

**Closing the Loop:
From Research on Natural Resources to Policy Change**

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The European Centre for Development Policy Management (**ECDPM**) aims to improve international cooperation between Europe and countries in Africa, the Caribbean, and the Pacific (ACP). It does this through capacity building for policy management, the promotion of policy dialogue between ACP countries and Europe, and the provision of information and facilities for knowledge exchange.

The International Service for National Agricultural Research (**ISNAR**) assists developing countries in bringing about lasting improvements in the performance of their national agricultural research systems and organizations. It does this by promoting appropriate agricultural research policies, sustainable research institutions, and improved research management. ISNAR's services to national research are ultimately intended to benefit producers and consumers in developing countries and to safeguard the natural environment for future generations.

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Preface

Sustainable management of natural resources in agriculture is a goal shared by all nations. Achieving this goal may require a great number of changes in the way natural resources are allocated, utilised and regulated. Both science and public policy have key roles in enhancing the sustainability of natural resource use. The greater the degree of cooperation between the two, the better the prospects that suitable solutions to resource management challenges will be found. In practice, however, natural resource researchers and policy makers rarely speak the same language and they communicate only rarely. Forging an effective and efficient interface between resource management research and policy makers is a difficult task, but the returns to bringing these partners together in the quest for sustainable development is very high indeed.

The International Service for National Agricultural Research (ISNAR) and the European Center for Development Policy Management (ECDPM) have long recognised the need for close links between technical “practitioners” and the policy community. Supported by the German Ministry of Economic Cooperation and Development, the two institutions joined in implementing a project to identify best practices in closing the loop between research on natural resources and policy change in the developing world.

In November 1997, ECDPM and ISNAR hosted an expert consultation that brought together the experiences of policy makers, donor agencies and non-governmental organisations in bridging the gap between science and resource management change. The results of this meeting make up this report.

As the proceedings demonstrate, a solid interface between resource management research and public policy making can be forged, and there are many ways to do this. Those seeking ways to bridge these gaps will find much of interest in this volume.

From the perspectives of our organisations as centres focused on policy management and research capacity building, it is clear that innovative ways to bridge the gap between research and policy change are developing all the time. We trust that capturing and sharing such lessons can inspire the evolution of new and improved institutional arrangements for managing natural resources, and more effective policy making.

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Acknowledgements

This cooperative endeavour was initiated by Dr. Christian Bonte-Friedheim and Dr. Louk de la Rive Box, Directors of ISNAR and ECDPM respectively. Both worried that the growing gulf between scientific and policy making processes in developing nations could hinder attempts to improve sustainable use of natural resources. With generous support from the German Government, these two leaders committed their institutions to seek ways of forging a more effective interface between research and policy making.

Many staff from ISNAR and ECDPM participated in this project, and the editors would like to acknowledge their contributions and insights. Other authors, from development cooperation agencies, non-governmental organisations, universities, government ministries, and the private sector generously donated their time and effort towards this project. Without their special expertise, it would have been difficult to do justice to many important topics.

In addition to the chapter authors, special thanks are extended to Mr. Okyeame Ampadu-Agyei of Ghana's Environmental Protection Agency, Ms. Sarjeni V. Rengam of the Pesticide Action Network and Ms. Simone Kortbeek of the Royal Tropical Institute. Their active participation in the expert consultation is reflected in the summary of the consultation provided in the text.

With so many actors involved, the publication would not have reached this stage were it not for the sustained support provided by the staff of our respective institutions. We are especially grateful to Carola Baur, Suzanne Cartigny, Gerdien Meijerink and Cockie Kuyvenhoven for keeping this project on course and for providing such outstanding support for the expert consultation. Bringing the publication to an orderly close is a demanding task, and for that, the editors gratefully acknowledge editorial assistance by Mr. Peter Ballantyne at ECDPM.

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PART I

Introducing the Interface

Policy makers and researchers working on natural resource topics operate in very separate worlds. Bringing the two groups together can contribute to scientifically-sound resource management policy decisions and to research that is better focused on society's needs. But developing an effective interface between science and public policy is a difficult and often elusive part of the institutional development puzzle. In this first part of the book, the authors frame a set of concepts and propositions about the interface between science and public policy change.

Chapter 1 summarizes the main findings of an expert consultation held on the interface between agricultural research and natural resource policy making in Maastricht in November of 1997. The chapters in this book result from the contribution of people attending the meeting.

The second and third chapters distill what is known about the link between research and policy in the natural resource management area. The second chapter, entitled "the research-policy interface", finds ample support in the literature for an effective interface, but also reveals many reasons why "good" interfaces rarely exist in practice.

Chapter 3, entitled "loops of a spiral", finds that the process of building a science-policy interface can be conceived as one of internalizing increasingly complex agendas. In practice, agricultural research institutions are able to tackle more complex objectives, such as environmental risk and uncertainty, after they have developed capacities to tackle more basic production and farm income concerns.

The fourth chapter by a policy practitioner shows that the policy process is rarely understood by the scientific community and that a better understanding of the process of policy change should be a first step in integrating scientific information into the policy change process. From a policy maker's vantage point, improving communication is the best way to close the loop between science and public policy making.

Chapter 1

The Interface between Natural Resource Management Research and Policy Change

Steven R. Tabor and Doeke C. Faber

Improving the Interface

Scientists, politicians and the public at large have come to appreciate the fragility of the earth's many eco-systems. Increasingly, efforts are being made to work towards a loosely shared vision of sustainable development, or towards a pattern of development that respects the earth's inherent ecological vulnerabilities. In the agriculture sector, scientists are putting more emphasis on research approaches that promote better management of the natural resource base. Likewise, Governments are attempting to mould policies that provide communities and individuals with incentives to use natural resources in a more sustainable manner.

In the crusade to promote more sustainable approaches to managing natural resources, scientists and policy makers should be natural allies. After all, scientific results must be translated into effective policies if they are to have an effect on the resource-using community. Policy making, to avoid egregious error, should to the extent possible, be based on accurate, timely and appropriate knowledge and information. But bringing science and policy making together is a difficult process. Often the *interface* between the two institutions is under-developed or functions poorly.

Improving the interface between natural resource management (NRM) oriented agricultural research and public policy change was the focus of an expert consultation, sponsored by GTZ, the International Service for National Agricultural Research (ISNAR) and the European Centre for Development Policy Management (ECDPM) in Maastricht, the Netherlands. Scientists, policy makers, NGO leaders and donor agency representatives from all parts of the world gathered to address this important topic.

The participants noted that, unto itself, the interface between research and policy change was an *under-researched* topic. This is surprising, given that the effectiveness of both NRM-oriented research and resource-management policy making hinges on the effectiveness of the partnership between these different processes. What research does exist suggests that the interface between *research* and *policy making* processes may be problematic, because of communication barriers, reward systems unrelated to cooperation between research and policy change, different ways of defining and establishing time-frames for tackling *identified problems*, the importance of being an insider in a policy change process, the importance of maintaining distance and independence to preserve scientific integrity, the role of special interest groups in influencing policy change and the scientific agenda, and the need for best available information in a policy change process versus the scientific quest for exactitude. It was stressed that many environmental problems are "long gestating", and that research may not be able to provide appropriate answers at the time when policy must be made. Furthermore, bringing scientists and policy makers together involves a learning process. This process appears to have high initial costs, that fall quite quickly once both parties learn to appreciate each other and to express resource management challenges in a framework of risk and uncertainty.

Cases

But, there are examples of well-functioning linkages between NRM-oriented research and policy change that provide some very useful lessons. In Ghana, for example, research into the dangers of water hyacinth quickly captured national attention and policies were adopted to raise public awareness and promote community initiatives to halt the spread of this weed.

The research into this problem was designed with the direct involvement of policy makers, the research institute was located in close proximity to central government, the main research institute – WRI - seconded a scientist to work with the Environmental Protection Agency on public awareness and policy change, and policy technocrats in the Ministry of Environment, Science and Technology were quick to confirm the urgency of this issue.

In contrast, Ghana suffers from a slow, but serious soil erosion problem, which erodes the fertility of the rural landmass. A “bottom-up” effort aimed at researching solutions to soil erosion has been ongoing for many years, but has yet to attract the attention of policy makers. In this case, policy makers did not initiate or provide meaningful financial support for the research.

In the Philippines, overuse of pesticides dangerous to human health, was recognised by scientists as a serious problem in the late 1970's. Scientists, working in close partnership with non-governmental organisations (NGO's), were able to inspire Government of the advantages to banning the most toxic pesticides and of adopting a more integrated pest management approach to agriculture development. Factors that contributed to this change included the end of martial law, learning from the experience of neighbouring countries, news reports that brought to public attention pesticide poisoning, and bringing policy makers to the fields to witness the potential of integrated pest management. Bringing scientists into the board of the regulatory oversight body for agro-chemicals helped broaden policy making beyond the scope of industry concerns. It may have been possible to change policies earlier, although the Government's agricultural reform agenda was quite full and more “whistle blowing” would have involved too great a personal and professional risk in the scientific community.

In Mali, soil erosion was a “slow gestating” threat to the sustainability of cotton production, one of that nation's leading export earnings. Working directly under the umbrella of Mali's cotton parastatal, a long-standing cooperative research effort tackled the problem of soil erosion in the cotton areas. Farming systems research demonstrated that changes in cropping patterns and soil reclamation practices could be economically viable, even for very poor households. The initial soil conservation trials were so successful that the programme was extended throughout the entire cotton producing area, a special division was created within the extension service for soil conservation activities, soil conservation policies became a high extension outreach priority. Changing soil conservation policies in Mali required the commitment for more than a decade between a powerful parastatal corporation, a donor agency and research institutes in Mali and the Netherlands. The results, in terms of policy change and improved soil conservation practice, are visible and positive.

In the Western and Northern Pacific, over-fishing of tuna, the slaughter of dolphins together with tuna and the need to preserve endangered whales emerged as serious concerns during the past three decades. As these were trans-boundary problems, both national and international policy making was required to resolve these issues. Close working relationships were forged between regulators, the fishing industry and scientists, often in the form of “industry oversight boards” to seek solutions to these problems. Scientists have played an integral part in these bodies, in large part because the policies adopted mandate the need for a *scientific* estimate of either the sustainable resource catch or of sustainable fishing practices. Furthermore, scientists have been charged with monitoring policy implementation and reporting on the consequences of different forms of fishing practice.

The industry has cooperated closely with scientists to seek suitable solutions to potential closure of

major markets (in the case of the dolphin and whale slaughter) and in the case of adopting tradable quota's to extend property rights to the flow of sea resources. Whistle-blowers, NGO's and multilateral organisations played an important role in raising public consciousness and creating a sense of policy urgency to solve these problems. However, once the policy-crisis has passed, the attention of these groups to these issues has receded.

