Overview

David Pearce

Introduction

As for previous reports in ACIAR's adoption studies series, the 11 projects presented here continue to demonstrate the diversity of the ACIAR portfolio. The projects reported here cover six individual partner countries (China—three projects, Fiji—one project, India—three projects, Indonesia—one project, PNG—one project and Vietnam—three projects) and one major regional grouping (Central Asian republics and Caucasus —1 project). They also cover seven products (beef cattle, fish, maize, peanuts, rice, shrimp and wool) as well as two projects covering combined major commodity groups.

These studies illustrate the fact that agricultural research in its broadest sense can be focused on many points in the production chain. Sometimes this is providing information for researchers themselves (as in the plant genetic resource project) while at the other end it may involve specific techniques for processors (as in the Chinese and Indian wool-processing projects) or information for policymakers to influence the development of an industry (as in the barramundi fishery project, for example). In between, techniques suitable for immediate dissemination to farmers may be developed (as in the rice–shrimp farming project).

The adoption studies presented here describe the intentions and the outcomes of 11 projects completed in 2003–04. They contain useful information on what works and what doesn't, and on the factors that help adoption and those that hinder it. This overview provides a summary of the project outputs, their effects in terms of capacity building and the lessons for adoption that may be useful in the future.

Of the 11 projects presented here, the majority were focused on providing new technologies or practical approaches to assist processors, breeders or farmers increase their effectiveness—although in most cases some scientific knowledge was also gained. Two of the projects were focused on policy issues, with one being highly successful and the other achieving very limited success.

Overall, just under half (five) of the projects achieved a very high level of adoption, two achieved a medium level of adoption, two experienced low adoption and the remaining two had no adoption. The levels of adoption are explained in more detail below.

Project outputs

As noted in previous adoption studies, ACIAR-funded projects have three broad categories of output:

- new technologies or practical approaches to dealing with particular problems or issues
- new scientific knowledge or basic understanding (pure or basic science) of the phenomena or social institutions that affect agriculture
- the development of knowledge, models and frameworks to aid policymakers or broad-level decision-making.

There is, of course, potential overlap between these categories, and many projects contribute to more than one of them. Projects also target a variety of different elements in the overall production chain. Table 1 summarises the nature of the outputs for the 11 projects covered in this report.

New technologies or practical approaches feature highly as major outputs in these projects, in many cases involving the processing or storage stage of production, rather than activities at the farm level. While scientific knowledge did emerge from several projects, this was generally not a major output. Knowledge for policy featured in two projects.

Table 1. Project outputs

Project	New technology/practical approaches	Scientific knowledge	Knowledge, models for policy
Determinants of food choice in Fiji and their role in demand trends for high nutritional valued foods and nutrition security	Improved understanding of survey techniques —targeted at policy researchers	Understanding of food choices in Fiji—targeted at policymakers	Food choice model for policy analysis—targeted at policymakers
Treatment of wool-scouring effluents in Australia, China and India	Technologies and systems for optimising wool-scouring processes and effluent treatment—targeted at processors		
Development of specification and processing prediction techniques for the Chinese and Indian wool industries	Techniques to improve yarn quality and spinning performance in Chinese and Indian wool mills including the Yarnspec model—targeted at processors		

Table 1. (continued)

