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# ACIAR Database for Impact Assessments (ADIA): an outline of the database structure and a guide to its operation

ACIAR IMPACT ASSESSMENT SERIES

# 60

Research that works for developing countries and Australia

# ACIAR Database for Impact Assessments (ADIA): an outline of the database structure and a guide to its operation

Centre for International Economics



**ACIAR**

Research that works for developing countries and Australia

[www.aciar.gov.au](http://www.aciar.gov.au)

2009

The Australian Centre for International Agricultural Research (ACIAR) was established in June 1982 by an Act of the Australian Parliament. ACIAR operates as part of Australia's international development cooperation program, with a mission to achieve more productive and sustainable agricultural systems, for the benefit of developing countries and Australia. It commissions collaborative research between Australian and developing-country researchers in areas where Australia has special research competence. It also administers Australia's contribution to the International Agricultural Research Centres.

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In order to monitor the effects of its projects, ACIAR commissions independent assessments of selected projects. This series of publications reports the results of these independent studies. Numbers in this series are distributed internationally to selected individuals and scientific institutions, and are also available from ACIAR's website at <[www.aciar.gov.au](http://www.aciar.gov.au)>.

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# Foreword

Which types of research and development (R&D) lead to the best returns, and in what circumstances? The Australian Centre for International Agricultural Research (ACIAR) constantly strives to answer these questions in order to make better-informed decisions with respect to future research projects. As part of this learning process, the agency has commissioned several meta analyses of its Impact Assessment Series reports. Such impact assessment studies are, however, often designed to demonstrate the returns to ACIAR investment, in order to support the agency's application for public funding, and much less to provide a comprehensive examination of the project portfolio. Also, there are concerns that projects have been hand-picked and are not representative of the entire suite of projects undertaken.

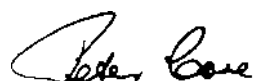
These factors have limited the lessons that might be learned from the evaluation of projects. Thus, in the future, ACIAR hopes to both assess a greater variety of projects and to capture the information from such projects in a consistent manner. To those ends, in 2008 Dr Jeff Davis, then Manager for ACIAR's Policy Linkages and Impact Assessment Program, spearheaded a standard approach to assessing projects. This also led to the development of the Project Impact Assessment Summary (PIAS), a tool that comprises a standard form to summarise key results from adoption studies and impact assessments.

This report describes the development of a database, the ACIAR Database for Impact Assessments (ADIA), that will be the repository of information from impact assessments and PIAS forms. The database will record all projects funded by ACIAR, and build up the information for each project as adoption studies and impact assessments are undertaken.

An important motivating factor for the development of the database was the need for a mechanism to choose a stratified random sample of completed projects for impact assessment. The data can also be presented in various forms for reporting and analysis.

Templates will guide the assessor and assist in prompting thought about the issues and aspects of the research that need considering, as well as providing the information necessary for the final report. These templates provide a basic framework for assessing the performance of projects and will be invaluable in rapid impact assessments, adoption studies and impact assessments / benefit-cost analyses.

The major aim of the database is to provide a consistent set of information that can be updated over the life of a project, and beyond to when the impact becomes observable. I commend the substantial work that has gone into the database development to date and look forward to its progressive implementation.



**Peter Core**  
Chief Executive Officer  
ACIAR



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# 1 Introduction

The Australian Centre for International Agricultural Research (ACIAR) funds a wide variety of research projects that aim to improve the productivity and sustainability of agriculture in developing countries and Australia. In order to make better informed decisions about future research projects, it is critical to understand what are the types of research and development (R&D) and circumstances that lead to the best returns.

In the past, this understanding has largely rested on the findings of meta analyses of reports in ACIAR's Impact Assessment Series (IAS). IAS studies have often been aimed at demonstrating the returns to ACIAR investment, in order to support the agency's application for public funding, rather than examining the project portfolio as a whole. This has led to concerns that the projects assessed have been hand-picked and therefore do not represent the entire suite of projects undertaken. This limits the lessons that might be learned from the evaluation of projects.

ACIAR hopes in future to not only evaluate a greater variety of projects but also to be consistent in the way it captures the information from assessment studies. This will mean standardising the approach used to gather information (without constraining the creativity of assessors) and developing a central repository for the storage of this information. A standard approach to assessing projects is set out by Davis et al. (2008), who also introduce the Project Impact Assessment Summary (PIAS), a tool using a standard form to summarise key results from adoption studies and impact assessments. The aim of their approach is to provide a body of information that can be updated consistently over the life of a project, and beyond to when the project's impact becomes observable.

This IAS report describes the development of a database, the ACIAR Database for Impact Assessments (ADIA), that will hold the information from impact assessments and PIAS summary forms. The database will record all projects that ACIAR funds, and build up the information for each project as adoption studies and impact assessments are undertaken. The report:

- sets out, in Chapter 2, the characteristics of the database in terms of the criteria for development of the database, the process that will be required to update the information in it, and its key features
- describes, in Chapter 3, the classification system used in the database
- summarises, in Chapter 4, the content of the database
- gives, in Chapter 5, installation instructions
- demonstrates, in Chapter 6, the types of reports that can be generated using the database.

The database is currently populated with the information collected in a study by Pearce et al. (2006) of the benefits to Australia of ACIAR-funded research.



## 2 Characteristics of the database

### Development criteria

The requirement is for a relational database that can support stratified random sampling; portfolio investment information; aggregation of the returns to ACIAR research across years, countries and commodities; and other portfolio analyses. This requires standardisation of terminology and, to a lesser extent, the approaches taken to evaluation.

### Random sampling of projects for impact assessment

An important factor motivating the development of the database is the need for a mechanism for choosing a stratified random sample of completed projects for impact assessment. Key requirements are:

- the ability to identify sets of related projects that should be evaluated as a package rather than separately, especially to avoid crediting the last project in a series with the gains of the package as a whole, and hence avoid overstatement of the net benefits
- the capacity to select samples of projects for evaluation stratified according to ACIAR's current needs for information on performance. This includes stratification by:
  - country/region
  - commodity
  - type of R&D—technical, capacity building or policy.

### Portfolio analysis

The database is designed to support analysis of the portfolio in a range of ways. The main development directives were that it should permit :

- calculation (based on the sample of projects for which impact assessments were undertaken) of the total benefits derived from ACIAR projects in any one year
- a summary of the returns on ACIAR projects across countries and commodities
- a snapshot of trends in returns for investments made over the life of ACIAR
- an overview of the history of ACIAR expenditure across commodities, countries and the type of research, to indicate (on an expenditure basis) trends in the composition of the ACIAR portfolio.

Based on the data entered, ADIA can be used to manipulate information and present it in various forms for reporting and analysis. At this stage, the PIAS form asks for more information than is likely to be available from project proposals, may be available from adoption studies, or even might be fully documented in the impact assessments. These gaps are recognised, and a process to fill some of the gaps is proposed for the next stage of development. The gaps in the data limit the scope of the reporting that can be undertaken. As the database will have preliminary information on all ACIAR projects (country, commodity and type of R&D), it will be possible to assess how restrictive the information gaps are on the portfolio analysis; that is, the extent to which the subsample on which the analysis is based is representative can be calculated.

## Data standardisation

Previously, impact assessors were simply assigned the task of assessing a project or group of projects and charged with the responsibility of providing a report detailing the benefits and costs. On the whole this approach will not change, but new templates will be provided to guide the assessor and stimulate thought about issues and aspects of the research that need to be considered. They will also indicate information that needs to be in the final report. The templates provide a basic framework that can be used for assessing the performance of projects and will promote consistency in reporting across various types of assessments including:

- rapid impact assessments
- adoption studies (these will take up the PIAS template over time)
- impact assessments / benefit–cost analyses.

## Operating procedures

The process for obtaining, standardising, entering and reporting on the data is illustrated in Figure 1. The PIAS template is set up as a form that allows electronic transfer of the information directly into the database, avoiding the need for re-entry of the information.

The database allows:

- selection of a sample of projects based on specific criteria, to facilitate stratified random sampling
- presentation of summaries of the entire ACIAR portfolio
- generation of reports on each of the above.

Each of these tasks is flexible and can be performed at the discretion of the end user. Unique criteria can be specified to generate different samples, summaries can be tailored to meet certain requirements and reports can be configured to convey information about project inputs, outputs and, in the long run, impacts.

The ability to examine the complete set of projects, a subset of projects or individual projects allows different types of analyses to be carried out. Essentially, the

database is designed to allow many types of analyses to be done on the complete set of projects. The type of analysis is limited only by the requirements and capacities of the end user.

## Final structure and prospects

The reporting stage of impact assessment is critical in determining the requirements for data collection, and highlights the circularity of the database development process. Knowing the output requirements of the database in advance assists in:

- defining which data sources are necessary in order to obtain the relevant information
- understanding how to structure the templates and shape the data such that meaningful comparisons can be made across various studies.

The incorporation of feedback between the reporting stage and the data source and template stages that precede it (see Figure 1) was critical in the design phase of the database project.