In the fisheries case, scientific uncertainty is huge. Recognising and identifying which groups should bear the costs of this ecological uncertainty has come to be a major issue of both scientific and public policy concern.

Throughout Asia, cyanide is used to stun reef fish, which are then exported into the highly profitable exotic aquarium and foodstuff trade. Using cyanide for reef fishing kills the coral reefs and is hazardous to the health of the fishers. In the Philippines an international NGO has worked for more than a decade to document the problem, identified alternative reef fishing technologies, changed public policies, improved the awareness and understanding of the problem and alternatives within the reef fishing industry and created the enforcement capacity necessary to ensure that sustainable reef fishing policies will be adhered to. Having improved regulations prepared, implementation arrangements designed and the ability to demonstrate alternative, economic technologies helped accelerate the policy change process

Pesticide overuse and poisoning has been a persistent problem throughout the developing world. The Pesticide Action Network (PAN) has worked to assist many local non-governmental organisations improve pesticide use policies and promote integrated pest management strategies. In Asia, PAN commissioned a series of research reports that focused on the linkages between women and pesticide use. These helped to provide clear evidence of the health problems that women encounter when using hazardous pesticides. PAN has been able to influence national policies directly, through its national-level NGO's, but also through a variety of international fora, such as the Earth Summit, the FAO's World Food Day's and the World Bank's conferences on sustainable development. Policy advocacy efforts, backed by sound research and country studies, and targeted towards these global conferences and events have helped to sway the views of national policy makers.

From the policy making perspective, the problem is often one of failure to communicate and to understand political realities. In Ghana, successive changes in Government opened, and sometimes closed, possibilities for scientists to be involved in the policy change process. During the past decade, a close working relationship has evolved between senior officials in the Ministry of Environment, and faculty members of the University and CSIR institutes. For the researchers, this has meant learning about the ways in which policy processes operate, and especially learning to draft results in a way in which policy leaders can follow. Ghana's environmental action plan marked a turning point in this process, for it brought together policy advisors and scientists to prioritise environmental issues and plan future initiatives. Involving policy makers in setting the research agenda for Governmental research bodies has proven to be especially effective in feeding policy reform. Bringing research results to the policy makers (rather than bringing policy makers to research funding presentations), through seminars and discussions tailor-made for the policy makers, has also proven effective.

In Kenya, the leaders of the agricultural research organisation (KARI) have developed a series of policy briefs to convey research results to policy makers. These briefs, written in a clear, easy-to-understand fashion, are aimed at distilling the policy lessons of sometimes highly technical research. The KARI researchers find that almost all research has policy content, but that capturing the attention of policy leaders is a difficult process. While putting such messages in a "policy maker-oriented" format is a good start, this may need to be combined with policy advocacy efforts.

A policy maker from the Philippines remarked that the process could be broken down into three basic steps. First, there must be sound science and research to identify the knowledge needed for decision

making. Second, this must be communicated in a clear and consistent manner to policy makers. Raising the consciousness of policy makers requires both research and advocacy skills. These may not necessarily rest in the same person, but a clear reform strategy will be needed if policies are to be changed.

For this, researchers, together with their policy advocates, need to understand the policy processes; they need to be able to draft new rules and regulations that policy makers can use, and they will need to understand the political schedule and backdrop to policy change matters.

The third stage in the process is to identify and work constructively with the bureaucrats that are charged with implementing new policies. Should they not be involved in the early stages, then even the best policies will stand little chance during implementation. Researchers are now being sued in the Philippines, when their research results adversely effect corporate interests. Likewise, researchers are well advised to learn to “use the courts” in their efforts to have public policies reformed.

In Brazil, the practice of environmental policy making is being transformed into a more open, decentralised and participatory effort. In the area of water-use management, the Ministry of Environment has involved local stakeholder groups in discussions over a number of water use and water-quality issues. The dedication of senior officials to broad-based participation in water use policy formulation has created a popular groundswell of support for sustainable water use policies. Scientists have participated in these discussions and debates, but as one of many stakeholders involved in changing public policies. Bringing science into the open, or, in other words, involving scientists in discussions with representatives of civil society as well as Government, has been an important learning process. For policy makers, the challenge in Brazil has been to blend scientific insight with public awareness, consciousness and control of the policy change process.

Donor agencies are also concerned about the weak scientific resource base which reduces the potential impact of scientific research on policy making. They stress the importance of policy making processes, both as partners (or users) of research results, and also as the main agents which can authorise funding support for research processes. Research leaders were urged to improve their understanding of policy change processes, both in national governments and in donor agencies.

Some bilateral donors have already identified a range of key environmental initiatives that they will allocate resources to. By focusing assistance on a set of resource management “hot spots”, donors can help draw research and policy making attention to particular problems. In some circumstances, donors can help bridge the gulf between research and policy change processes. Often this is done in the form of donor-instigated “policy solving” missions, or technical assistance aimed at helping to reform environmental problems. Building research-policy interfaces that are truly embedded in national skills and capabilities is a more time-consuming practice. However, it may guarantee that the institutional capability to respond appropriately, flexibly and scientifically to resource management problems remains long after donor-funded investigative missions have left.

Lessons

The cases presented, and the lessons and experiences shared underscore both the importance and the possibility of forging a well-functioning interface between NRM-oriented agricultural research and policy change. While what has worked in one country, or with respect to one set of issues may not work very well for others, some of the findings appear to be reasonably generic. Key recommendations include:

- Good science is needed to identify “policy facts”. The scientific process must be professional, have a strong sense of integrity and credibility, be independent and be protected from adverse political interference;

- Scientists must be made aware that policy makers are a target user group for their research results. Bringing relevant research results to the attention of policy makers is an obligation for all agricultural researchers, not only those working in specific policy research sub-disciplines;
- Involving policy makers early on in the definition of the research agenda may improve their understanding of the problem and their commitment to finding and eventually implementing a solution;
- Research that focuses on problems that are urgent and have a clear, devastating impact on particular communities are most likely to attract the attention of policy makers;
- Research incentives must be altered to provide rewards to researchers that attempt to improve public policies. Examples of university promotion schemes that count “research for policy reform” efforts in tenure reviews are a step in this direction;
- Secondment of scientists on a temporary basis to policy making bodies within Government is good way to build institutional bridges;
- Research leaders will need to better understand the workings of the policy change process. They may need staff with policy advocacy skills and clear strategies for targeting change in particular policies;
- Preparing research results in a form that policy makers can well understand, such as policy briefs, outreach seminars, and direct consultations, together with targeting those materials to the appropriate individuals, is essential to bridge communication gaps;
- Although NRM problems are local, area-specific issues, there may be merit in locating NRM-research activities close to the policy making process, be this in a national or provincial capital. Improving the physical proximity of scientists and policy makers appears to help reduce the communication distance between them;
- Developing regulatory oversight bodies which bring together the interests of industry, consumers, producers and scientists is a good way of formalising the involvement of science in policy processes. The degree to which decision-making in such bodies can be made to be transparent through public hearings, and explicit through specific policies linked to hard scientific evidence, will help improve the impact of research findings;
- In some circumstances, scientific “whistle blowers” can lead to public awareness of dangerous resource management practices. Some measure of institutional protection is required if such “whistle blowers” are to be heard;
- Persistence is often required. In many circumstances, unexpected political changes provide opportunities to inject scientific findings into policy debates. Scientific services should be aware of these sudden, and often unexpected, opportunities to influence the policy process;

- Policy makers should be encouraged to bring scientists into their inner circle of reform advisors. Using scientists as advisors, in oversight committees, in public hearings and as providers of second-opinions helps to improve the quality of policy making and overcomes the communication problems between these groups;
- Policy makers should be encouraged to experiment, in the sense of employing new and novel forms of encouraging participation by scientists and the community at large in the policy formulation process. While these experiments may have a high, initial learning cost, they should also help foster a policy-reform process that is better informed and better received;
- The press plays an important role in creating public awareness of resource management functions. Research institutions need to ensure that their press-relations function provides a useful and effective public education role (and goes beyond institutional promotion);
- Non-governmental organisations play an important role, particularly in the policy advocacy process. Forging strategic alliances between “leading NGO’s” and “respectable research institutes” helps to ensure that policy advocacy and research management science are consistent with one another. NGOs often have a good sense for what research is actually needed to drive better policy making. Their leaders can make an important contribution to setting a relevant research agenda; and
- NGO’s can help build “change networks”, that involve local citizen’s groups, national and international institutions and research bodies. These “change networks” can help put an issue on the policy agenda, and identify the contours of needed reform.

Forging a better interface between resource-management research and policy change is a complex matter. But, as the examples presented show, there are often simple and practical solutions to even the most complex and complicated problems. Furthermore, when the interface between resource management research and policy change does work well, the rewards can be very high indeed.

Chapter 2

The Research - Policy Interface¹

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Sustainability and Agricultural Research

For much of the past three decades, agricultural research services have been driven by the imperative to stimulate growth in agricultural output. The main agricultural research challenge has been to raise production, in part to feed ever-growing populations and in part to support the growth in output and exports needed to underpin rising incomes and employment.

Considerable progress has been made towards meeting these objectives. At a global level, supply has outstripped demand, and for the past four decades, there have been no signs of sustained upward trends in real global agricultural product prices. In the developing world, although agricultural performance is not uniformly a success, “green revolutions” have taken place, technological innovation has drawn subsistence farmers into wider, expanding markets and the slow, but steady, spread of improved technology has significantly contributed to higher productivity, poverty reduction and income growth.

But at the same time, there has been an increasing recognition that growth is not without cost. Attempts to raise agricultural output very rapidly have been accompanied by degradation of the natural resource base. Resource-related problems, such as the salinization of water supplies, soil erosion, as well as pesticide and other agro-chemical related pollution have spread along with modern agricultural production techniques. As these problems become more acute, governments are giving increased consideration to balancing environmental and agricultural growth objectives.

However, this does not imply that there is any less need for very rapid growth in agricultural output. In fact, global demand projections suggest that agricultural output will need to rise much faster in the coming decades to meet the increase in demand resulting from rising population, incomes, urbanisation and improved diets. But satisfying this demand will need to be done in a manner that makes more cautious use of natural resources, and, at the same time, reverses the pattern of resource degradation and species loss associated with past production practices. In some parts of the developing world, prospects for sustaining growth in agricultural output are limited if problems of environmental degradation are not addressed.

The starting point for this paper is the shift in orientation in agricultural research towards a greater concern with natural resource management (NRM). This shift is motivated by a number of factors, not least the need to tackle resource-based constraints to higher growth. Often resource management problems reflect incomplete or imperfect markets, and the persistence of negative externalities and opportunities for “free riding”. Public policies, at the different levels in which collective behaviour is governed, will need to promote socially desirable resource use outcomes. But making good policy requires good information, and resource use and resource management information is notoriously difficult to collect, analyse and comprehend. This implies that agricultural research aimed at understanding resource management use in agriculture can play an important role in informing and assisting in the process of resource management policy. To do so, agricultural research and natural

¹ The authors wish to extend their thanks to Dr. Helio Tollini, Dr. Dale Squires and Dr. Michael Loevinsohn for helpful comments on an earlier draft of this paper.

resource policy making will need to work in close cooperation to tackle rural resource use problems.

