so undertaking the first set of research is high risk and it may take several sets of research to fully understand the crop behaviour and develop practical solutions. On the other hand, disinfestation of fruit to satisfy quarantine requirements has been common practice for many years. In this case the banning of previously used chemicals to satisfy quarantine requirements generated the need for new technologies. There were some ideas available and even a significant set of other research being undertaken or results were already available. This area was lower risk and, indeed, one of the important impact assessment issues was how to attribute the benefits from increased trade to ACIAR as opposed to the other activities. The return on investment estimates reflected the above outcomes. The mango flowering project was found to have no measurable benefits. Although the research groups indicated that subsequent research, funded by other organisations, is still investigating this area, the start made by the ACIAR project could be a critical link to



achieving a final solution. For the disinfestation research, the returns of investment were found to be significant. The NPV of benefits was \$20.8 million with a benefit–cost ratio of 5:1 and an IRR of 27%. This study has generated some interesting issues which will be factored into future decisions regarding funding research in this type of area. The results were published as Impact Assessment Series Report No 50.

### ***Growing trees on salt-affected land***

Salinity and water logging are significant problems in a wide range of agricultural areas throughout the world. Australia, Pakistan and Thailand are disproportionately affected by salinity. In Pakistan, especially, significant areas of agriculture have been or are close to being abandoned due to salinity. Hydrological and chemical methods of land reclamation can be effective but are usually found to be very expensive and not financially feasible. Bio-agriculture has often been suggested as a potentially lower cost option. It has been found that there are a range of Australian tree species such as eucalypts and acacias which are adapted to not just surviving, but thriving in these types of environments. In addition, some Australian scientists have a relative international advantage in this type of research. ACIAR has funded a series of research activities in this area. This project was selected for impact assessment this year as part of a small random sampling process. It was not chosen because it was an obviously successful, high rate-of-return project. This impact assessment study found that although the research clearly demonstrated that growing short rotation trees can result in reclamation of abandoned land, the adoption of the outcomes has not been high. To date 7,000 ha in Pakistan and 5,000 ha in Thailand have been treated. This adoption was directly tied to development assistance provided by aid donors or the partner-country governments. There was little privately-funded farmer adoption identified. The gross welfare gains from adoption of the strategies developed were found to be high a present value (PV) of around \$300 million for the study areas. However, the development costs and relatively long investment periods before receiving a return mean that the net gains are low. The overall results of the impact assessment study show that the return on the research investment was positive but relatively low. The NPV of research benefits was \$2.4 million with a benefit–cost ratio of 1.12:1 and an IRR of 5.7%. This is significantly lower than many other areas of technology-oriented research activities. It is not uncommon to find that environmental research does not have high rates of return and it is often due to the long lags in achieving impacts. The results were published as Impact Assessment Series Report No 51.