In broad terms, a two-stage approach was employed to develop the final database:

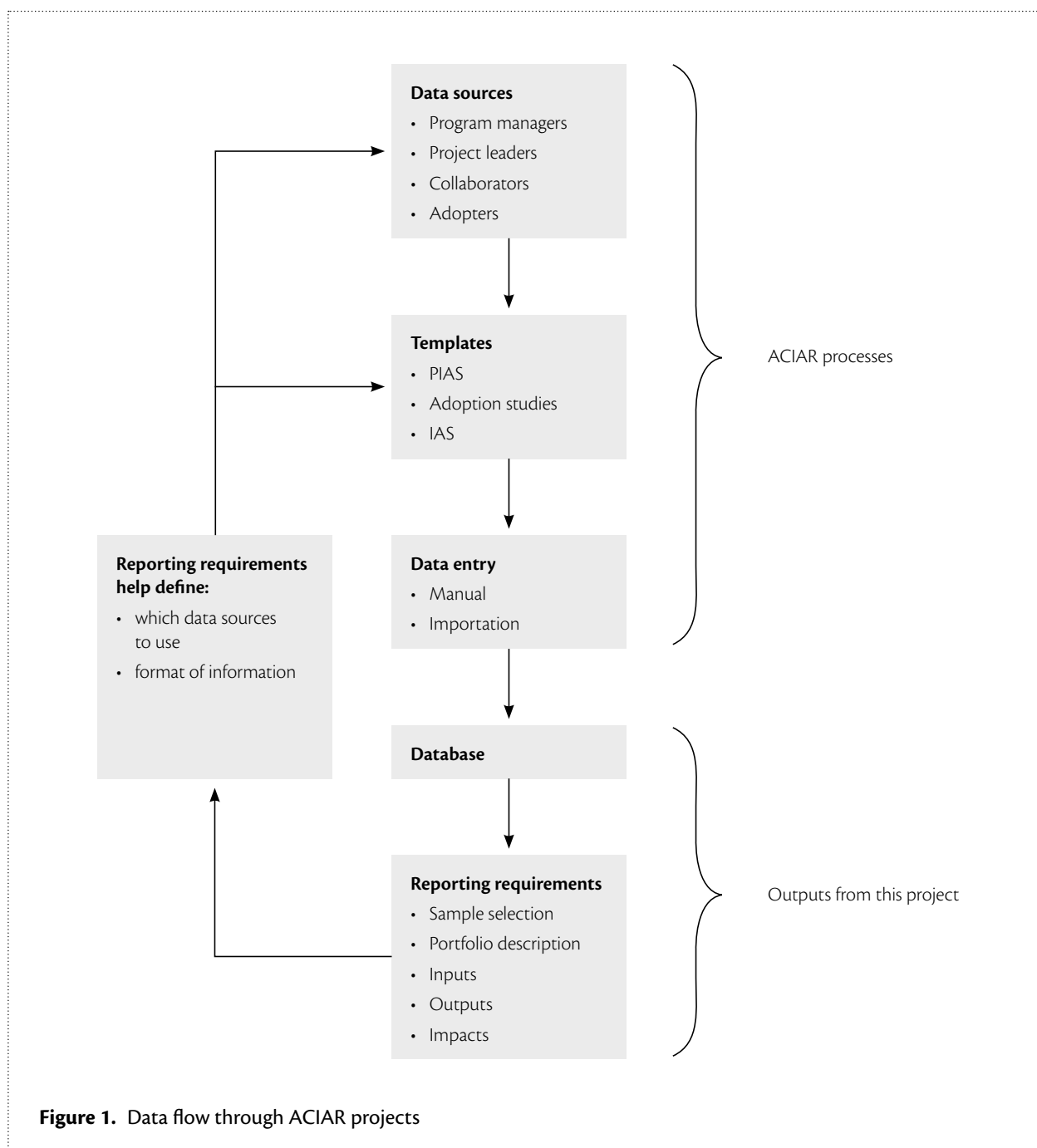
- definition of a classification system that can be used to categorise projects and analyse the overall research portfolio
- construction of a database system to be used in the manipulation of project data and reporting.

The first stage involved creating a theoretical basis on which to develop the database. This entailed defining categories for different areas within the database, suitable formats for data such as benefit streams and so on. We then proceeded to the second stage.

The database is a relational database developed using Microsoft® Access. The format of the data is designed such that data that conform to the aforementioned templates can be directly and readily entered or imported into the database. The database is designed to allow for expansion at a later date. The overall goal was to develop a product that could be used to analyse the complete portfolio of ACIAR projects.

This report is not the end of the process. The value of ADIA will depend on the quality and coverage of the information it contains. Against the value for sampling and reporting on portfolio investment and performance must be set the cost of data compilation and entry. The following steps aim to minimise this cost, while maximising the information gathered.

- The assessors in all impact assessments undertaken should be required to complete the PIAS template electronically and submit this with their impact assessment report (it should be an annex to the final report). The time series of benefits and costs used in the impact assessment should also be submitted in a Microsoft® Excel spreadsheet, with benefits flows for each country separately identified (an Excel template will be provided for reporting the results). Both batch processing and manual entry are supported by the database.



**Figure 1.** Data flow through ACIAR projects

- All adoption study assessors should be required to complete the PIAS template to the best of their ability. The PIAS template asks for estimates of magnitudes in several places. Assessors should be encouraged to provide their 'best guess' where actual magnitudes are difficult to estimate. The completed template should be provided as an annex to the adoption study report. The areas in the template that require text describing the research, outputs, adoption pathways and impacts should be drawn directly from the summaries.
- On the completion of all projects, project personnel should complete the PIAS template to the best of their ability (outcomes may be envisaged, but are unlikely to have yet occurred). Currently, the submission of project completion reports is patchy and, while the PIAS should, ideally, be attached to the project final report, enforcing the submission of a PIAS will provide a subset of desirable information at project completion.
- Over time, the PIAS could be applied at the project proposal stage. Its advantage is that it provides a structured approach to assessing projects. Moreover, its application should strengthen the requirements for analysis of potential benefits at the proposal stage. This should assist in identifying the application of the R&D and improve focus on the adoption by next and final users, while not ruling out research proposals that are more 'blue sky'.

### 3 The database classification system

The classification system used is based on current ACIAR categories where possible. A brief review of the majority of past ACIAR projects was undertaken and several additional categories established based on the results of that review. These categories will allow the presentation of the research portfolio across a number of dimensions including:

- partner country
- program area
- commodity
- type of R&D
- adoption pathway
- nature of impacts
- initial assessment impacts (high, medium or low)
- rate of return.

This classification system supports the selection of stratified random samples of projects for impact assessment. A comparison can also be made between those projects already assessed and the entire portfolio, to determine if the current assessments are representative of the full set of research.

Some of the broad categories have further underlying subcategories. In entering data, the most disaggregated level should be entered (this will subsequently be automatically aggregated). When a project is about rice, for example, this aggregates automatically to grains, then to crops. Drop-down menus are available in the database to avoid the problem of alternative descriptions (such as grain and grains, and cereals). Some of the categories, such as program area, country and project status, are easily defined. Others are less clear and require careful definition. This is especially so when considering how the project benefits arise.

#### Input categories

Table 1 lists ACIAR's program areas. Note that some of the areas listed have been subsumed into others and are no longer separate programs.

The other main input categories are the countries and commodities involved. As ACIAR shifts the focus of its work to the less-developed countries such as Cambodia and Laos, an increase in the relative importance of the whole farming system may lead to an approach that is less commodity based. The database has scope to add new categories as such changes arise.

#### Output, outcome, impact and benefit categories

The categorisation used here is based on the pathways by which ACIAR projects may lead to benefits. These pathways are illustrated in Figure 2. Initially, each project will have outputs in one or more of four basic areas:

- technology
- scientific knowledge
- capacity building
- policy.

These channels are not intended to be exhaustive; nor are they mutually exclusive. There may, in fact, be a great deal of overlap between them. Each one will, however, have a unique influence on the way the project findings are adopted. Having established how the research outputs are being used enables an assessment of the impacts. Four areas may be affected:

- demand
- supply
- environment
- social.

**Table 1.** ACIAR programs and program codes

Program	Program code
Agricultural Development Policy	ADP
Agricultural and Natural Resource Economics	ANRE
Agricultural Systems Economics and Management	ASEM
Animal Health	AH
Animal Sciences	AS
Communications, Training and Extension	CTE
Crop Improvement and Management	CIM
Crop Protection	CP
Crop Sciences	CS
Economics and Farming Systems	EFS
Fisheries	FIS
Forage	FOG
Forestry	FST
Horticulture	HORT
Impact Assessment Program	IAP
Impact Assessment Unit	IAU
Land and Water Resources	LWR
Livestock Production Systems	LPS
Plant Nutrition	PN
Policy Linkages and Impact Assessment	PLIA
Postharvest Technology	PHT
Smallholder Farming Systems	SFS
Soil Management and Crop Nutrition	SMCN
Soils and Water Management and Land Use	SWL

Source: ACIAR

Each of these areas has an inherent risk, such as a supply-chain failure or a pollution event, that could be altered by the research. Any change in the risk will also influence the way in which the research will affect these areas. Once the impacts are determined, the benefits of the research can then be valued quantitatively or qualitatively. The benefits can be:

- economic
- environmental
- social.

Each of the output, outcome, impact and benefit areas can be further broken down as described below. The classifications outlined in the following sections are not exhaustive but are based on the most common approaches and pathways for ACIAR projects. They were identified in the study by Pearce et al. (2006) of benefits to Australia from ACIAR-funded research, which scanned 900 projects.