This paper is in six parts. The first discusses the science policy interface, in the second part several key changes in the context for NRM research and public policy making are reviewed. The final section provides a summary and conclusions.

The Science-Policy Interface

Given different settings in which agricultural research and policy making processes operate, the interface between resource-management oriented agricultural research and public policy making is bound to be problematic. Even when there are mechanisms established for official communication between agricultural research leaders and NRM policy makers, such communication is likely to be “noisy”, periodic and characterised by a low match between signal and policy information-demand. The main reasons for this are:

- different ways of defining the NRM “issue” by research and policy making;
- an absence of mutual recognition in the policy change process;
- communication barriers;
- a policy preference for “inside” information;
- closed advocacy coalitions;
- a lack of institutional depth; and
- the application of global environmental principles to local resource management problems.

Problem definitions with different starting points

Policy makers and agricultural scientists may view natural resource problems in very different ways. The “same issue” may be defined to be a very different “problem” to both groups. The scientist may observe a natural resource management problem and go back to the biological, chemical and physical factors affecting natural resource management use. The policy maker may start from the same problem and frame it in terms of the likely economic and political consequences of the issue.

In this type of situation, the “solutions” that are proposed will reflect this very different understanding of what exactly the natural resource problem is. Scientists may have solutions to problems that are not considered legitimate or terribly important problems by policy makers. And vice-versa, policy makers may be seeking solutions to “problems” that are not perceived to be technical resource management problems by the scientists. Policy makers may be interested in treating the immediate symptoms of a problem and be less interested in addressing its underlying cause. In cases where the definition of the problem is not the same, it is unlikely that the scientific “solutions” will fit the perceived policy problem.

The main reason why scientists and policy makers may not have a shared understanding of the natural resource problem is because the scientific community tends to use the “resource” as the starting point and the policy maker uses the “social consequences” of resource use as a starting point. The scientific investigation typically begins with the natural resource base for agriculture as the research topic. The degree to which agricultural resources are sustainably used is normally a legitimate reason for it to be investigated. To the scientist, the natural resource problem may be one of a degraded or sub-optimally used resource. The scientist may study the resource, attempt to understand why it is degraded (or used sub-optimally) and suggest ways in which this situation can be ameliorated.

To the policy maker, natural resources are typically treated as a means to a social end. The policy maker may be trying to accelerate growth, and may understand that sub-optimal rural resource use is a

“binding constraint” to growth. The policy maker may be responding to a complaint from a particular constituency, such as those adversely affected by rural pollution. In such a case, the policy maker is less interested in understanding the nature of the resource use problem than in quickly and equitably addressing the claims of adversely affected parties.

Is there mutual recognition?

Even where scientists and policy makers share a common definition of the natural resource use “problem”, they may not communicate because scientists may not view policy makers as a legitimate client for their research results; and policy makers may not perceive the research community as producing relevant information for policy making purposes.

In some instances, the scientific establishment views its peers as the main end-users of agricultural research. Scientists tend to be judged by their “scientific” output. In publish or perish environments, it is the rare scientist whose career is advanced because of a key contribution to improving public policy. In such circumstances, there is a danger that research will generate scientific prestige, but is not really designed to serve any particular group of natural resource stakeholding clients.

When agricultural research is not closely targeted to the needs of any particular set of end-users - and this would apply for basic as well as more strategic and applied research - the likelihood of it having a significant social impact diminishes.

But traditionally, for agricultural research, the farmer, or the “user” of the natural resource is considered to be the ultimate user or “client” of the research results. There are typically well-defined linkages between agricultural research institutes and the agricultural extension service and from extension to the farm community. In some countries, agricultural producer associations have direct links with research institutes or with individual researchers. Even in those specialised research institutes dealing specifically with natural resource issues (i.e. water, soil, remote-sensing or uplands), the linkages are typically drawn most closely and directly to the farm community or to the agricultural extension service. For research leaders accustomed to thinking of farmers as the users of research results, it is quite a change to think of policy makers as an important (and in some instance, the most important) ultimate consumer of research findings. Channels of communication with policy makers may be murky, politically risky or non-existent. Making an effort to improve these communication channels may be deemed to reduce the attention that is accorded to the farm community, the “priority” client of the research institute.

Conversely, to policy makers, the agricultural research institute leaders become known as those who produce new technologies for farmers. Even in matters of natural resources, the policy makers tend to think of agricultural scientists as suppliers of information to extension services, farmer associations, or to other groups associated with farming. For the policy maker, the agricultural research establishment is seen as a way to generate services for farmers. Providing advice and inputs into public policy matters is simply not seen as the job of scientists.

In some cases, this problem is compounded by bureaucratic compartmentalisation. Agricultural research institutes, in many countries, are either part of or report to Ministries of Agriculture. The primary responsibility for natural resource policy making, in matters such as conservation or pollution prevention, may be with a Ministry of the Environment or some other multi-sectoral body.

Research institutes working in agriculture may be perceived as being biased representatives of a Ministry of Agriculture rather than an unbiased source of expertise on sustainable resource use. Leaders of agricultural research institutes may be reluctant to cooperate too closely (or even share findings) with senior officials of a Ministry of Environment for fear of undermining the production and farm-income objectives of their parent Ministry. Such inter-Ministerial compartmentalisation may

effectively preclude the research institute from defining natural resource management policy makers as an important client group for their research.

Communication barriers

Scientists and policy makers may both be working on the same agricultural resource problem, but their cooperation may be impeded by the lack of a common communication framework. Springer-Heinze (1995) notes that the lack of a common communication framework can lead to distrust and antagonism between policy makers and scientists. Communication problems between scientists and policy makers occur in four different ways.

First, for reasons of efficiency and precision, scientists tend to use technical terminology to describe research problems and research results. Conversely, to reach their target audience, policy makers tend to describe problems in socio-economic, legal or political terminology. As disciplinary specialisation proceeds, both in the agricultural sciences and in the different forms of policy making, the technical requirements to be an “expert” in each field become greater and greater. With disciplinary specialisation come linguistic specialisation and a narrowing of the communication corridors between disciplines.

Second, scientists and policy makers may communicate in very different ways and according to very different time schedules. The analytical nature of research leads scientists to break problems into their component parts, frequently without attempting the necessary (and often multi-disciplinary) synthesis that would be required in order to reach policy conclusions. For scientists, research publications, books, presentations in scientific conferences or in other professional gatherings at which they provide information to their peers, is the standard means of presentation. Those who formulate public policy may be more accustomed to communicating with leaders of business and economic organisations. They would be far more likely to attend a business association meeting than, for example, a convention of soil scientists.

Third, scientific communication and policy making communication follow very different time schedules. For the scientist, public communication follows discovery or the identification of new knowledge in one form or another. For the policy maker, communication takes place in the narrow window of opportunity in which problems of public policy are placed on the political agenda, debated, discussed and decided upon. In some cases, the two time frames do intersect. When they do, it is by coincidence.

And fourth, by its very nature, the scientific community operates according to what is described as the principle of “absolute truth”, while the policy makers, by contrast, must reconcile differing perspectives and opinions. Especially for the physical scientist, a proposition is either true or false with a given, and often technically observable, probability of occurrence. For the policy maker involved in a decision of public policy, there are no hard ‘facts’. Data is not neutral but is the result of an exercise of values, beliefs and assumptions. In such an environment, science cannot yield “the truth” (Hisschemöller & Hoppe, 1996).

Moreover, (scientific) information is not the only component in solving the problems which decision-makers face. Decision-makers confront a range of interpretations or accounts of reality, and thus information is not deemed to be value-free (Parson, 1995; Collingridge & Reeve, 1986).

Inside versus outside information

The ways in which science and public policy making are organised and operate may, unto itself, impede the development of an effective communication system. The belief that science can provide a

“single answer” to a resource management problem is often untrue because:

- In any decision-making process, it is imperative to reduce uncertainty by gathering as much relevant information as possible. More often than not, after all the “facts” have been collected, there will be a remaining cloud of uncertainty (Collingridge & Reeve, 1986; see also Hisschemöller & Hoppe, 1996).
- The belief that science can provide whatever information is needed to reduce uncertainty in making a particular policy choice also does not hold true. The direction of research in science cannot be quickly and easily changed to provide the information required by policy makers without introducing long delays in the policy process (Collingridge & Reeve, 1986).
- Despite growth in attention to the importance of information in the decision-making process, recent studies generally indicate that government policy makers rarely make full use of all available information (Oh & Rich, 1996).

Political scientists find that policy makers (or bureaucratic organisations) use information if it can maintain or increase bureaucratic power, or confirm a policy position or interest held by a policy maker. Furthermore, only a limited amount of information is searched for, and databases developed within the organisation are primarily relied upon. Accordingly, in the policy making process a great deal of importance is attached to information generated by “insiders”. That which is generated outside of the policy originating Ministry is deemed somehow to be suspect because it was not generated by those whom the policy maker supervises and trusts. To add to this complication, natural resources problems typically cross different government administrative domains. The flow of information across government ministries is often difficult in its own right, without even considering the contributions that different scientific experts can bring to bear.

But it bears noting that scientists and policy makers view the role of external, expert information in a very different manner. For the scientific organisation, “outside” information may be more trustworthy because it is independent, objective and presumably subject to internal validation. For the policy making body, the motives and agenda associated with “outside” sources of information may be suspect.

Closed advocacy coalitions

Policy makers/advisors and scientists are rarely, if ever, the only participants in the policy making process. The policy process can be conceptualised in terms of policy subsystems (Parson, 1995). The policy subsystem is composed of a number of “advocacy coalitions” (ACs), which are composed of all those who play a part in the generation, dissemination and evaluation of policy ideas.

ACs “seek to alter the behaviour of governmental institutes in order to achieve policy objectives in their respective policy cores” (Sabatier and Jenkins-Smith, 1993:227, cited in Parsons, 1995). The advocacy coalitions may be distinguished from one another in terms of their beliefs and resources. In a policy subsystem, there will be multiplicity of ACs who competed for influence in the decision-making process.

“Policy brokers” are actors who are concerned with finding reasonable or feasible compromises between the positions advocated by coalitions. This framework fits best in a political system where the government tends to consult with interested groups and organisations and less well where government is more prone to impose policy (Parsons, 1995).