Project	New technology/practical approaches	Scientific knowledge	Knowledge, models for policy
Leucaena management in West Timor and Cape York	Identification of a superior feed hybrid for feeding cattle—targeted at farmers Adoption of known profitable farming system more broadly—targeted at farmers	General knowledge on limitations and opportunities for enhanced cattle production in Timor—targeted at a broad policy level	
An evaluation of the sustainability of farming systems in the brackish water region of the Mekong Delta	Identified rice variety for salinised fields—farmers Techniques for shrimp management—farmers	Management practices to ensure environmental and economic sustainability of rice–shrimp farming	
Conservation, evaluation and utilisation of plant genetic resources from the Central Asian republics and Caucasus	Germplasm for use in plant breeding targeted at plant breeders	Material for Australian genetic resource centres	Improved relations with international organisations
Bioherbicide development for cereals in integrated weed management	Attempt to find effective fungal pathogens for wheat and rice	Knowledge that this approach is not successful in actual use	
More efficient breeding of drought-resistant peanuts in India and Australia	New breeding approaches—targeted at breeders Promising varieties released—to farmers	Knowledge of the physiological basis of crop performance under drought	
The biology, socioeconomics and management of the barramundi fishery in the Fly River and adjacent coast of Papua New Guinea		Biology of barramundi fisheries Importance of barramundi to local economies	Barramundi Fisheries Management Plan Bioeconomic model
In-store drying of grain in China	Technology transfer of in-store drying and storage facilities	Adaptation of technology to Chinese conditions	
Monitoring mycotoxins and pesticides in grain and food production systems for risk management in Vietnam and Australia	Rapid diagnostic tests Improved tests and procedures		

Capacity development

As well as the specific output intended for the research, by bringing together diverse groups of researchers and by connecting Australian and partner-country practitioners, ACIAR-funded projects can lead to the development of increased capacity (to do research, to apply research techniques or to understand policy issues) amongst partner-country researchers and decision-makers. ACIAR funding may also create research infrastructure that may generate returns from future use. Table 2 summarises the kinds of capacity developed in the projects covered in this report.

Many of the projects involved formal training of partner-country researchers; others involved obtaining higher academic qualifications. In some cases, research infrastructure was provided, or new techniques were transferred to researchers in partner countries.

Capacity building was sometimes an explicit and essential part of the technology transfer from the project. In other cases it was the side effect of undertaking research for the project. In most cases, this increased capacity has continued to be used within similar areas of research in the partner country, sometimes with trained researchers being promoted to positions of greater responsibility in partner-country organisations and continuing to work in areas similar to those of the original project.

Two of the adoption reports noted that the encouragement of collaboration between Australian and partner-country researchers and the establishment of productive networks of exchange was in fact a major output of the projects. This was identified as a unique feature of ACIAR-funded projects.

Table 2. Research capacity built by the projects

Project	Partner-country/ies researchers	Research infrastructure	Capacity utilised
An investigation of the determinants of food choice in Fiji and their role in demand trends for high nutritional valued foods and nutrition security	Survey training improved the capacity and skills of staff at the National Food and Nutrition Centre	A 'food choice model' made available	The food choice model has not been used
The treatment of wool-scouring effluents in Australia, China and India	Research personnel in China and India trained in laboratory techniques for analysis of wool and effluent		Ongoing
Development of specification and processing prediction techniques for the Chinese and Indian wool industries	Enhanced linkage between industry and university teaching by introducing process prediction and quality control into the syllabus		Ongoing

Table 2. (continued)

Project	Partner-country/ies researchers	Research infrastructure	Capacity utilised
Leucaena management in West Timor and Cape York	Training of university staff		Those trained remained researchers within the field
An evaluation of the sustainability of farming systems in the brackish water region of the Mekong Delta	University collaborators exposed to new techniques Project produced PhD and Masters degrees		Scholars in senior university positions or continuing to study
Conservation, evaluation and utilisation of plant genetic resources from the Central Asian republics and Caucasus	Improved linkages between countries and international agencies	Increased availability of germplasm in Australia	Ongoing use
Bioherbicide development for cereals in integrated weed management	Skills development amongst Vietnamese researchers		Research is continuing in Vietnam. Several collaborators have been promoted within the Vietnamese research community.
More efficient breeding of drought-resistant peanuts in India and Australia		Installation of a national research facility	Continues to be used
The biology, socioeconomics and management of the barramundi fishery in the Fly River and adjacent coast of Papua New Guinea	Survey and biological research training	Bioeconomic model	Capacity used as part of the management plan
In-store drying of grain in China	Technology transfer	Computer-assisted learning systems	Learning system continues to be widely used
Monitoring mycotoxins and pesticides in grain and food production systems for risk management in Vietnam and Australia	Training of Vietnamese scientists Organisational capacity	Specialised laboratory in Ho Chi Minh City	Facilities remain in operation

Uptake of the R&D outputs—progress along adoption pathways

Even where the intended output is 'knowledge' of some form, the ultimate objective of ACIAR-funded research is to change something in the world—to provide producers, processors or decision-makers with knowledge and techniques that will ultimately allow them to produce better outcomes. The ultimate outcomes that ACIAR looks for include improved agricultural productivity, more sustainable resource use, higher incomes and, consequently, poverty alleviation.