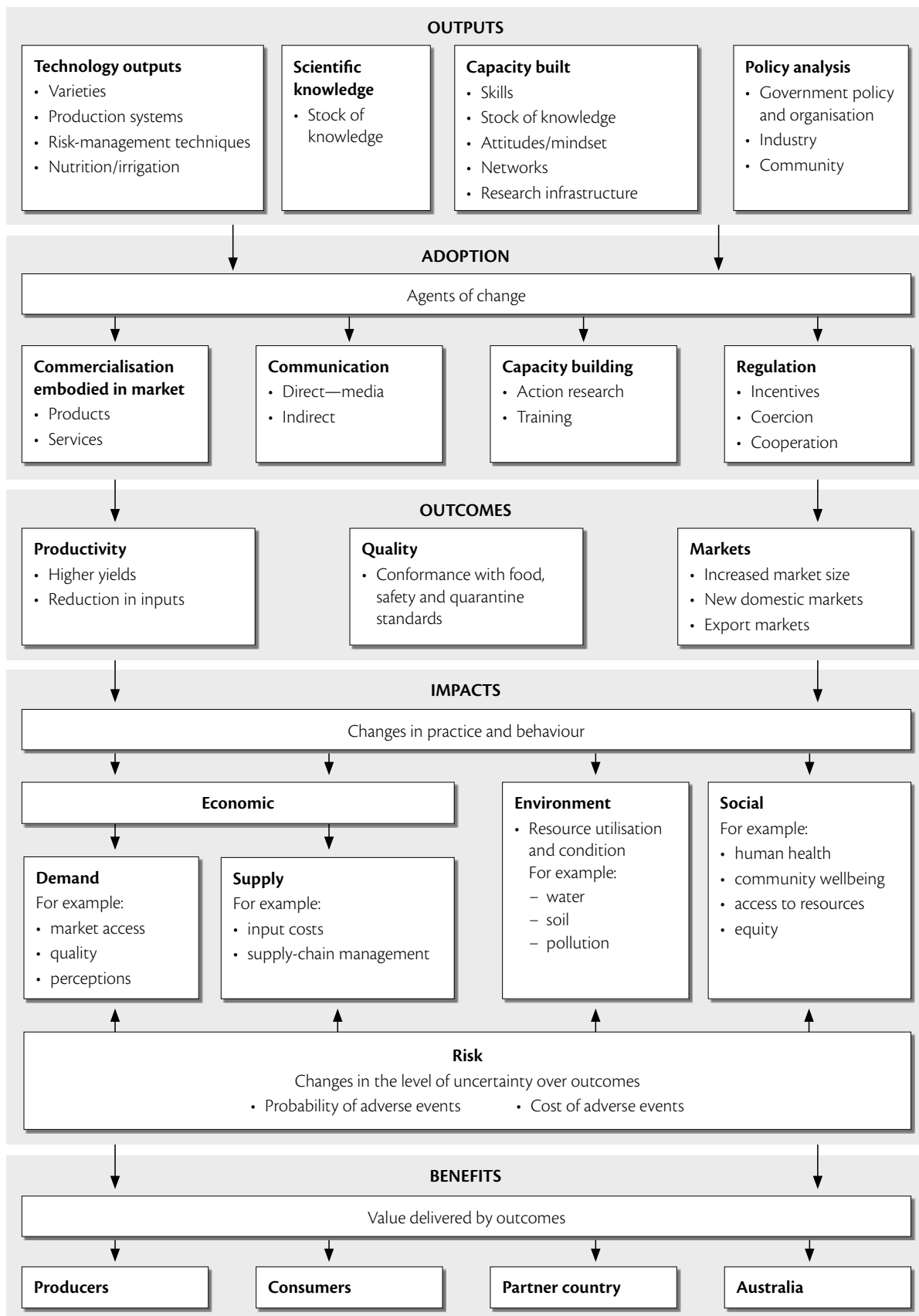
The primary beneficiaries are usually members of the industry targeted (growers, processors, wholesalers, retailers and service providers) and consumers of the industry's products. Distinction needs to be made by country as well.

### Outputs

Outputs can be considered at two levels. Level 1 defines the broad area of the output as technology, scientific knowledge, capacity built or policy analysis, with overlap between each. For example, new technology is often based on raising the stock of knowledge which, in turn, was generated in parallel with capacity development.

The key distinctions are that:

- technology is embodied in a good or service that could, but need not, be sold
- scientific knowledge is independent of people and organisations, and can be freely shared, although the capacity to use it may limit access
- capacity built is embodied mostly in individuals but can also be in institutions in terms of their capabilities to undertake R&D or to further develop and adopt R&D outputs
- policy analysis is an input that can guide decision-making by government, industry or the community.



**Figure 2.** The pathways to benefits flowing from ACIAR projects. Data source: Davis et al. (2008)

A short description of each of the level 1 categories follows.

### Technology

The most direct impact of agricultural R&D is the development or adaptation to local conditions of technology and agricultural production methods. The supply of agricultural products is directly affected by the elaboration of:

- plant genotypes or animal breeds
- farming methods and equipment
- methods of combating pests and diseases.

### Scientific knowledge

Although most ACIAR projects have an emphasis on application, scientific breakthrough and better understanding of some fundamental mechanisms are often important outputs of the research and may form the basis of new technologies or seed further research work. These are intermediate outcomes and impact assessment will thus be contingent on the utilisation of the gain in scientific knowledge.

### Capacity built

ACIAR R&D projects are collaborative and aim to share technical and scientific knowledge and increase the research capabilities of the participating scientists and organisations in partner countries. The lead times in agricultural research, from the identification of new breeds, through further development, field testing and adoption by farmers, are often very long, stretching beyond the intervals commonly covered by evaluation reports.

Most ACIAR projects emphasise building strong research platforms in partner organisations. This facilitates the future development of new technologies or changes in policy as these international and national organisations continue to undertake R&D. Like scientific knowledge, capacity built is an intermediate outcome, and impact assessment requires mapping through to the changes that arise from the application of the additional capacity. Gordon and Chadwick (2007) provide guidelines for assessing capacity-building projects.

### Policy analysis

The third channel through which ACIAR R&D projects result in benefits is by providing policymakers with the analyses needed to make informed decisions and develop effective policies. This often arises through providing a new perspective on an issue as a result of applying new analytical techniques and/or the provision of more accurate data. The benefits flow when the policy change is made, and this, in turn, changes behaviour and practice.

Many individuals who have worked on ACIAR projects have risen to prominent positions within their home countries. Their intimate knowledge of the research, coupled with their influential positions, allows them to champion new ideas and facilitate adoption via policy change.

Each level 1 output is subsequently disaggregated into level 2 outputs that home in on the origins of the outputs. The breakdown is shown in Table 2.

### Adoption

Research that yields outputs does not necessarily result in benefits. Agents of change—that is, those who adopt the findings of the research and produce something useful with it—are the ones who influence the value of any benefits that may arise. Table 3 lists the adoption pathways at two levels.

### Commercialisation

Partnership with commercial players in the distribution of publicly funded R&D outcomes is a common pathway for adoption of new varieties and, in some cases, techniques. Many organisations also view partnership as a way to leverage the returns from their research. Commercialisation can be undertaken by not-for-profit organisations. Its main feature is that the R&D is embodied in a product or service that is then sold, or provided free of charge, to the final user.

In some developing countries where ACIAR works, the policy and institutional environment may not be conducive to stimulating commercial supply of new technologies. Alternative pathways have to be identified or developed, such as public-sector extension systems or linkages with other development-assistance programs. Even so, commercial operations seem to thrive even



in the most unfriendly environments, and ACIAR is seeking to further support the dissemination of new ideas in ways that do not crowd out private initiative.

**Table 2.** Classification of outputs from ACIAR projects

Level 1 outputs	Level 2 outputs
Technology	Varieties
	Production systems
	Risk management
	Nutrition/irrigation
	Husbandry
	Harvest
	Postharvest handling/storage
	Distribution/transport
	Value-added/processing
	Marketing/market access
	Sustainability
Other technology	
Scientific knowledge	Journal articles
	Database
	Internal working papers
	Seminars
Capacity built	Skills
	Attitudes/mindset
	Networks
	Research infrastructure
	Other capacity built
Policy analysis	Government
	Industry
	Community
	Other policy analysis

Sources: various ACIAR Impact Assessment Series reports

### Communication

Research findings can be communicated via a number of channels, including direct contact with individual end users, public seminars for industry stakeholders, development of formal courses in the existing

educational infrastructure, and the publication and distribution of printed material. Often the projects are run in conjunction with real-world test sites, so informal word-of-mouth communication between project participants and colleagues can be a simple but effective means of disseminating the knowledge gained from research.

At a more formal level, findings are often published in scientific journals. These publications are aimed more at scientists than end users. While this does not necessarily aid in the uptake of research findings it can stimulate further debate about findings and often provokes further work in the field of interest.

### Capacity building

Doing research is itself a way of building capacity. Through learning by doing in the undertaking of collaborative research, researchers in partner countries and Australia are able to improve their knowledge in relevant areas and to develop their ability to carry out future research. In addition to knowledge and skills gained by researchers, the research capacity of collaborating organisations may be improved by capital investment in infrastructure such as equipment and buildings. Participants from all countries involved often have the opportunity for international travel, allowing them to interact directly and network with their foreign counterparts.

Training is another method of building capacity. It can be organised at two levels. The first level is mainly for researchers in partner countries. They are often offered on-the-job training via collaboration with Australian organisations, or formal training in an Australian education institution.

The second level of training is for farmers, extension workers and agribusiness personnel. Many projects embody a seminar program to disseminate new technology and practices to end users. Such activities may also sometimes be categorised as extension.

### Regulation

Government regulation sometimes plays an important role in the adoption of R&D results. Governments may provide incentives such as direct subsidies and tax deductions to encourage farmers to use new technologies and practices. Conversely, they may

**Table 3.** Pathways to adoption of research outputs

Level 1 adoption pathway	Level 2 adoption pathway
Commercialisation (embodying research and development (R&D) output in a good or service)	Products
	Services
	Other commercialisation
Communication (behaviour change arising from accessing knowledge about the R&D output)	Direct media (e.g. information brochures for farmers)
	Indirect media (journal articles resulting from the project)
	Other communication
Capacity building (changes resulting from capacity built being utilised)	Action research
	Training
	Other capacity building
Regulation (change arising from industry, government or purchasers placing conditions affecting production systems, market access or other characteristic of the good or service)	Incentive (e.g. government subsidies, industry branding)
	Coercion (e.g. government penalties, standards for access to markets)
	Cooperation
	Other regulation

Sources: various ACIAR Impact Assessment Series reports; Davis et al. (2008)

penalise farmers using ineffective technologies and/or products. Changes in policy that have an impact on all market participants can lead to high levels of adoption.

### Outcomes

Adoption of the research outputs and innovations described above can increase agricultural yield and/or overall productivity by:

- raising yield or reducing net input requirements
- expanding the area suited to the agricultural practice concerned
- making agricultural production possible on marginal land
- permitting the use of land previously held fallow between the harvesting and planting of other crops.

These outcomes increase the supply of the commodity in question and consequently decrease its unit price to consumers. The change may occur at any level in the value chain from farm level to retailer. In some instances, the change may affect both supply and demand.

For example, a project that results in higher productivity may reduce the unit costs of a given product, thereby shifting the supply curve to the right. This may prompt certain consumers to switch from another previously cheaper but now more expensive good or service to the one targeted by the project.

The demand for agricultural products is also affected by such circumstances, since they can lead to:

- higher quality that conforms with food safety and quarantine regulations in potential export markets
- increased market size/penetration domestically and internationally.