The use of knowledge (information, advice, analysis, and research) within the decision-making process may be considered in terms of four dimensions: formal or informal, and internal or external (Parsons 1995). Internal information can flow smoothly if attention is paid to issues such as participation of policy makers in project design or in the way conclusions are communicated. The external, informal channel often determines the fate of policy-relevant research. The media, NGOs and other interest-based organisations play an important role in influencing policy through advocacy efforts. In a number of instances, NGOs have evolved to take on a more collaborative ‘insider’ or formal role, working with governmental agencies on pilot trials and implementation of new approaches (Shah, 1996).

In this process, “advocacy coalitions” and “policy brokers” may or may not include scientists or scientific findings in their advocacy effort. They may accurately represent the findings of scientific research in their policy advocacy, but they may also misrepresent scientific findings in order to justify the position they are advocating. When scientific findings are misrepresented, the researcher’s credibility is undermined either in the eyes of the policy makers or in the eyes of the scientific community. Facts are value-laden and if the research brings the “wrong” facts to the table, the scientists’ values may be questioned.

Sometimes it is clear that advocacy coalitions and policy brokers will simply not wish to have scientists involved in a policy change process. For example, if powerful industrial groups are exploiting a natural resource, and in the process imposing large costs on society, then they would be unlikely to want independent scientific advice as a part of the policy advocacy process. For example, logging and mining companies may attempt to insulate policy discussions from scientific input, or from input other than from scientists that they employ.

The lack of institutional depth

In upper income countries, a great many institutions are involved in the policy making process. Civil society has evolved in a way such that many different “advocacy coalitions” compete for public and political attention. With a well functioning press, these tend to operate with reasonable degree of transparency. In well-functioning democracies, where there is a high degree of political involvement and literacy, the general public will be made aware of the pros and cons of the different policy decisions at hand.

But the institutional setting is very different in low-income, developing countries. At the risk of over-generalising, from a scientific vantage point, there is often only a single research institute that is competent to comment on a particular resource-use matter.

Well-informed groups advocating in the public interest may or may not exist, and they may not have access to suitable information. Donor agencies (e.g. World Bank and others) may play a strong policy advocacy role, bringing into question the degree to which policies are taken in order to stay on good terms with donors or to actually improve the resource management situation. The decision making process may not be transparent, and even if it is, the level of general education and understanding may be such that technical issues cannot be thoroughly debated in the press².

² In some developing countries, the Press may be free and able to discuss complex resource management issues, but they may lack specialist reporters able to adequately cover such topics.

Furthermore, legal challenges to policy decisions may not be, or if possible, are only undertaken by the most powerful special interest groups.

A comparison of a typical, stylized institutional environment for agro-NRM research and public policy making in low-income and upper-income economies is presented in figures 2 and 3. What this graphical comparison suggests is that the institutional environment is simply more “thin” or lacking a number of the checks and balances typically found in upper income economies. An important consequence of this “thinness” is that there is a lack of competition in the process. Because of this, the conclusions reached by leading scientists can be broadly debated, but often not on matters of scientific accuracy. At the same time, a lack of competition between policy advocacy groups implies that there may be inadequate pressure to involve scientific expertise in matters that can be handled quickly and quietly by Ministry insiders. Finally, in such an environment, policy makers may have a high degree of autonomy to impose policies that have not been screened by outside authorities or debated and discussed by the public at large.

As economies grow, the “depth” of the institutions involved in the policy process tends to increase. As it does, the demand for scientific input into the decision making process is also expected to increase. Accordingly, economic growth, unto itself, is likely to enhance the role of agricultural research in the natural resource policy making process.

Global principles and local actors

For developing countries, eager to exploit trade and investment opportunities with larger and wealthier economies, there may be little choice but to accede to the environmental agreements advocated by the “clubs” of wealthier nations.

Lobby groups in the wealthier countries, in turn, may be concerned that rapidly growing trade and investment relations between wealthier and poorer countries could inadvertently lead to a “race to the bottom” in terms of environmental protection standards (Kruger, 1996). Accordingly, they tend to insist that such global treaties safeguard environmental standards set in the wealthier market economies.

For any single, poor developing country, the issue of whether or not to adopt a particular natural resource use policy may not be driven by a concerned evaluation of the costs and benefits of such a policy, but more by a conscious desire to harmonise national legislation with international standards. Without such harmonisation, access to markets and investment opportunities may be put at risk. In these instances, the “scientific opinion” is that which gave rise to the international standards, treaties or practices in the first place.

The scientific opinion that underpins global environmental accords is rarely identical to the conclusions reached by local researchers familiar with a nation’s own natural resource problems. But for a single developing country, the costs of not acceding to global pressures to harmonise environmental legislation and practices may be great. In these circumstances, there is an international crowding-out effect - in point of fact, environmental decision making at an international level substitutes for the interaction between domestic policy makers and national agricultural research leaders.

There are cases, however, where global negotiations on environmental standards have forged coalitions between key groups of developing countries. The Biodiversity Convention, for example, inspired a number of large developing countries to take common positions on protecting their indigenous species.

The Changing Context for Agricultural Research and Public Policy

Making

While a great number of factors combine to impede or weaken the interface between agricultural researchers and public policy makers working on NRM issues, there are also factors working in the opposite direction. As noted above, agricultural demand is rising rapidly and, for many countries, achieving satisfactory rates of agricultural growth will not be possible unless better use is made of natural resources in agriculture. Policy makers aiming to meet the agricultural growth challenge will, by necessity, need to find solutions to complex problems of natural resource use. When the solutions to such problems are not easily identified, the views of technical specialists will be needed. In addition, as developing countries become wealthier (as in much of Asia and Latin America), the demand for environmental amenities will rise. This, unto itself, creates a demand for NRM-oriented agricultural research as an input into policy making. But beyond the effects of income growth and the need to tackle NRM problems to maintain agricultural output growth, there are other changes in the development setting of low-income countries that also tend to promote better cooperation between research and policy making on NRM issues. Three such factors that merit mention are democratisation, structural adjustment and globalisation.

Democratisation

The past decade has witnessed remarkable change in the political and economic environment in the developing world. According to the indicators measured by Freedom House, more than 100 developing countries have some measure of democratic representation, and the tendency towards pluralistic government is increasing world-wide. *Democratisation* provides some measure of political representation to farmers residing in resource poor areas, or at the very least, provides opportunities for groups residing in fragile areas to voice their concerns. Democratisation also implies a trend towards freedom of the press and with this, the chances that environmental degradation will be brought into the public domain increase.

Democratisation is typically accompanied by calls for greater clarification of property rights, and as such rights are clearly assigned, resource holders have a greater incentive to safeguard the quality of their assets. Parallel to democratisation comes efforts to improve the quality of governance and to enhance the accountability of the public sector to civil society. The greater the degree of accountability, the greater the chance that misuse of natural resources will be exposed.

Furthermore, the public sector, as the final “trustee” of a nation’s stock of natural resources is more likely to be accountable if such resources are “well governed” than in a system in which public performance is not subject to careful scrutiny. In essence, democratisation injects a great deal of competition into the decision-making process and, in so doing, raises the stakes for policy makers who do not take scientific understanding of natural resource use processes into account.

Structural adjustment

Most developing countries, and all economies-in-transition, have undertaken structural adjustment programmes to improve their economic growth. Although specific adjustment efforts vary according to country circumstance, most programmes involve a mix of policy efforts aimed at strengthening macroeconomic management, liberalising trade and exchange rate arrangements, reducing public sector involvement in commercial activity, and strengthening core government functions.

The effects of structural adjustment efforts on natural resource management are complex and country specific. In general, structural adjustment efforts involve a reduction in “price and trade related” distortions to efficient resource use. Many of these distortions to the working of the market

mechanism also have adverse effects on natural resource use. For example, fertiliser subsidies, commonly used to promote crop intensification, would also tend in some countries to discourage soil conservation. Policies that under-price irrigation water would tend to discourage water conservation measures. The phasing-out of price-distorting measure, as a part of a structural adjustment effort, would tend to increase the farm sector's preference for agricultural technologies that conserve natural resources (Barbier, 1992, Repetto, 1994). In such an environment, economic management concerns may "force" a need to change policies that have large natural resource use consequences. This change process may force a closer interaction between policy makers and agricultural researchers (possibly mediated by external agencies involved in structural adjustment efforts) when decisions need to be reached on the removal of price distortions.

Structural adjustment efforts are almost always undertaken in economies in which the governments are experiencing fiscal distress. The need to improve the government budget balance also tends to involve measures to increase official tariffs and charges.

This may inspire governments to correct the under-pricing of those natural resources (water, forestry products, and fishery stocks) that are treated as "natural national capital". In such situations, the economic imperative to correct the under-pricing of natural resources may drive policy makers and researchers together to determine the "correct" price of the natural resources.

Globalisation

The GATT Uruguay Accord of 1994 marks the first time that agriculture has been subject to multilateral trade discipline. It also marked an effort to forge more globally accepted production standards for agricultural products. Part of the Accord involved an attempt to harmonize phytosanitary standards. Establishing and enforcing such standards would provide producers with an incentive to seek alternatives to production practices which harm both product quality and the natural resource base (e.g. over-use of pesticides and fungicides). In the aftermath of the Uruguay Round Accord, the upper-income countries have called for the World Trade Organisation (WTO) to link market access for agricultural commodities to the manner in which the commodities were produced. In other words, countries could legitimately be denied market access if agricultural products were produced in a manner that was deemed to be environmentally hazardous. Under the North American Free Trade Agreement, a number of bilateral deals have been forged on environmental production standards for agriculture and fisheries products. This signals the beginning of efforts to more closely link trade to environmental standards.

While many have argued that the attempt to link environmental standards to trade access is just protection in a new form, developing countries that wish to retain (or improve) market access to wealthier nations will no doubt need to improve environmental standards. This implies that those who benefit from trade, within a given country, will have a strong stake in the way in which resources are utilised in agricultural production. This broadening of the number of interest groups with a stake in resource-use outcomes tends to increase the demand for scientific solutions to problems of (what are deemed globally unacceptable) resource use patterns. While, as noted above, globalisation may set standards for agricultural resource use that are inappropriate for individual developing countries, it will also create a demand for national measures to bring local laws, regulations and practices in conformity with the emerging global standards.

Summary and Conclusions

Forging an effective interface between NRM-oriented agricultural researchers and public policy makers is a difficult challenge. It is necessary to have an effective interface because the solution to sub-optimal use of agricultural resources often requires measures that alter the way collective choices are made. National governments have a strong stake in seeing that such linkages are made because sub-optimal resource use causes countries to achieve less than their potential rates of agricultural output growth and can reduce opportunities for future generations.

But there are many obstacles to forging an effective link between the agricultural research and the policy making community. Neither group may be accustomed to working with each other; they may communicate in very different fashions; problem definitions and time-frames for problem resolution are very different; one group values objectivity while another values insider loyalty; advocacy coalitions may act to exclude the scientific voice; with thin institutional structures, neither scientists or policy makers will face competitive pressure to cooperate; and global agreements may take precedence over national decision making.