In line with the diversity of projects funded, there are various pathways by which adoption of the outputs of the projects can occur. Table 3 summarises the broad adoption results.

Summarising the often complex adoption outcomes for a range of projects is inevitably a difficult task and involves an element of judgment. In the underlying adoption studies, a six-level classification was used. However, for the purposes of the summary presented here, this has been reduced to the same four-level classification used in a previous adoption report (Gordon and Davis 2007).

In this classification scheme, the lowest level of adoption is *0*, signifying no uptake of the results by either initial or final users of the outputs of the project. As Table 3 indicates, two projects had no adoption for their major output—the food-choice project in Fiji (in which a major output has not been used), and the bioherbicide project. Note that in both of these projects there was some adoption of secondary output of the projects. In a sense, the bioherbicide adoption results were a special case in that for this project the underlying research produced a negative result, so there was nothing for final users to adopt. The knowledge gained, however, becomes part of the base for future researchers.

The next level of adoption is *N*, the situation where there has been some uptake by initial users but no uptake by final or ultimate users of the research. Two projects fell into this category—leucaena management in Indonesia and use of plant genetic resources from the Central Asian republics.

The next level of adoption is *Nf*, a situation where there has been uptake by initial users, and some uptake by ultimate users. Two projects fell broadly into this category—the wool-scouring-effluent project and the monitoring mycotoxins project.

The highest level of adoption, *NF* (use by initial and final users), was achieved by the remaining five projects reported here (for at least part of their research output).

Table 3. Project outputs and the current progress of adoption

Project	New technology/ practical approach	Scientific knowledge	Knowledge, models for policy
An investigation of the determinants of food choice in Fiji and their role in demand trends for high nutritional valued foods and nutrition security	*N* — researchers in National Food and Nutrition Centre learned new techniques	*N* — underlying policy results	*O* — Food choice model
The treatment of wool scouring effluents in Australia, China and India	*Nf* — scouring technology in India *N* — scouring technology in China *N* — effluent treatment in India in one mill *O* — effluent treatment in China		
Development of specification and processing prediction techniques for the Chinese and Indian wool industries	*NF* — China, particularly major spinning mills *N* — India		
Leucaena management in West Timor and Cape York	*N* — dissemination was not an objective of the project; limited adoption to date		
An evaluation of the sustainability of farming systems in the brackish water region of the Mekong Delta	*NF* — shrimp within the region *Nf* — rice variety	*N* — used at university	
Conservation, evaluation and utilisation of plant genetic resources from the Central Asian republics and Caucasus	*N* — plant breeders	*N* — Australian Genetic Resources centres	
Bioherbicide development for cereals in integrated weed management	*O* — approach not effective in actual use	*N* — base on which researchers can build	
More efficient breeding of drought-resistant peanuts in India and Australia	*Nf* — plant breeders *NF* — some varieties released	*N* — researchers	

Table 3. (continued)

Project	New technology/ practical approach	Scientific knowledge	Knowledge, models for policy
The biology, socioeconomics and management of the barramundi fishery in the Fly River and adjacent coast of Papua New Guinea			*NF* — Fishery Management Plan made law and forms the basis of actions and monitoring of various stakeholders
In-store drying of grain in China	*NF* — rice *NF* — maize, but slower *O* — wheat		
Monitoring mycotoxins and pesticides in grain and food production systems for risk management in Vietnam and Australia	*Nf* — some uptake		

Note:

Level of uptake is summarised as high, medium, low or none using the following abbreviations:

NF demonstrated and considerable use of results by the initial and final users

Nf demonstrated and considerable use of results by the initial users but only minimal uptake by the final users

N some use of results by the initial users but no uptake by the final users

O no uptake by either initial or final users.