These outcomes have a direct flow-on effect to the community. Lower unit costs of production usually increase farm incomes. The opportunity to farm different crops diversifies the sources of farm incomes, reducing the temporal volatility of income. The development of disease and pest treatments and protection also creates more certainty about future incomes.

The development of plant genotypes with shorter growing times facilitates additional cropping seasons in rotation systems and makes possible the use of otherwise fallow land in intercropping applications. When the crops concerned are associated with positive environmental effects—such as legumes, which take nitrogen from the atmosphere and fix it in the soil—the result can be a significant improvement in agricultural sustainability. This can also improve human health and environmental outcomes as a result of reducing the likelihood of water sources becoming contaminated by fertiliser run-off.

Bringing marginal agricultural land into production has the strong potential to reduce poverty in areas with poor-quality soils. The ability to grow crops and raise livestock provides poor communities with much-needed nutritional supplements as well as products to sell and generate cash income.

### Impacts

Impacts are changes in products, policies, practices and behaviours that result from the application of R&D outputs. They are usually changes that affect:

- the supply of, and demand for, goods and services, through effects on the value chain (economic effects)
- uncertainty associated with economic activity
- attributes of the social and natural environment.

The actual impacts that arise from a project often differ from those that were envisaged at the outset. The categorisation used here allows for the inclusion of both expected and unexpected impacts. Table 4 lists each of the level 1 impacts included in the database and the associated level 2 impacts.

#### Demand (economic)

These impacts include those that directly influence demand-side changes. Anything that influences change in demand—perception, quality, market access, income etc.—is included in this category.

**Table 4.** Categorisation of impacts from ACIAR projects

Level 1 impacts	Level 2 impacts
Demand	Market access
	Quality improvement
	Perceptions of product (more desirable)
	Other demand-side impacts
Supply	Input costs change—prices or volumes required
	Change in volume per unit input (yield)
	Supply-chain management—transaction costs change
	Other supply-side impacts
Environment	Waterway health / marine health
	Soil health (erosion, soil nutrients etc.)
	Biodiversity (ecosystem health)
	Pollution (air, water, noise)
	Other environmental impacts
Society	Human health and safety
	Community wellbeing
	Community access to resources (basic needs)
	Equity
	Other social impacts
Risk	Probability of risk
	Cost of risk
	Other impacts on risk

Source: Davis et al. (2008)

#### Supply (economic)

Possibly the easiest impacts to measure are those that affect supply. Anything that has an impact on input prices, processing costs and yields, for example, will change the supply side. A supply impact can arise at any point in the value chain.

## Environmental

Agriculture is highly reliant on the environment and prevailing conditions. Research that assists in more efficient use of natural resources such as water and land will have an environmental impact. These impacts are not limited to resource use or even agriculture. Any research resulting in, for example, lower pesticide use or a reduction in pollution due to improved processing will also have positive environmental consequences.

## Social

The most important social impacts associated with agricultural research are improvement in human health and nutrition and a reduction in poverty, the latter deriving mainly from higher incomes and levels of employment (labour productivity). Other, less-direct impacts will come from improvements in community cohesion and participation, self-esteem and confidence because of higher incomes and better or more secure access to resources and services.

## Risk

Each of the above impact areas—demand, supply, environment and social—has risks associated with it. Risk can be defined as the likelihood or probability of an event occurring multiplied by the consequences of such an event expressed as a cost:

$$\text{risk} = \text{probability} \times \text{cost}$$

It is clear from this equation that changing either the probability of an event occurring or its cost will alter the associated risk and therefore feed back into the impacts of the research.

## Benefits

Benefits measure the value that is delivered by the outcomes. Their assessment must consider the beneficiary, which can be the industry (producers, processors or others in the value chain) or consumers, either of which may be located in one of the research partner countries or in a country that did not participate in the project.

## Industry

A change in economic impacts (supply or demand) at any point in the value chain will have an effect on producer surplus. This surplus, the difference between the price a producer is willing to receive and the price they actually receive, is used as a measure of the welfare change for the industry.

## Consumers

Consumer surplus is similar to producer surplus but measures the difference between the price a consumer is willing to pay and the price they actually pay. Just as changes in supply and demand will affect producer surplus they will also affect consumer surplus. This change will permit a measure of the welfare change to consumers.

## Beneficiaries

ACIAR projects tend to involve multiple partners in different geographical locations and so the benefits may be spread across many countries. The countries generally include those involved in the research but may also include countries that did not actively participate. These ‘third-party’ countries may benefit indirectly through things such as quarantine improvements or directly by adopting the findings of the research.

## 4 Content of the database

The database comprises a number of interlinked tables, designed to accommodate data relating to different aspects of ACIAR's projects. The structure of these tables largely mirrors the way in which data will be obtained:

- *Project input information.* These data will be collected from a range of sources and reflect a factual account of various aspects of the project (expenditure, timing of the R&D, countries involved etc.).
- *Outputs.* Each project has certain outputs that are targeted, such as new varieties, disease control methods and so forth.
- *Impacts.* After a set interval the impacts of each project can be assessed and recorded in this section of the database.

The database tables can be classified into six groups according to the information they contain:

- basic project information
- types of R&D outputs
- adoption pathways
- types of impact and impact assessment
- benefits and costs
- documentation.

### Basic project information tables

Table 5 summarises the structure of tables containing basic information on ACIAR projects, including project number, program, project type and status, organisations involved, commodities and countries impacted, related

projects and funding. Most of the information may be collected from the current ACIAR database or other sources such as project documentation. Some of the data fields act as 'keys' in the database; that is, they represent a variable over which the data are indexed and so can be ordered or searched.

These tables are linked by the unique project number assigned by ACIAR. Flexibility was the main driver of the way in which they are structured. For example, the number of commodities and partner countries varies from project to project. Instead of having fields for commodities and partner countries in one table, the database has them stored as records in different tables, so that the user of the database can enter as many commodities and partner countries as appropriate. Similarly, the number of related projects and the number of years of funding are not fixed.

### Tables for types of R&D outputs

R&D outputs are grouped at two levels, as discussed earlier. Level 1 outputs are broad categories covering technology, scientific knowledge, capacity building and policy analysis. They are further divided into more detailed, level 2 outputs. For example, level 2 outputs of technology include varieties, production systems, risk management, nutrition/irrigation, husbandry, harvest, postharvest handling/storage, distribution/transport, value-added processing and marketing/market access.

Each output is assigned a code. Users need to enter the relevant code in the main table of types of R&D output. Codes are obtained from a tabulated list provided. In this way, data entry will be facilitated and involve many fewer keystrokes to record a particular output.

**Table 5.** Structure of database tables storing basic information on ACIAR projects

Table	Field	Note
Project information	Project number	Key: unique number assigned by ACIAR
	ACIAR program	
	Project name	
	Project type	Bilateral, multilateral or other
	Project status	Active, complete or pipeline
	Size	Small, medium or large
	Start/end year	
	Project leader	Project leader at commissioned organisation
	Project manager	Project manager at ACIAR
Commodity	Project number	Key
	Sequence number	Key: 1 for primary commodity, 2 for secondary commodity, and so on
	Commodity	Commodity classified by ACIAR
Partner country	Project number	Key
	Sequence number	Key: 1 for primary partner country, 2 for secondary partner country, and so on
	Country	
Organisation	Project number	Key
	Sequence number	Key
	Name of the organisation	
	Type of organisation	Commissioned organisation, partner country collaborating organisation, or other collaborating organisation
	Contact person	
	Phone/fax/email	
Project history	Project number	Key
	Sequence number	Key
	Related project	Project number of the related project
	Relationship	Immediate preceding project, other related project
Project funding	Project number	Key
	Year	Key: year the funding occurred
	ACIAR	Funding from ACIAR
	Other Australian organisations	Funding from other Australian organisations including commissioned and collaborating organisations, and other agencies, in current Australian dollars; no data yet
	Partner country	Funding from partner countries, in current Australian dollars; no data yet

Other advantages of this treatment are that it eliminates the chance of entering different names for the same output and makes the processing of data easier and quicker.

The database gives users flexibility to enter R&D outputs that are not predetermined. To do this, they have two options. They can simply enter 'Other' in the level 2 output field and type the output in the comment field. Alternatively, if a particular output has a high rate of occurrence, the database manager could add a record to the relevant code table, defining this output by a unique code, then enter the code in the main output table. This code could be used again later. Table 6 describes the structure of these tables.

**Adoption pathways tables**

Table 7 describes the structure of the tables storing information of project adoption pathways.

As with types of R&D outputs, there are two levels of adoption pathways: level 1 is a broad categorisation while level 2 is more detailed. Codes are again used to reduce the data-entry effort. Also, database users have the flexibility to add pathways that are not predetermined and to enter as many pathways for a project as they deem appropriate.

**Impact and impact assessment tables**

Table 8 describes the structure of tables in the database storing information about project impact and impact assessment.

As with R&D outputs and adoption pathways, *project impacts* are classified at two levels. At level 1, they are categorised into demand, supply, environment, social and risk impacts. Each of these level 1 impacts is further categorised into several level 2 impacts.

*Impact assessment*, on the other hand, is a single-level categorisation based on the impact categories developed by Pearce et al. (2006) in their study of the benefits to Australia of ACIAR-funded research. Here we extend their categorisation to partner countries.

**Benefit and cost tables**

Project benefits data are obtained from reports in ACIAR's Impact Assessment Series (various authors, 1998–2006). Because some projects were assessed in more than one IAS study, a table describing the relationship between IAS studies and ACIAR projects is needed. This is 'IAS projects' in Table 9. Some basic

**Table 6.** Structure of database tables for types of R&D outputs from ACIAR projects

Table	Field	Note
Type of research and development (R&D) output	Project number	Key
	Sequence number	Key: 1 for primary R&D output, 2 for secondary output, and so on
	Level 1 output	Choose from broad category of R&D outputs: technology, scientific knowledge, capacity building and policy analysis
	Level 2 output	More detailed output as set out in Table 2
	Comment	For users to put comments on the project, and input other R&D outputs
Level 1 output code	Code	Key
	Description	
Level 2 output code	Code	Key
	Description	

Note: Codes are used for standard level 1 and level 2 outputs to ease the data-entry effort.