Still, changes in the external context for policy making in developing countries are inspiring a greater openness and willingness to involve scientific experts in the policy making process. Democratisation is increasing the transparency and accountability of political leaders. Structural adjustment efforts are focusing attention on the need to eliminate distortions to the under-valuation of scarce natural resources. And globalisation, by linking agricultural trade to environmental standards, is forcing countries to put resource management improvement higher on the political agenda.

How then can agricultural research systems gear their NRM-type agricultural research efforts to have a positive influence on public policy? In general, agricultural research systems must become more oriented toward producing research outputs that meet the needs of public policy makers, and conversely, public policy makers must become more active stakeholders in the agricultural research process. Bringing research results into the policy domain implies that NRM-researchers need a better understanding of how policy processes generally work. That barriers to effective communication will exist is well understood, but for each country, the specific barriers should be identified, and efforts made to find institutional solutions that will foster improved interaction.

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Figure 2.1: The institutional framework for NRM-research and public policy: An indicative low-income country setting

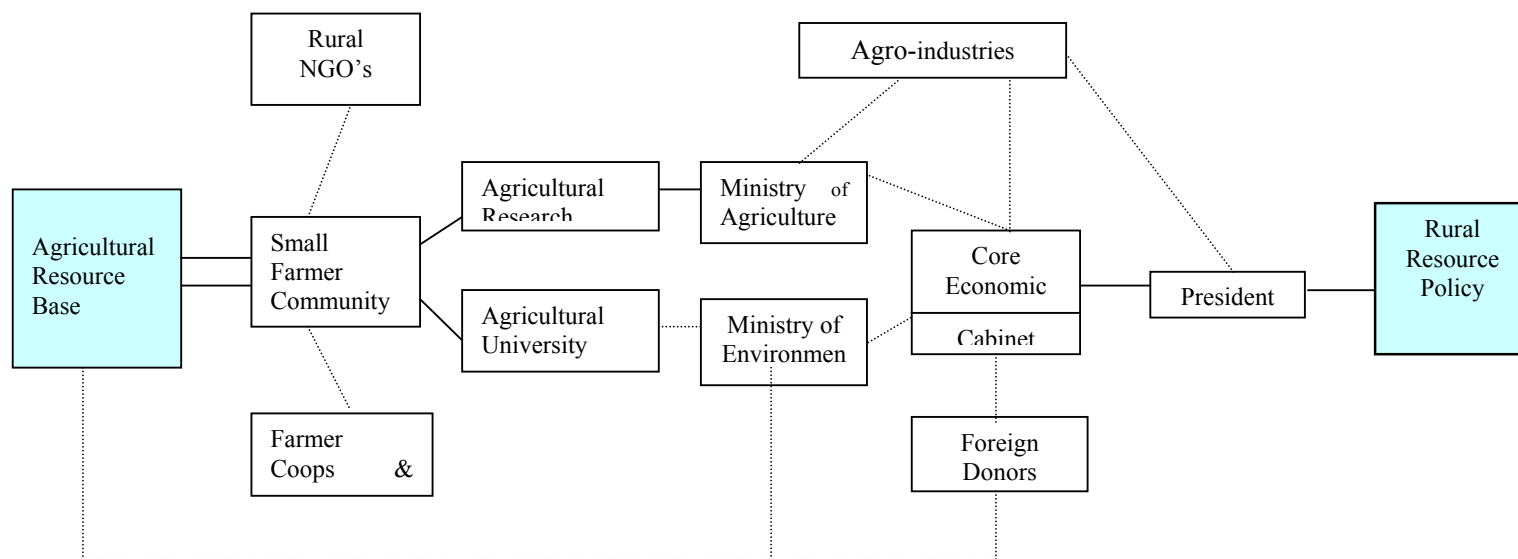
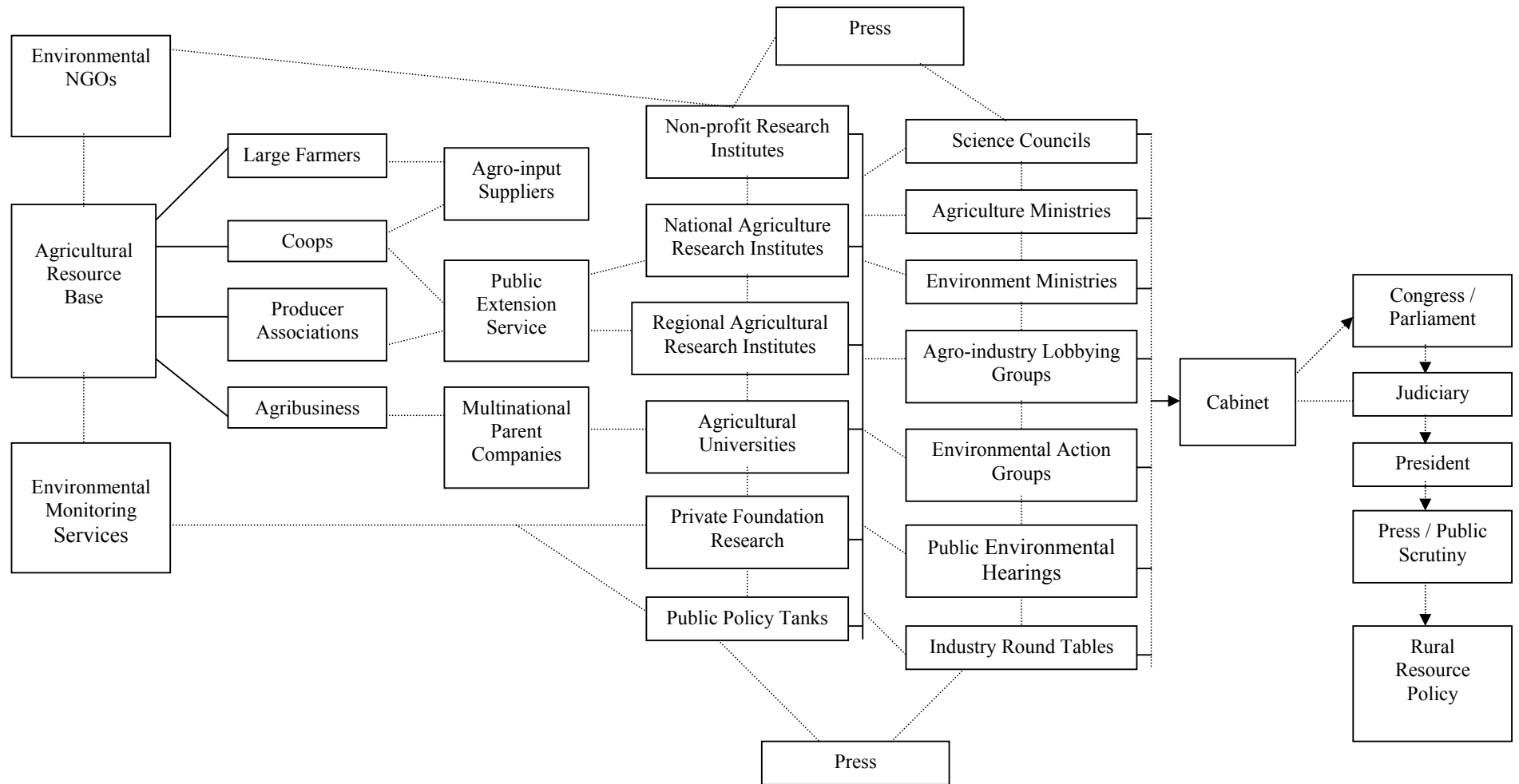


Figure 2.2: The institutional framework for NRM-research and public policy: An indicative upper-income country setting



Chapter 3

Policy and Research: Loops of a Spiral?

Helio Tollini

Introduction

Many developing countries are still struggling with the basic quest for better production processes that increase *input* productivity. The sole objective of most research in developing countries still is to increase *land* productivity. Most agricultural research systems in developing countries today have only developed capabilities for very basic experimental trials of varieties, testing fertilisers and pesticides, and comparing simple production techniques.

As most agricultural research institutions know little about alternative experimental designs for better economic analysis, they rarely evaluate the *economic* impact of their experimental results.

Yet, these institutes are now increasingly being requested to deal with problems related to the sustainability of the production capacity and environmental conservation. They are called upon to focus more on food security, poverty alleviation, and gender issues. They are asked to move upward in a scientific spiral when they have not been able to even close the loop at the base of the first spiral. And when they do manage to close that loop, then researchers will have to learn to work with policy makers.

The traditional research problem of finding ways of increasing agricultural productivity seems simple compared with today's challenge to maintain and improve the productive potential for future generations and conserve the quality of the environment, not to mention alleviation of poverty and improvement of food security. Moreover, the complexity of the data and the analyses required for generating the information necessary to support policy decisions on sustainable development and natural resource management (NRM) is greater than ever.

There are two obstacles to developing a self-reinforcing linkage mechanism between research and policy: i) policy makers and researchers need to be able to communicate without misunderstanding each other; and ii) policy change is, over time, affected by uncertainty as regards key policy variables. This note will address these two obstacles briefly.

The Policy Maker – Researcher Nexus

The extent to which policy makers and researchers have been able to communicate may partly explain why some national agricultural research systems have been effective and others have not. When policy makers take a genuine interest in scientific research and its outcomes, the probability that such results will be considered for use by such policy makers will be significantly higher than in its absence; and vice versa. Agricultural research and the policy formulation process are therefore mutually dependent on each other, if their efforts are to be at all effective. Below, a number of issues that may contribute to the

communication problem have been identified.

- *Differences in focus.* Frequently, policy makers and researchers interpret problems in a different fashion: policy makers are inclined to treat symptoms, whereas researchers look for the cause. This is further complicated by the fact that the analytical nature of research leads researchers to deepen out a problem, to focus on very specific aspects and produce very specific answers. Policy problems are therefore often too broad for researchers to handle. Policy makers, however, need a broad (generic) solution to an issue in order to take a policy decision. To be truly complementary, researchers and policy makers will have to closely collaborate in all stages of the process of finding a solution to problems, and thus bridge the gap that has separated them.
- *Differences in objectives.* It may also happen that researchers and policy makers are looking for different kinds of information. Researchers may be interested in an optimal technical solution, while policy makers look for socially and politically feasible solutions. Scientists look for recognition from their peers; policy makers need legitimisation from their constituency. Only the patient practice of dialogue can reduce this difference and the resulting communication barriers.
- *Different degrees of urgency.* Researchers find answers to problems by testing hypotheses. This usually takes time. Policy makers need solutions to problems soon after they become evident, as the problem may require urgent action. The time frames of researchers and policy makers therefore differ widely. Also, policy makers often consider that researchers have sufficient information, while researchers typically feel that they do not know enough about a problem and need more time and data in order to address additional issues that may come into play.
- *Distance between the research station and the ministry.* Researchers and policy makers often live in different “worlds,” and opportunities for interpersonal contact are few. On the one hand, there are researchers who feel that scientists should not get involved in politics, because scientists accept only the scientific truth and see politicians typically as having a different view of “the truth”. Policy makers, on the other hand, feel that researchers are detached from the “real” world and deal with research issues in a much too academic and impractical fashion. These distorted views greatly hamper collaboration between researchers and policy makers.