Factors contributing to adoption of project outputs

As identified in previous adoption reports, a number of factors contribute to the uptake and ultimate impact of projects. Broadly, these centre on whether or not:

- final or ultimate users know about the project output
- next or final users have incentive to adopt the outputs
- adoption is either compulsory or indirectly prohibited
- potential users face capital constraints, limiting ability to raise funds to adopt the outputs
- the outputs are complex to absorb relative to the capacity of the users
- use of the outputs faces cultural constraints
- adoption of the outputs increases risk and uncertainty
- there is continuity of staff in organisations associated with adoption.

Table 4 summarises the major factors contributing to adoption for the projects reported here. In most cases, results were disseminated to users through mechanisms established within the project itself. There were either explicit extension activities, or the project participants themselves were responsible for adopting the findings. In some cases, extension activities have not yet taken place, so further adoption depends upon this happening.

Economic incentives provided the major impetus for adoption once results were known. In some instances these economic incentives appeared to be very strong (as in the rice–shrimp farming project, for example). There were not many cases where adoption was either compulsory or prohibited, although in the case of effluent from wool scouring, further environmental regulation is likely to increase adoption.

Capital constraints are not strongly evident in projects reported here, although in some cases a switch to the new technology will not take place until existing capital has depreciated. In the wool-scouring-effluent project in China, for example, the existing design of mills precluded the adoption of better processing methods. As existing capital depreciates, new designs that allow better processing will presumably be adopted. While this is partly a capital constraint, it also reflects a judgment about the timing of relative benefits and costs of adopting new designs.

Outputs seem to have been pitched at an appropriate level of complexity for the projects reported here. In the rice–shrimp farming project, farmers were clearly able to understand the implications of the findings and, in China and India (in the wool processing projects), a strong technical capability within the partner organisations meant that the otherwise complex processing implications were well understood, contributing to adoption.

Cultural constraints did not emerge as an issue in these projects, and risk did not seem to be an issue in adoption. Continuity of staff was, however, an issue in the Fiji food-choice project.

Lessons

The results that emerge from the adoption studies reported here provide a number of lessons for the establishment and conduct of ACIAR-funded projects.

Choice of partner

A number of the adoption studies reported here noted the importance of the choice of research partners to the success of the project.

- The collaborating agency needs to be actively involved in the relevant industry sectors, particularly if the project involves a processing chain in between the producer and the final consumer. This is strongly evident, for example, in the wool-processing projects.
- In policy-related projects, the research partner needs to have a direct conduit to the policymaking process, otherwise impacts are considerably less likely. For example, the Fiji food-choice project expressed some concerns about the partner's ability to influence policy choices.

Table 4. Factors influencing adoption and impact—analysis of the reviews

Factors contributing to uptake	Factors inhibiting uptake
Do potential users know about the outputs?	
▪ For the Chinese and Indian wool (scouring and spinning) projects, the partner organisations were either the final users, or were closely associated with those users. Circumstances in the plant genetic resource project were similar. ▪ The rice–shrimp farming project in the Mekong Delta produced extension material that was disseminated to farmers in the region. In addition, leading farmers were used for testing and demonstrating experimental techniques. ▪ In the case of drought resistance in peanuts, new varieties are being evaluated using farmer participatory approaches.	▪ Rapid changes in political circumstances, such as in the Fiji nutrition project, may mean that awareness of the project has declined over time. ▪ Dissemination of results to users was not a major component of the leucaena management project. Without this, there is unlikely to be further adoption by final researchers.
Are there sufficient incentives to adopt the benefits?	
▪ A clear financial incentive for adopting project findings is evident behind high levels of adoption in the wool projects, the rice–shrimp farming project and the grain postharvest project. ▪ In the barramundi fishery project, major stakeholders appeared to be actively engaged in the project and interested in the outcome, significantly contributing to the success of the outcome.	▪ Potential adopters may consider that there are more profitable alternatives to the technology adopted in the project. This is evident, for example, in the case of Chinese mills in the wool-scouring-effluent project. In the rice–shrimp project in the Mekong Delta, integrated rice–shrimp practices have been dropped in favour of intensive shrimp production.
Is adoption compulsory or effectively prohibited?	
▪ Tighter environmental standards are likely to increase uptake of wool-effluent technologies.	
Are there capital constraints on the ability of potential users to raise funds?	
	▪ In China, design of scours in existing mills precluded, for cost reasons, the adoption of better processing methods.
Are outputs complex in comparison with the capability of the users?	
▪ For most of the projects presented here, there appeared to be sufficient capacity for the users to adopt results.	▪ Some studies considered that partner organisations had insufficient funding to allow them to complete the work needed in the project.