**Table 7.** Structure of database tables for adoption pathways for ACIAR projects

Table	Field	Note
Adoption	Project number	Key
	Pursuit of adoption	Effective, partial or not included
	Time	Years to impact/adoption by users external to project
	Uptake	Grade of adoption uptake (choose one) NF: demonstrated and considerable use of the results by the next and final users Nf: demonstrated and considerable use of the results by the next user but only limited uptake by final users N: some use of the results by next users but no uptake by final users 0: no uptake by either next or final users
Pathways	Project number	Key
	Sequence number	Key: expected 1, 2, 3 and actual 1, 2, 3
	Level 1 pathway	Choose from commercialisation, communication, capacity building and regulation
	Level 2 pathway	More detailed pathways as set out in Table 3
Level 1 code	Code	Key
	Description	
Level 2 code	Code	Key
	Description	

Source: Davis et al. (2008)

**Table 8.** Structure of database tables for ACIAR project impact and impact assessment

Table	Field	Note
Impact	Project number	Key
	Sequence number	Key: 1 for primary impact, 2 for secondary impact, and so on
	Level 1 impact	Choose from demand, supply, environment, social and risk
	Level 2 impact	More detailed impacts as set out in Table 4
Impact code	Code	Key
	Description	Description of one particular level 2 impact
Impact assessment	Project number	Key
	Country	Key: Australia or partner
	Sequence number	Key: 1 for primary, 2 for secondary, and so on
	Impact	Choose one from: new production technology' direct protection from disease/pests already in country; indirect protection from disease/pest incursion from outside; increased trade; technology sales; biodiversity; training and stock of knowledge
Impact magnitude	Project number	Key
	Impact on Australia	Choose one from large, medium or small
	Impact on partner countries	Choose one from large, medium or small



**Table 9.** Structure of database tables for determining benefits and costs of ACIAR projects

Table	Field	Note
IAS <sup>a</sup> information	IAS number	Key: unique number of the IAS report
	Author	Authors of the study
	Year	The year when the impact assessment was made
IAS projects	IAS number	Key
	Sequence number	Key
	Project number	Project included in the relevant IAS
Benefits	IAS number	Key
	Project number	Key
	Country	Key
	Year	Key
	Benefit	Benefit in Australian dollars, current value
Budget share	Project number	Key
	Country	Key: Australia and specific partner countries
	Budget share	Share to split total budget of a project to several countries
IRR <sup>b</sup> guess	IAS number	Key
	Project number	Key
	Country	Key
	IRR guess	Initial guess for the calculation of the IRR

<sup>a</sup> ACIAR Impact Assessment Series (IAS) of reports

<sup>b</sup> Internal rate of return

information about IAS studies, such as authors and year of the study, is also collected and stored in ‘IAS information’ (Table 9).

The ‘Benefits’ table stores annual benefit flows for each country identified by each project appearing in each IAS study. It should be noted that the annual benefit data are not original. Original IAS country benefits are for all projects included in each of the IAS studies. They are split into relevant projects according to IAS study and ACIAR funding.

Some projects were assessed more than once and the benefits estimated differed between studies. It is therefore very important to include IAS report number in the benefits table.

Project funding data are included in the project information (input) section above (see foot of Table 5). In order to complete country benefit–cost analysis, project funding should be split into affected countries. The database stores information on the project budget share for each country in the table ‘Budget share’. It can then generate annual cost data for each country for each project by applying the budget share to project funding. The budget shares are determined outside the database.

Table 9 also lists a database table called ‘IRR guess’. The information in this table is used by a program calculating a country-specific internal rate of return (IRR) for each project in an IAS study. This information is needed because of the limited power of the IRR function in Microsoft® Access, which allows only 20 iterations. The default initial value of IRR function is 10%. If the actual IRR is too high, the function will not

be able to calculate the actual IRR within 20 iterations. In this case, the program stops and an error message is displayed. Providing an initial guess close to the actual IRR value is therefore very helpful.<sup>1</sup>

In order to be able to comment on both the quality of individual documents and of the project documentation overall, separate tables for these purposes are included in the database (Table 10).

**Documentation tables**

**Other tables**

The database can accommodate information about the project documentation available and its quality. Project documents include the initial proposal, progress reports, the final report, review reports, and adoption and impact assessment studies.

The database also includes some ‘calculated’ tables that are generated from the data in other tables. For example, a ‘Project country budget’ table includes the annual budget for every country in each project. It is produced from the ‘Project funding’ and ‘Budget share’ tables. Other examples of such tables include present value of benefits and costs, and IRR by project and country.

<sup>1</sup> Benefit and cost data can be exported to Microsoft® Excel, which has a more powerful IRR function than does Microsoft® Access.

While such tables are not essential to the database, they provide a convenient means for further explorations of project data.

**Table 10.** Structure of database tables for ACIAR project documentation

Table	Field	Note
Project documentation	Project number	Key
	Sequence number	Key
	Document type	Proposal, progress report, final report, review report, adoption study, impact assessment study etc.
	Exist?	Yes/no
	Archive number	ACIAR archive number of the document, if it exists
	Comment	Comments on the quality of the document
Overall comments on project documentation	Project number	Key
	Comment	Comments on overall quality of documentation of the project

## 5 Installing the database

The database has two parts:

- a front-end, which is the user interface and provides access to the database for end users.
- a back-end, which houses all the data relating to the projects in the tables described in previous chapters.

To install the database, the user needs simply to copy the front-end to their PC and connect it to the back-end using Microsoft® Access.<sup>2</sup> The process of installation varies slightly between machines running Access 2003 and Access 2007. The method for each version is outlined below.

### Copying the database front-end

The database front-end consists of a single file called 'ADIA\_user interface.mdb'.<sup>3</sup> This file should be copied onto the local machine from which the database is to be accessed. The location of the file is not important but it should be noted where it is saved in order to allow easy access. A typical location may be in the 'My Documents' area. Shortcuts may be created in the start menu, desktop or quick launch bar at the user's discretion.

<sup>2</sup> Users can run the database from a network location if they wish, but the method for doing so is not covered in this report. The concepts remain the same as running it from a location on an end user's PC.

<sup>3</sup> The name and location of this file may vary. For more information, contact the ACIAR person responsible for maintaining the database.

### Using Microsoft® Access 2003

Once the front-end has been copied onto the local machine, the interface needs to be linked to the underlying data. This is done using the 'Linked Table Manager', which can be found in the 'Tools' menu under 'Database Utilities'.

When activated, the manager brings up a screen on which each table referenced in the interface can be selected and linked to a corresponding table in the back-end (Figure 3). Select all the items in the list and then choose 'OK'. The 'Linked Table Manager' will then prompt for a location of the data, select the correct location and link the interface with the underlying data. The back-end data file is typically called 'ADIA\_data.mdb', but it may have been renamed.

### Using Microsoft® Access 2007

In Access 2007, linkage of the interface to the underlying data is made using the 'Linked Table Manager', which can be found in the 'Database Tools' menu (Figure 4).

When activated the manager brings up the screen shown in Figure 5 via which each table referenced in the interface can be selected and linked to a corresponding table in the back-end. Select all the items in the list and then choose 'OK'. The 'Linked Table Manager' will then prompt for a location of the data. Select the correct location and link the interface with the underlying data. The back-end data file is typically called 'ADIA\_data.mdb', but it may have been renamed.

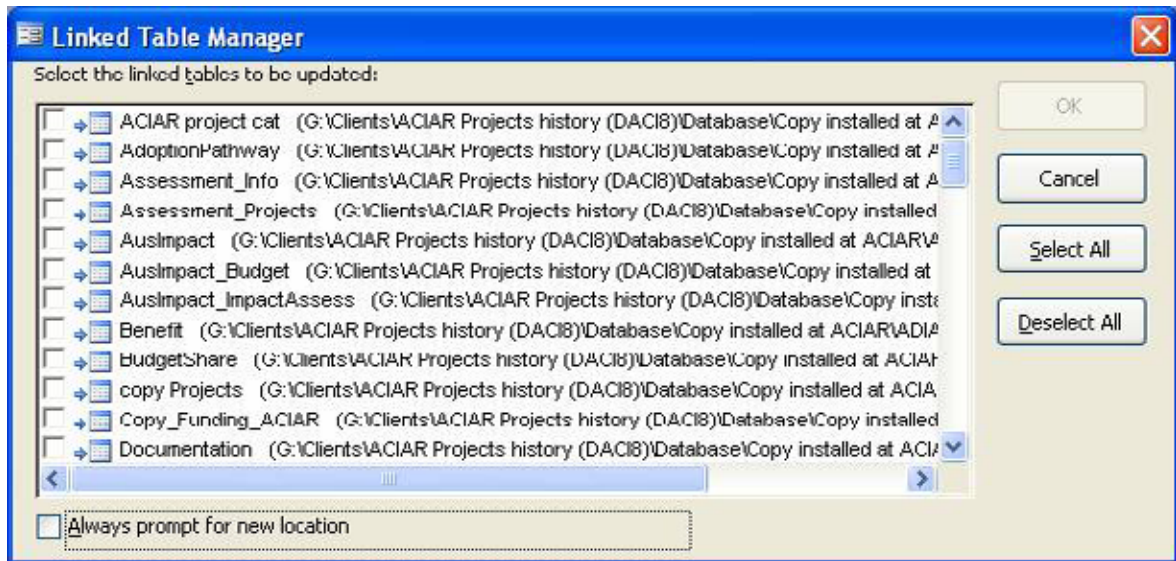


Figure 3. Microsoft® Access 2003 'Linked Table Manager'