But there is hope. If researchers and policy makers would collaborate, they will discover how much they have in common. They will see how science can enrich policy, and how relevant research can be, if supported by good policy. This will take time and involve costs, but the costs of learning to communicate and collaborate are a decreasing function of time spent working together. In other words, once the results in terms of better policy analysis and enhanced policies become apparent, the easier it becomes for researchers and policy makers to work together.

Learning to Deal with Uncertainty

Although in everyday life, people make frequently decisions under situations of risk or uncertainty, most are not aware of this or are not concerned about the possible consequences. These decisions are usually not based on a careful analysis of the problem, a study of alternative courses of action, the possible situations that may occur in future, or an assessment of the gains and losses associated with each course of action for each possible future situation. Policy makers and researchers alike are not used to specify

problems in a framework of risk or uncertainty. It is important, however, that they learn to analyse problems in this way, so that they can make the best use of whatever (incomplete) information they may have, thus avoiding a breakdown in communication because of differences in perspective, information, and urgency.

Researchers may feel uncomfortable making policy recommendations because they lack quality data. They might feel better if they could describe the problem in terms of a continuum of risk or uncertainty, and if policy makers understood that the information is at best based on probabilities. One way in which economists analyse problems is through the use of a method called game theory. This is a model of cooperation or conflict under uncertainty. Policy makers and researchers may want to use game theory, and, by institutionalising this approach, to help enhance a sustainable policy making environment.

Chapter 4

The Implementation of Policy Reforms in the Philippines: Some Lessons from Experience

V. Bruce J. Tolentino

Introduction

The Philippines has been described as being in a “transitional” and “reform” mode for close to two decades. The current process was started in the early 1980’s as the country was forced to initiate structural adjustment measures. In 1986 a “people-powered” revolution swept Ferdinand Marcos into exile and Corazon Aquino into office. Mrs. Aquino’s administration adopted reform as its principal goal. In 1992, the first free elections in 20 years saw Fidel Ramos elected to the Presidency and his leadership in intensifying economic reforms.

Direct participation in the continuing reform process in the Philippines is the principal experience from which these notes arise. This paper draws some personal observations and lessons from the point of view of a researcher / policy analyst who had a unique opportunity to bridge the gap between research analysis, policy prescription, and the implementation of reforms.

More specifically, the lessons are drawn from experience as: (a) Executive Director of the Philippines’ Agricultural Credit Policy Council from 1986-90, (b) Assistant Secretary, and Under-secretary for Policy and Planning of the Philippines’ Department of Agriculture from 1988-92⁷ and (c) economic policy analyst and consultant with direct experience in policy reform efforts in various countries in Central America, North Africa and North and Southeast Asia.

Fundamental Lessons

The lessons from experience may be summarised in two major groups of statements. First, there is little substitute for experience in policy making and governance that the management of the reform process is successful and that policy reforms are effectively and efficiently implemented. Policy reform is invariably a political process – because policies are political – affecting the welfare of populations. Analysts and researchers are rarely the policy makers – while policy makers are almost always politicians. The second set of lessons is that the fundamental features of any policy reform strategy must include the following elements:

- (a) focus;
- (b) sustained, substantial attention;

⁷ The Philippine bureaucracy is structured along presidential lines, similar to that of the U.S. Cabinet. Ministers are political appointees of the President. They are not members of Parliament. The Ministers are called *Secretaries* and are assisted by Undersecretaries and Assistant Secretaries – also political appointees.

- (c) thorough analysis;
- (d) correct timing;
- (e) credible, skilful advocacy, and
- (f) implementation assistance.

Focus and priorities

It is quite obvious that issues and problems that require the attention of government are many. In addition there are many distractions in the business of governance – some natural (like disasters) and some political. Thus focus on a defined set of priority policy goals must be achieved. Focus is necessary because the human resources that can be harnessed to deal with the issue are invariably limited.

The selection of the focus of policy reform should be guided by the issue's importance in terms of individual impact – or its being the strategic entry point or linchpin that opens up a whole set of changes that will culminate in broad gains.⁸

The selection of focus for a particular department - say the Ministry of Agriculture - is less problematic than for the government as a whole. The range of choices are of course much more restricted, and therefore the political implications less severe.

Focus is also exercised by the government (or a department) in terms of a range of interventions – from advocacy through allocation of resources in projects and programmes. Actions involving the full range would imply greater focus, while activities in terms of say advocacy alone would imply less. Priorities can also be set in terms of shares of total resources – but not by exclusion. Issues that command a majority of resources are of greater priority.

The range of interventions and shares of resources are critical aspects of the public image that the government induces. Governments are expected to do something about everything. To generate favourable public perception, a minimum level of action and resources over the full range of issues is better than less than full coverage.

Attention: sustained and substantial

Once focus is achieved on a priority set of issues for reform, such attention must be sustained through to actual policy change and sometimes beyond to implementation. While the action of a policy change is literally made in an instant - “at the stroke of a pen” - the final action is often the culmination of a process through which the decision is arrived at. The reform process is incremental – often involving gradual internal change in the attitude and viewpoint of the policy maker(s). These changes are achieved by *chipping away* at the sources of resistance to policy changes, through continuing constant advocacy and the accumulation of evidence in support of reform.

⁸ To use a Dutch analogy - a critical reform would be to patch up the crack in the dam that - if left alone - would lead to the collapse of the entire seawall.

Box 4.1: Sustained Attention in Policy Reform: Rural Finance

The Philippines initiated reforms in its financial system in 1981. The basic reform package crafted in the early eighties has been pursued and refined ever since – through the “yellow revolution”, the administrations of three Presidents, three Central Bank Governors, and at least seven sets of Secretaries of Finance, Economic Planning and Agriculture.

Attention to the issues must not only be sustained, it must also be substantial. Thorough research and analysis on all aspects of the issue is required – in order to ensure that the impacts on each and all stakeholders are revealed. Such stakeholder analysis will also enable the formulation of safety nets or targeted actions that will facilitate transition, encourage support or neutralise resistance to reform.

***Box 4.2: Insubstantial Attention in Policy Reform:
Sugar Policy and Inter-island Shipping***

Sugar. Reforms in the monopoly-ridden and inefficient Philippine sugar sector were initiated in the mid-80s, but stalled in the late 1980's and could not be pushed further due to the resistance of major stakeholders. Current hindsight (of course in 20-20 vision) indicates that the principal failure was the poor understanding by policy makers and advocates of reform (who were mostly from outside the sugar sector) of the technical aspects of the sugar production process – especially of the benefit sharing systems dictated by the sugar content extraction process.

Inter-island Shipping. The Philippines suffers one of the largest transport margins in the production and marketing of basic agricultural outputs and inputs across Asia. Apart from poor roads, these margins are due to monopoly elements in port services and shipping services. Efforts at reform were initiated in 1988. These were stalled when the impacts of reform on dockworkers and their unions were not analysed and prepared as thoroughly as they should have been. The resistance of the dockworkers has greatly delayed the reforms.

Timing

The timing of reforms is critical – particularly in the maximisation of enabling opportunities – when the confluence of public and stakeholder opinion, related events and the readiness of policy makers and the bureaucracy to implement reform, is positive. Elections and the changeover of political leadership may hinder staff reforms already in process, or may enable their implementation or acceleration. Deadlines set

by international agreements may force domestic compliance. Mass action or leverage exerted by major stakeholder groups may spark policy changes.

Box 4.3: Timing and Reform

Success – Land Reform. Land reform has long been a major issue in the Philippines. President Corazon Aquino’s reform platform in 1986 placed major emphasis on “land to the landless”, and thus won the support of many farmers. Yet the complexity of land reform delayed action, until finally several farmers were killed during a pro-land reform rally in 1987. The incident pushed the Aquino government into speedy action on land reform.

Success – WTO Membership. The Philippines was an original signatory to the General Agreement on Tariffs and Trade (GATT), and was pulled along with many other members into accession to the successor World Trade Organisation (WTO). The Philippines membership of the WTO was facilitated by announced deadlines set by international agreements – deadlines that the pro-WTO advocates constantly emphasized.

Failure – Pesticide Policy. In 1990 a process to reform pesticide use policy and patterns toward optimal and cost effective use was initiated. The reforms were initiated at senior levels of the Department of Agriculture. The reforms had a rocky start, but by early 1992 substantial advances were in the offing. The elections of May 1992 and the subsequent entry of new officials into the DA delayed and somewhat stunted the reforms.

Credible, skillful advocacy

The heart of a policy reform strategy is advocacy, incorporating related and mutually supportive activities in communications, champions, coalitions, mobilisation and the management of perceptions.

Information material and the skilful use of the mass media are critical to policy advocacy. The results of research and analysis have to be translated from technical jargon to the more popular language of politicians / policy makers and supporters. Information materials need to be of various types – from policy briefings to policy options memoranda targeted at specific users and press releases suitable for broad audiences through both broadcast (radio and TV), print media, and now the world wide web.

In general, experience with the press in the Philippines supports an approach that is transparent and open: The press is sympathetic to policy reform efforts that provide as much background information as possible. The reporters appreciate relations in which an effort is made to carefully explain the technical underpinnings of the analysis and the basis for the proposed reforms.

The contributions of credible spokespersons for reforms – “issue champions” - often facilitate the

communication and advocacy process. As in the case of the late Princess of Wales on the issue of land mines, public figures are often accorded unparalleled opportunities to speak on issues and be listened to. Once the initial barriers of communication are broken, then more complex and technical information may be provided by analysts to facilitate decision-making on the policy issues.

The inherently political nature of policy issues demand that coalitions be built in support of reforms. Such supportive coalitions are made necessary by the already-existing coalitions among those who currently benefit from the status quo. The existence of coalitions facilitate dialogue: Representatives of opposing coalitions may be brought together to discuss the reforms and achieve mutually acceptable solutions.

Dialogue among coalitions may also produce mutually supported ideas for transition arrangements and assistance for those who lose from the reforms. Transition arrangements may involve “second-best solutions” a short-term tolerance for less-than-perfect solutions – where some level of temporary inefficiency is accepted, but within a time frame.

Mobilization

Continuing communication and participation facilitates the policy reform process. Thus the creation of institutions and structures that facilitate participation and communication is essential. This is particularly true in those contexts where policy disagreements may lead to violence – as is the case in many LDCs.

The imaginative and participative employment of groups and meetings is demanded in advocacy: Committees, task forces, focus groups, panels, advisory groups, steering committees, technical working groups, sectoral boards, and so forth are structures which facilitate the participation of diverse interest groups, organise and coordinate their input, and provide a formal mechanism for processing such input toward mutually-acceptable decisions.