Table 4. (continued)

Factors contributing to uptake	Factors inhibiting uptake
Are there cultural barriers to adoption?	
▪ No examples	
Does adoption increase risk or uncertainty?	
▪ Not evident in the projects reported here	
Was there sufficient continuity of staff to ensure adoption?	
	▪ The food-choice project in Fiji suffered from a lack of continuity, in part due to unrest in the country.

Extension activities within the project

A couple of the adoption studies noted that more time could profitably be devoted to extension activities and that the inclusion of specific extension activities within a project can significantly enhance the prospects of adoption. In addition, the collaborating agency needs to have the incentive and ability to continue with extension activities after the project finishes. This is evident, for example, in the leucaena project.

In projects with no formal inclusion of extension activities, ACIAR needs to be confident—before the project starts—that either the commercial incentives for adoption, or the extension infrastructure within the partner country, are sufficient to ensure some adoption in the future. This is particularly important in poor and marginalised regions where knowledge transfer may otherwise be very slow.

Multidisciplinary research program

Some adoption studies noted the extent to which the integration of scientific, social and economic analysis improved the overall quality of the research. The different disciplines were able to provide information essential to enhancing the products of other disciplines. While this makes overall project management considerably more complex, the benefits were considered worthwhile. This is strongly evident, for example, in the rice–shrimp farming project in Vietnam and can be seen in all projects that involve engaging farmers in novel practices that have new economic implications.

Collaboration within the project

Collaboration between researchers, extension workers, local policymakers and farmers was considered to be extremely valuable. This not only enhances the information from the point of view of researchers, but also contributes significantly to the subsequent adoption of outputs, which is closely related to the point made earlier about multidisciplinary research. The more interaction between different points in the research–production chain that the project allows, the more scope there is for transfer of information in both directions.

For technology-transfer projects, good relations with the technical community (that is, the community of researchers, engineers and others charged with solving day-to-day technical problems, particularly in processing industries) contribute enormously to the outcome. This may be the result of personal factors, but is also largely influenced by the perception that the project has something significant to offer. The Australian partner institution's reputation and track record is likely to contribute significantly to this.

The value of 'dry holes'

The bioherbicide project raises the interesting question of how to treat negative findings from an adoption (and impact evaluation) perspective. On the one hand, nothing has been adopted by farmers, as the research found that the proposed approach is unlikely to work. On the other hand, this provides a base to ensure that similar dry holes are not explored in the future. What becomes crucial is that the scientific reasons for the lack of success are communicated to other researchers.

Regulatory incentive

Changing environmental regulations are likely to affect adoption of particular technologies significantly (as, for example, in the wool-scouring-effluent project). Regulation, of course, affects the choice of technologies in many ways. But while regulation may drive a particular technology, there is no guarantee that this will have net benefits for the community unless the regulation was well targeted in the first place. Some care needs to be taken when relying on regulation as a major driver of adoption.

Commercial incentive

The results from these studies further illustrate the now well-known result that commercial or financial incentive remains the major driver of adoption. While the underlying research may be 'public good', the existence of good financial reasons to adopt the outcomes of the research is almost a guarantee of adoption (unless there are serious policy distortions in the partner country). Most of the five cases with the highest level of adoption had strong immediate commercial consequences for the ultimate users.