Figure 4. Microsoft® Access 2007 'Linked Table Manager' menu item

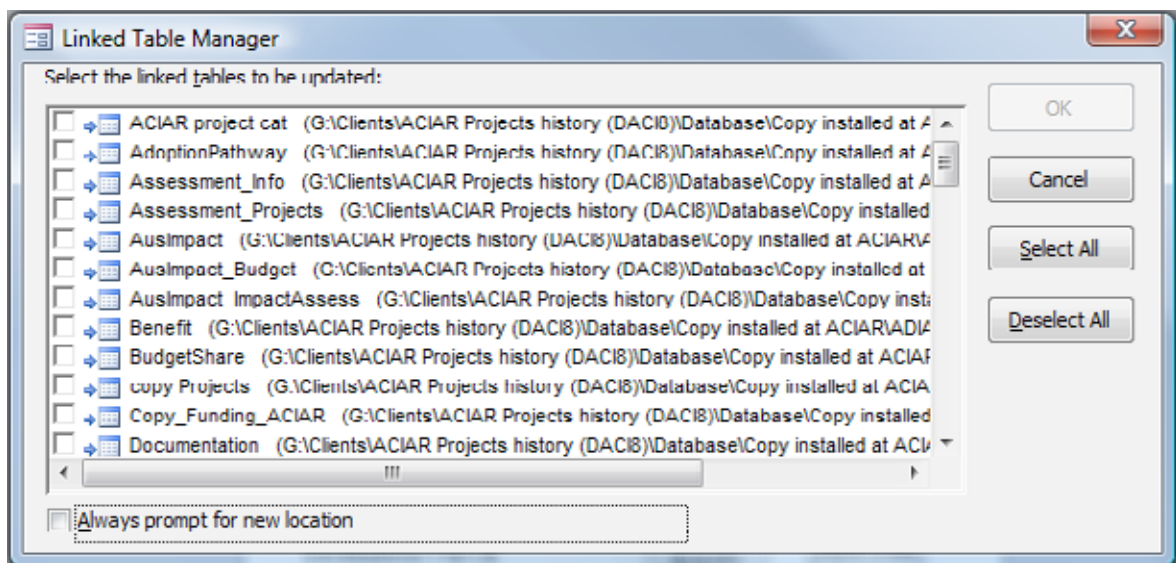


Figure 5. Microsoft® Access 2007 'Linked Table Manager'

## Database maintenance

The database may occasionally grow to a size that renders it slow and almost unusable. In such instances it may be necessary to 'Compact and Repair' it to restore optimal performance.

To perform this operation under Access 2003, select 'Database Utilities' from the 'Tools' menu, then choose 'Compact and Repair Database/Project'. In Access 2007, this option can be found by clicking on the 'Office Button' then choosing 'Manage' and 'Compact and Repair Database'. The database will automatically close, carry out any needed maintenance, then reopen once the process is complete.

## 6 Database operation

The two main activities involved in using the database are data entry and data retrieval.

### Data entry

The simplest way to enter data into the database is by using the pre-formatted PIAS template and the corresponding 'Cost Benefit Input Template'.

The PIAS template is a Microsoft® Word document that lays out each of the fields required for entry into the database. The form is designed to prompt users for data in a logical and simple way, such that they can easily enter the information in an operational environment that should be familiar to most of them.

The main menu of the database (shown in the left-hand part of Figure 6) contains an option labelled 'Import Data'. Selecting this option presents the user with the option of importing PIAS data or a benefit–cost stream (see the right-hand part of Figure 6).

### Importing PIAS data

The PIAS form includes a function to export the contents of the form to a small file convenient for emailing. This function is especially useful for researchers working in locations with low-speed internet connections. The small file can then be used to import the information into the database.

When the user opts to import PIAS data, they are prompted to choose a location where the data file (previously exported) is held and import its contents. Once the information is imported, the database will display a confirmation screen.

The process of importing the PIAS data erases any previous database information pertaining to the project in question.<sup>4</sup> The database creates new records for the project and imports the information accordingly. The project details can then be viewed in the database and included in reports (see later sections of this report for further information).

### Importing benefit–cost streams

The process of importing benefit–cost streams is similar to the procedure outlined above. The user selects 'Import Data' from the main menu of the database, then 'Import benefit cost stream' from the next menu. The user is then prompted to indicate where the data can be found.

The data for the benefit–cost streams is held in an Excel spreadsheet. The spreadsheet provides an environment that, like the PIAS form, should be familiar to most users. It should be filled out with the costs and benefits for each country (each country requires a separate spreadsheet) in base-year, undiscounted dollars. The base year can be specified by the user. Discounting and other functions are performed by the database.

### Reporting on the data

The main menu (see the left-hand part of Figure 6) contains an option to generate reports based on the data. These reports can be used to inform users on many aspects of the projects. The versatility of the reporting system parallels the creativity of the user. Two types of reports are allowed:

<sup>4</sup> It is important to note that this information is not recoverable, so care should be taken when performing this operation.

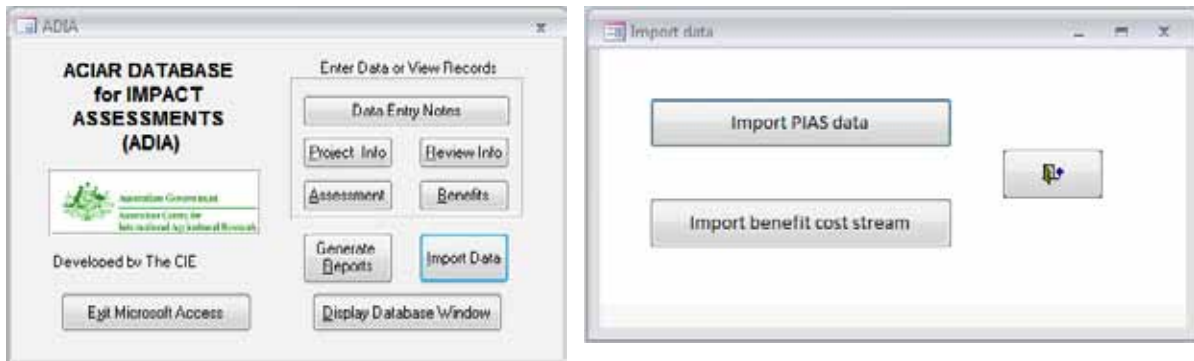
- user definable
- fully flexible.

**User-definable reports**

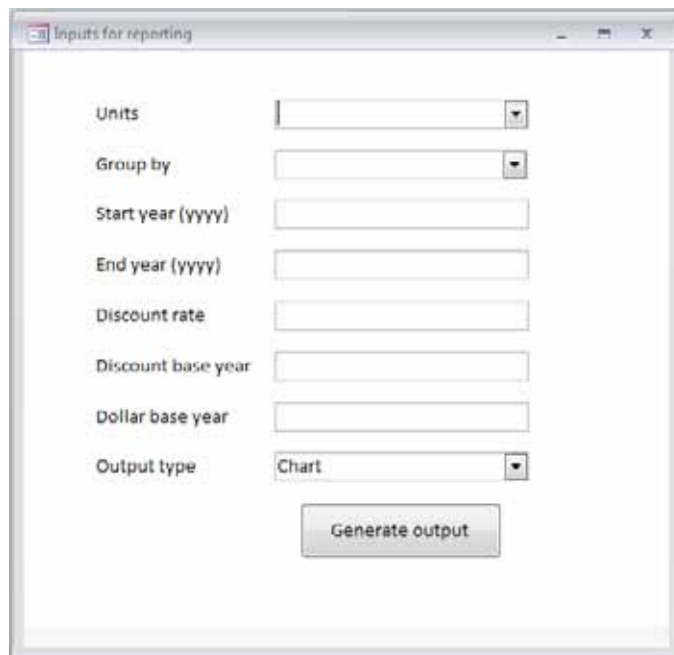
User-definable reports allow a user to generate reports based on a number of predetermined parameters. The user is presented with a number of options from which to choose and can customise the report accordingly. The options are shown in Figure 7.

Two menus form the basis of the reports generated using this menu. From the ‘Units’ menu the user can choose:

- dollar value of benefits
- dollar value of costs
- number of projects.



**Figure 6.** Database main menu



**Figure 7.** User-definable report menu

The 'Group by' menu contains three options:

- country
- program area
- year.

Using these menus, the user can generate various reports. For example, a report listing the 'Dollar value of benefits' by 'Country' could be chosen or the 'Number of projects' by 'Program area' could be displayed.

Subsequent options allow the user to further refine the report. A start and end year must be specified, together with a discount rate, discount base year and the dollar base year. The database will then present the information according to the options chosen.

The final menu item on this form offers a choice of outputs. The data can be presented graphically within Access or it can be exported to an Excel spreadsheet where the user may wish to further manipulate it. When exporting, the user is prompted for a file name and location to save the spreadsheet.

### Fully flexible reports

As the name suggests, the 'Fully flexible' reports can be more readily customised than the user-definable reports. By specifying a few key parameters and choosing one of six starting points the possibilities are wide ranging.

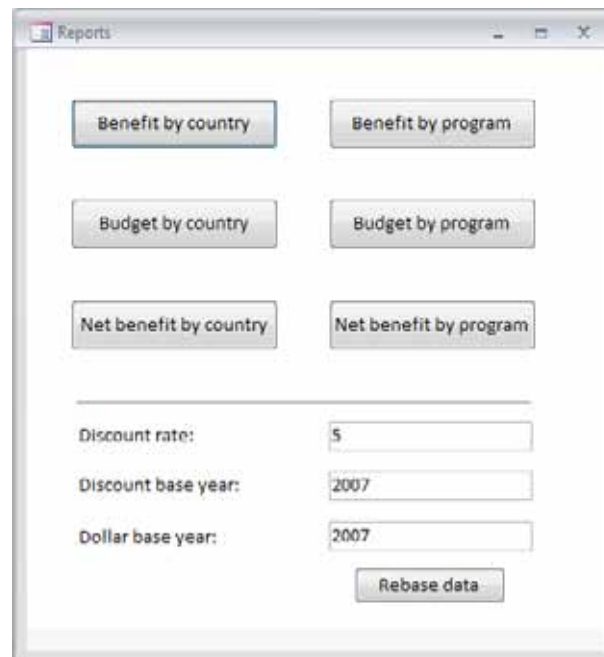
The parameters required are:

- discount rate
- discount base year
- dollar base year.

These three parameters are specified before the charts are displayed, at which point more customisation can take place.