Meetings such as conferences, seminars, public hearings, summits, consultations, workshops, and audiences, particularly if organised on a regular or periodic basis, may be seen as time-structured steps in the provision of information and analysis and interaction toward the resolution of issues. Such meetings are particularly useful when there is effective secretarial support that sets agendas, distributes information on time, and produces meeting minutes which document the content and the process.

It must be noted that organised groups and meetings are of particular importance for governments that are often expected in public perception to be unfailingly “doing something” – to be pro-active in all situations. Having a committee or conducting a meeting is at least “doing something”, particularly in those instances when inaction is the appropriate action.

Perceptions

In 1991, at a development policy conference, I asked an eminent development economist to summarise his experience of more than 4 decades of advising governments. He said that rarely do politician-policy makers make fundamental policy decisions on the basis of technical analysis. His impression is that policy advisors have only been able to influence the “development notions” of senior government officials. Once these notions, or policy tendencies, have been formed in the consciousness of the policy makers, then the technical analysis merely confirms or adds more detail to the basic policy attitude already reached.

The mass media is undoubtedly an important instrument in shaping the notions and attitudes of the public.

Mass information will modify public support for certain policy positions. The deliberate employment of mass media, public relations and advertising techniques draws from the notion that certain information, if repeated often enough, becomes the truth.

Implementation assistance

Gerald Meier (1991) offers a model of the “policy formation process” (see Figure 4.5). Economists offer analyses and prescriptions to policy makers, who are subjected to state and society-centered forces. Policy alternatives are made subject to constraints and influences leading to implementation of the chosen policy, and eventually resulting in an “expected” outcome. Meier’s conception overlooks the fact that in governments, there is a fundamental separation between policy makers (politicians) and policy implementors (bureaucrats).

Figure 4.6 extends Meier’s model to indicate the role of the implementors. Both the policy makers as well as the implementors are subject to internal pressure and external influence, eventually resulting in adjustments in the desired policy outcomes as first perceived by policy makers and implementors.

The role of the bureaucracy in policy reform is a poorly explored and understood area of analysis. Yet, it is one of the clearest lessons of the experience reported in this paper that interventions only at the study and advisory stages are often not enough to achieve policy reforms. Attention is required through to implementation, where the recommendations are translated into operational measures and decisions.

Box 4.4: Assisting in the Implementation Of Policy Reforms

Success: Rural Banks. A package of policies directed at financial sector reforms in the Philippines included the rehabilitation of the rural banking system. The Rural Bank Review and Rehabilitation Committee was formed, supported by a Technical Working Group. The working group was composed of some of the consultants and analysts who had helped recommend the sector reforms in the first place. The analysts thus helped design the operational rehabilitation programme which implemented the reforms recommended by the sector policies.

Success: *Bangko Sentral*. Another major part of the Philippines’ financial sector reforms was the radical reorganisation of the Central Bank. Some of the analysts on sector reforms also helped draft the legislation creating the new *Banko Sentral ng Pilipinas*, and also supported the lawmakers who sponsored the bill into law.

Failure: Foreign Exchange Policy. For years, monetary authorities stood firm against the chorus of recommendations from calls to devalue the Philippine peso. Part of the reason for the Central Bank’s resistance is that the analysts have failed to translate the prescription of a “competitive peso” into specific, operational guidelines on money supply, discount rates, reserve requirements and other policy levers directly under the Central Bank’s control.

Closing the gap

The “loop” of policy reform is an iterative continuum from research and analysis, advocacy to implementation. The experiences above imply that researchers committed to the implementation of their prescriptions have to be prepared to promote their recommendations and if necessary to shift their activities into implementation. The relative ease and frequency with which researchers and bureaucrats actually move back and forth between academia and government may explain successful policy reform in some countries - like Indonesia and Malaysia.

The danger is of course that researchers who shift to advocacy and even onward through to implementation become unable to do research. Each specialisation demands full attention. Attempts to be more than one – researcher, advocate or implementor – may mean poor performance in any single field.

A more realistic understanding of the interfaces between research / advocacy / implementation is that each are separate functions or separate disciplines. While specialisation is necessary for excellence in any one, an interdisciplinary approach for each helps improve performance in each. The researcher must know how to communicate research results and understand the constraints under which the bureaucrat operates. The policy maker must understand the limitations as well as the potentials of research.

Figure 4.5: The policy Formation Process (G. Meier, 1991)

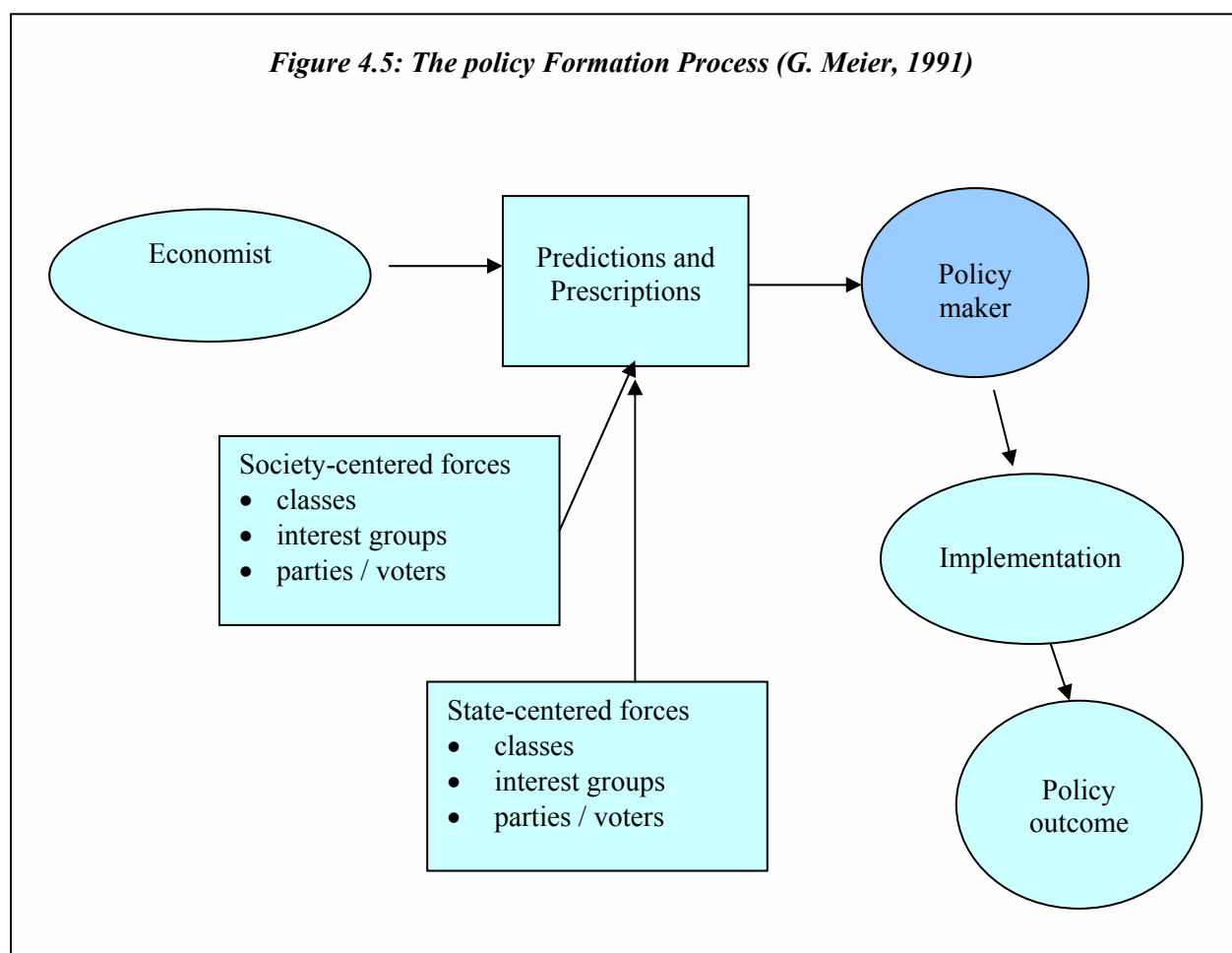
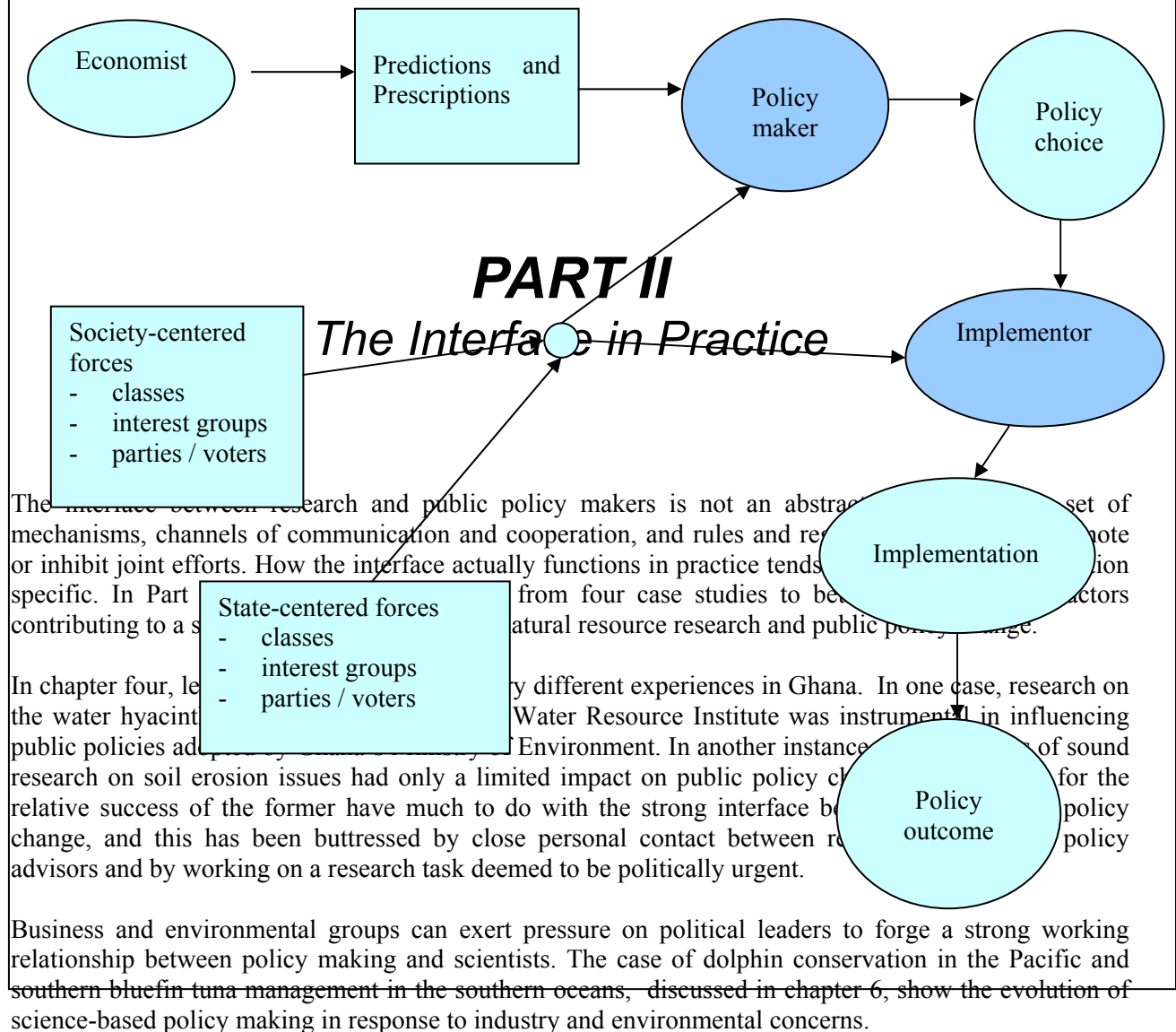


Figure 4.6: The Policy Formation Process - Extended



Sometimes science does influence policy making after a lag of many years. This happened with pesticide policy in the Philippines, as discussed in chapter 7. This chapter underscores the difficulty of bringing scientific evidence to bear on resource management policy making when scientific findings and industry interests clash. Once scientists had a voice at the policy making table however, significant progress was made.