The six possible starting points are:

- benefit by country
- benefit by program
- budget by country
- budget by program
- net benefit by country
- net benefit by program.



The screenshot shows a window titled 'Reports' with a grid of six buttons for report types: 'Benefit by country', 'Benefit by program', 'Budget by country', 'Budget by program', 'Net benefit by country', and 'Net benefit by program'. Below these buttons are three input fields for parameters: 'Discount rate' (value: 5), 'Discount base year' (value: 2007), and 'Dollar base year' (value: 2007). A 'Rebase data' button is located at the bottom right of the parameter section.

**Figure 8.** Fully flexible report options



The form used to specify the parameters and choose the initial type of chart is shown in Figure 8.

The reports are presented as pivot charts and are similar to their Excel counterparts of the same name. Figure 9 shows a 'Benefits by country' chart for China. The chart can be customised to display specific information depending on the user's requirements. For example, a user may wish to display similar information for all countries.

To do this, the user clicks on the drop-down box labelled 'Country' and selects 'All'. The chart shown in Figure 10 is displayed.

A further level of customisation can be achieved by adding fields to the chart. Returning to the China benefits chart, for example, we may be interested in examining the benefits from animal sciences

projects. By dragging the field 'Program' (from the field list shown in Figure 9) to sit next to the 'Country' drop-down box (Figure 11) a further level of filtering can be achieved.

Setting the value of the 'Program' field to 'All' in the output is equivalent to the original example (Figures 9 and 11 vary only in the addition of the 'Program' field in the latter). Changing this field to AS1 and AS2 includes only those benefits coming from the animal sciences projects, as shown in Figure 12.

The degree to which information can be manipulated to produce different types of charts is limited only by the data available and the knowledge and creativity of users. Application of the concepts described here will yield endless combinations and ways of manipulating the data.

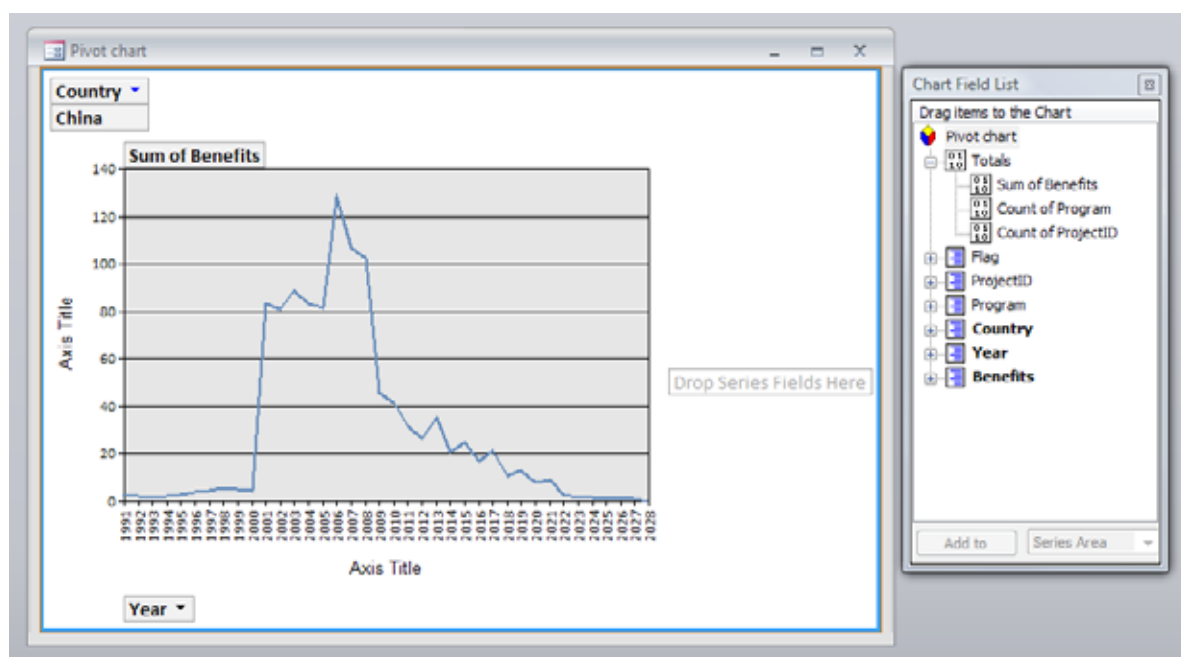


Figure 9. Chart of benefits by country for China

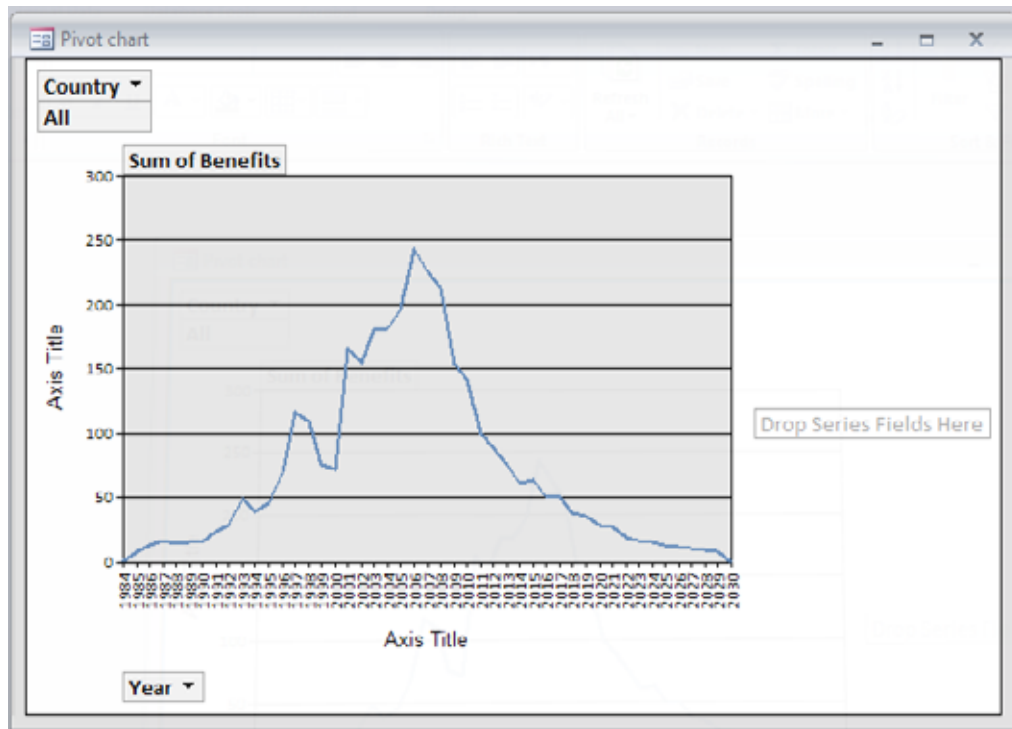


Figure 10. Chart of benefits by country for all countries

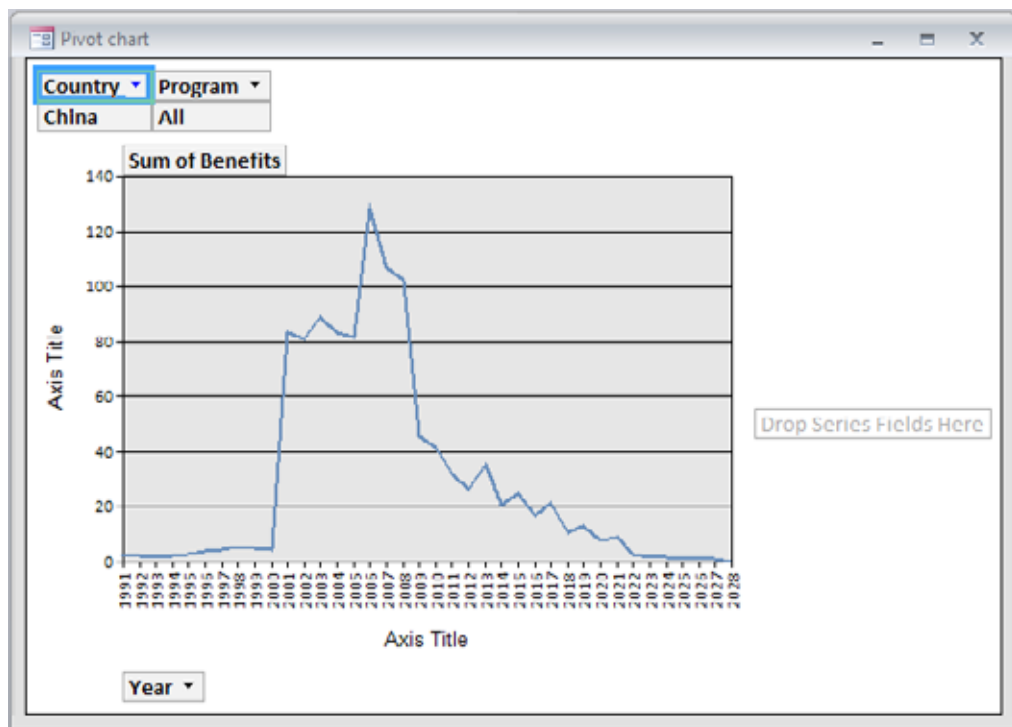
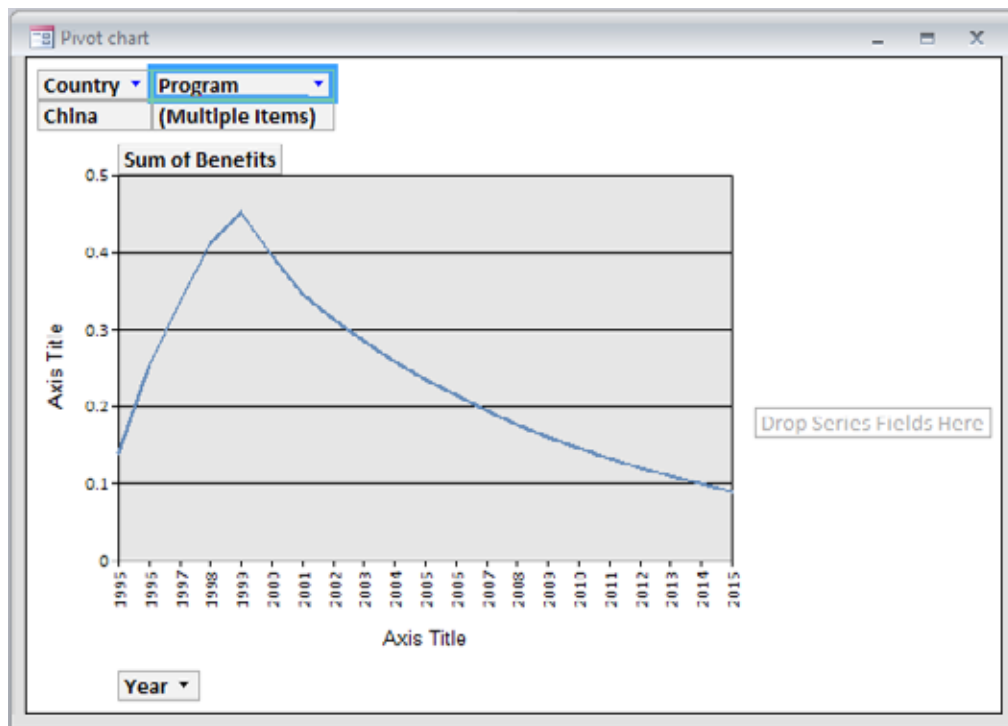


Figure 11. Adding 'Program' to the chart output



**Figure 12.** Chart of benefits by country and program for animal sciences projects in China

# References

- Davis J., Gordon J., Pearce D. and Templeton D. 2008. Guidelines for assessing the impacts of ACIAR's research activities. Impact Assessment Series Report No. 58. ACIAR: Canberra.
- Gordon J. and Chadwick K. 2007. Impact assessment of capacity building and training: assessment framework and two case studies. Impact Assessment Series Report No. 44. ACIAR: Canberra.
- Pearce D., Monck M., Chadwick K. and Corbishley J. 2006. Benefits to Australia from ACIAR-funded research. Impact Assessment Series Report No. 39. ACIAR: Canberra.

## IMPACT ASSESSMENT SERIES

No.	Author(s) and year of publication	Title	ACIAR project numbers
1	Centre for International Economics (1998)	Control of Newcastle disease in village chickens	8334, 8717 and 93/222
2	George, P.S. (1998)	Increased efficiency of straw utilisation by cattle and buffalo	8203, 8601 and 8817
3	Centre for International Economics (1998)	Establishment of a protected area in Vanuatu	9020
4	Watson, A.S. (1998)	Raw wool production and marketing in China	8811
5	Collins, D.J. and Collins, B.A. (1998)	Fruit fly in Malaysia and Thailand 1985–1993	8343 and 8919
6	Ryan, J.G. (1998)	Pigeon pea improvement	8201 and 8567
7	Centre for International Economics (1998)	Reducing fish losses due to epizootic ulcerative syndrome—an ex ante evaluation	9130
8	McKenney, D.W. (1998)	Australian tree species selection in China	8457 and 8848
9	ACIL Consulting (1998)	Sulfur test KCL-40 and growth of the Australian canola industry	8328 and 8804
10	AACM International (1998)	Conservation tillage and controlled traffic	9209
11	Chudleigh, P. (1998)	Post-harvest R&D concerning tropical fruits	8356 and 8844
12	Waterhouse, D., Dillon, B. and Vincent, D. (1999)	Biological control of the banana skipper in Papua New Guinea	8802-C
13	Chudleigh, P. (1999)	Breeding and quality analysis of rapeseed	CS1/1984/069 and CS1/1988/039
14	McLeod, R., Isvilanonda, S. and Wattanutchariya, S. (1999)	Improved drying of high moisture grains	PHT/1983/008, PHT/1986/008 and PHT/1990/008
15	Chudleigh, P. (1999)	Use and management of grain protectants in China and Australia	PHT/1990/035
16	McLeod, R. (2001)	Control of footrot in small ruminants of Nepal	AS2/1991/017 and AS2/1996/021
17	Tisdell, C. and Wilson, C. (2001)	Breeding and feeding pigs in Australia and Vietnam	AS2/1994/023
18	Vincent, D. and Quirke, D. (2002)	Controlling <i>Phalaris minor</i> in the Indian rice–wheat belt	CS1/1996/013
19	Pearce, D. (2002)	Measuring the poverty impact of ACIAR projects—a broad framework	
20	Warner, R. and Bauer, M. (2002)	<i>Mama Lus Frut</i> scheme: an assessment of poverty reduction	ASEM/1999/084
21	McLeod, R. (2003)	Improved methods in diagnosis, epidemiology, and information management of foot-and-mouth disease in Southeast Asia	AS1/1983/067, AS1/1988/035, AS1/1992/004 and AS1/1994/038
22	Bauer, M., Pearce, D. and Vincent, D. (2003)	Saving a staple crop: impact of biological control of the banana skipper on poverty reduction in Papua New Guinea	CS2/1988/002-C
23	McLeod, R. (2003)	Improved methods for the diagnosis and control of bluetongue in small ruminants in Asia and the epidemiology and control of bovine ephemeral fever in China	AS1/1984/055, AS2/1990/011 and AS2/1993/001
24	Palis, F.G., Sumalde, Z.M. and Hossain, M. (2004)	Assessment of the rodent control projects in Vietnam funded by ACIAR and AUSAID: adoption and impact	AS1/1998/036

## IMPACT ASSESSMENT SERIES <CONTINUED>

No.	Author(s) and year of publication	Title	ACIAR project numbers
25	Brennan, J.P. and Quade, K.J. (2004)	Genetics of and breeding for rust resistance in wheat in India and Pakistan	CS1/1983/037 and CS1/1988/014
26	Mullen, J.D. (2004)	Impact assessment of ACIAR-funded projects on grain-market reform in China	ANRE1/1992/028 and ADP/1997/021
27	van Bueren, M. (2004)	Acacia hybrids in Vietnam	FST/1986/030
28	Harris, D. (2004)	Water and nitrogen management in wheat–maize production on the North China Plain	LWR1/1996/164
29	Lindner, R. (2004)	Impact assessment of research on the biology and management of coconut crabs on Vanuatu	FIS/1983/081
30	van Bueren, M. (2004)	Eucalypt tree improvement in China	FST/1990/044, FST/1994/025, FST/1984/057, FST/1988/048, FST/1987/036, FST/1996/125 and FST/1997/077
31	Pearce, D. (2005)	Review of ACIAR's research on agricultural policy	
32	Tingsong Jiang and Pearce, D. (2005)	Shelf-life extension of leafy vegetables—evaluating the impacts	PHT/1994/016
33	Vere, D. (2005)	Research into conservation tillage for dryland cropping in Australia and China	LWR2/1992/009, LWR2/1996/143
34	Pearce, D. (2005)	Identifying the sex pheromone of the sugarcane borer moth	CS2/1991/680
35	Raitzer, D.A. and Lindner, R. (2005)	Review of the returns to ACIAR's bilateral R&D investments	
36	Lindner, R. (2005)	Impacts of mud crab hatchery technology in Vietnam	FIS/1992/017 and FIS/1999/076
37	McLeod, R. (2005)	Management of fruit flies in the Pacific	CS2/1989/020, CS2/1994/003, CS2/1994/115 and CS2/1996/225
38	ACIAR (2006)	Future directions for ACIAR's animal health research	
39	Pearce, D., Monck, M., Chadwick, K. and Corbishley, J. (2006)	Benefits to Australia from ACIAR-funded research	FST/1993/016, PHT/1990/051, CS1/1990/012, CS1/1994/968, AS2/1990/028, AS2/1994/017, AS2/1994/018 and AS2/1999/060
40	Corbishley, J. and Pearce, D. (2006)	Zero tillage for weed control in India: the contribution to poverty alleviation	CS1/1996/013
41	ACIAR (2006)	ACIAR and public funding of R&D. Submission to Productivity Commission study on public support for science and innovation	
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44	Gordon, J. and Chadwick, K. (2007)	Impact assessment of capacity building and training: assessment framework and two case studies	CS1/1982/001, CS1/1985/067, LWR2/1994/004 and LWR2/1998/034
45	Turnbull, J.W. (2007)	Development of sustainable forestry plantations in China: a review	
46	Monck M. and Pearce D. (2007)	Mite pests of honey bees in the Asia–Pacific region	AS2/1990/028, AS2/1994/017, AS2/1994/018 and AS2/1999/060

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No.	Author(s) and year of publication	Title	ACIAR project numbers
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55	Martin G. (2008)	ACIAR fisheries projects in Indonesia: review and impact assessment	FIS/1997/022, FIS/1997/125, FIS/2000/061, FIS/2001/079, FIS/2002/074, FIS/2002/076, FIS/2005/169 and FIS/2006/144
56	Lindner, B. and McLeod, P. (2008)	A review and impact assessment of ACIAR's fruit-fly research partnerships – 1984 to 2007	CS2/1983/043, CS2/1989/019, CS2/1989/020, CS2/1994/003, CS2/1994/115, CS2/1996/225, CS2/1997/101, CS2/1998/005, CS2/2003/036, CP/2007/002, CP/2007/187, PHT/1990/051, PHT/1994/133, PHT/1993/87, CP/1997/079, CP/2001/027 and CP/2002/086
57	Montes N.D., Zapata Jr N.R., Alo A.M.P. and Mullen J.D. (2008)	Management of internal parasites in goats in the Philippines	AS1/1997/133
58	Davis J., Gordon J., Pearce D. and Templeton D. (2008)	Guidelines for assessing the impacts of ACIAR's research activities	
59	Chupungco A., Dumayas E. and Mullen J. (2008)	Two-stage grain drying in the Philippines	PHT/1983/008, PHT/1986/008, PHT/1990/008
60	Centre for International Economics (2009)	ACIAR Database for Impact Assessments (ADIA): an outline of the database structure and a guide to its operation	









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