Sometimes non-governmental organisations are able to catalyse policy change by demonstrating the seriousness of a resource degradation problem and the existence of viable, sustainable production alternatives. In the case of cyanide fishing in the Philippines, an international NGO was able to bring

together scientific evidence, appropriate technology and political lobbying to engineer a change in public policy and policy implementation institutions.

Chapter 5

Natural Resources Management Oriented Agricultural Research and Policy Change: Comparing two Ghanaian Research Experiences

W. Kwadwo Asenso-Okyere, Doeke Faber and Gerdien Meijerink

Introduction

To ensure access to low-cost food to consumers and remunerative returns to producers there must be an increase in the productivity per unit of land and per agricultural worker and, a decrease in unit costs in agricultural production, processing, and distribution.

The required productivity gains, however, will, to a large extent, be dependent on a well-functioning research system that can develop improved agricultural technologies and techniques (IFPRI, 1995).

For policy makers to make well-informed decisions as regards results and impact of policies, research output is of invaluable help. Also, in the process of policy formulation, monitoring and evaluation, qualitative and timely information ensures an effective link to the policy maker. However, for natural resources management-oriented agricultural research to be of interest to the policy maker, it must relate to the country's and the policy maker's priorities. Unfortunately, the alliance between policy makers and the researchers is not always a happy one. Timeliness, direction, and magnitude of research results often create tension between the two groups.

The policy maker, or more clearly, the government may also impact the research agenda through consultation and co-ordination with the research establishment. Problems confronting policy makers may provide a useful basis for research. Thus, a symbiotic relationship between research and policy exists, which is of mutual benefit. One way to further strengthen this relationship is to develop effective institutional arrangements that enhance the research based policy formulation and implementation process.

Ghana Vision 2020

In line with the recommendation from various experts for the introduction of innovative, decentralised and multi-dimensional forward-planning system, reaching far into the grassroots, the government of Ghana adopted a new planning system which provides for more effective development management based upon participation of the entire body politic. It was envisaged that any consultations should culminate in a national plan that reflects the development needs and aspirations of the ordinary people in their localities as well as the needs of all sectors of the economy.

The National Development Planning Commission (NDPC) was established to co-ordinate the national planning effort. The NDPC was charged with the preparation of the broad national development plan for

Ghana. The efforts of the NDPC resulted in the issuing of the Ghana Vision 2020 Document that shows the strategic direction of national development over a 25-year period, from 1996 to 2020.

The main purpose for the preparation of the Vision 2020 was to provide a consistent framework for comprehensive development planning over the long-term. The main development goal of the Document is to transform Ghana from a poor, underdeveloped, low-income country into a vibrant, prosperous middle-income country within a generation.

The implementation of the development policies outlined in the Ghana Vision 2020 are expected to be undertaken through the mechanism of a series of Medium-Term Development Plans.

The first Medium-Term Development Plan has been prepared through the harmonisation of District Development Plans of all the 110 District Assemblies of Ghana and Sector Plans of the Ministries and Sector Agencies. The Plan is therefore a collaborative effort among local communities, District Assemblies, Regional Co-ordinating Councils, Government Ministries and Sector Agencies, the private sector, the universities, the consultancy and research and technology community, the Trade Unions and non-governmental organisations. The central thematic focus of the Plan is on (i) human development, (ii) economic growth, (iii) rural development, (iv) urban development, and (v) enabling environment.

The Plan places a lot of emphasis on the protection of the environment as human activities exploit natural resources for survival and economic growth. The Plan addresses issues related to land management, forestry and wild life, water management, marine and coastal ecosystems, industrial pollution, mining, hazardous chemicals, and human settlements.

The programme objectives in support of Natural Resource Management (NRM) include:

- improving management of land and water bodies and the conservation of their resources
- abolishing destructive farming, forestry and fishing practices
- ensuring sustainability in the development, management and the use of renewable natural resources
- developing the policy, legislative and institutional framework for the conservation and sustainable use of biological resources

Part of the activities in support of NRM includes the promotion of research and the dissemination of the findings to a large number of people.

Linkages Between Research and Policy

Even though Ghana has a well established institutional set up for agricultural research, many policy relevant research results end up on the shelves of researchers and policy makers without being considered for implementation.

To try and understand the factors that contribute to this situation, this chapter discusses two research projects that were undertaken by Council of Scientific and Industrial Research (CSIR) institutes, but which met with different levels of success in getting the results implemented.

Dealing with the Water Hyacinth Problem

Background and problem

Water hyacinth (*Eichhornia crassipes*) also known as the "Florida Devil" or "Bengal Terror" is undoubtedly the world's most problematic aquatic weed.

Water hyacinth was first identified in Ghana in late 1984 in a residential area in Tema. It is believed that the weed spread around the Accra Metropolis through the activities of floriculturists who sold it to the ignorant public as "water lily". By 1987, it had found its way into some drains and streams in the Accra / Tema Metropolis. In 1990 the weed was identified in the Tano / Abbey / Ehy lagoon complex on the south-western border with Côte d'Ivoire. Water hyacinth can be found over 40 kilometres of the lagoon shoreline and 20 kilometres of the Tano river covering an area of about 50 hectares. Movement of the weed in the lagoon from the Ivoirien side sometimes swells up to the surface on the Ghana side and prevents water transportation, which may lead to complete isolation of villages, if other modes of transport are not available.

In the Tano lagoon, fish catches have dropped by 80-90% since 1991, the cause of which is attributed to the water hyacinth. In some of the fishing villages, fishermen have left to search for alternative employment because of the menace caused by water hyacinth.

Before the water hyacinth problem caught the eye of the public, the Water Research Institute had made it an objective to eradicate the weed from the country. This was not an easy task because of the weed's rapid expansion. The Plant Protection and Regulatory Service of the Ministry of Food and Agriculture and the Environmental Protection Agency (EPA) joined the fight.

Research design

The research, although conceived originally by the Water Research Institute, was planned with the full involvement of the communities where the weed had become a nuisance. The research was designed to be exploratory in nature to allow the researchers to estimate the extent of water hyacinth infestation of water masses in the country. However, it became obvious that an intervention had to be devised to go along with the research for controlling the weed to reduce its impact on the livelihood of the people. Any control strategies adopted were fully discussed with the communities and their participation in the implementation was sought. This ensured acceptance of the project and its apparent success.

Control strategy

When the Water Research Institute found out about the extent of infestation of water hyacinth and the potential that exists for its spread within a relatively short period of time, it alerted the Environmental Protection Agency. In 1987, a National Water Hyacinth Control Committee was set up under the auspices of the EPA with representatives from water-related and other agencies concerned with the havoc the weed causes.

As a first step, the Committee embarked on a public education programme through the national print media, electronic media, symposia/talks and the distribution of information posters to warn people about the potential harm the weed can cause. The second step was the physical removal of water hyacinth in several places. This involved many organisations including the Ghana Armed Forces and the Water Research Institute. The third step was a selective herbicide application in some drains and streams.

In 1992 a National Biological Control Committee was formed under the National Agricultural Research project with a grant from the Austrian Government to implement a project on biological control of water hyacinth. When the project ended in 1994, the GTZ sponsored it for 1995/96. In 1994 a project on "Integrated Control of Aquatic Weeds in Ghana" funded by the European Union and administered by the FAO was initiated for a two-year phase and later extended by one more year to 1997.

In addition to water hyacinth, the project also looks at water lettuce (pistia) and cariba weed (salvinia). To co-ordinate the implementation of the control projects for water weeds, the Water Research Institute seconded one of their officers to EPA and a Cross-Sectoral Steering Committee was set up, with EPA chairing it.

The Government of Ghana has also sought to enter into dialogue with those countries with which it shared water bodies, in order to mobilise a united front to combat the water hyacinth problem.

Introducing Soil and Water Conservation Methods

Background

Soil fertility management is becoming increasingly important with the intensified cultivation practises caused by population pressures. With increasing population, shifting cultivation within the customary time intervals is no longer possible, and thus farm families have had to stay on the same piece of land for a longer period. This situation is considerably worse in the northern savannah zone of Ghana. The problem is further aggravated by the naturally poor state of the soils and insufficient water resources. In a predominantly agricultural region, like the northern savannah zone, it is therefore important that soil and water conservation methods are known and practised by the farmers in order to increase yields or at least sustain them.

Although recognised as important by farmers, especially in the northern savannah zone, soil and water conservation has not been recognised as a serious problem by policy makers, which has made it extremely difficult to attract national attention, consequently resulting in a continuation of the problem.

Based on the perceived continued degradation of the soils of farmers' fields, the Soil Research Institute developed a project to evaluate soil and water conservation methods used by farmers in the interior savannah zone of Ghana in 1991. The project was discussed with a World Bank mission that visited the Institute and it was suggested that funding be sought from the National Agricultural Research Project (NARP). This was done and an amount of \$90,000 was approved for the project to take off in April 1996.

The objectives of the project were:

- to develop suitable soil and water conservation methods with farmers
- to increase crop yields by 10 percent on selected farmers fields
- to produce land management maps for the interior savannah zone
- to improve soil fertility status of the soils

In addition to research, the project had a component that dealt with implementation of the research results by the Soil Research Institute.

Research design

Multi-disciplinary teams comprising biophysical scientists and socio-economists were set up for the three regions (Upper West, Upper East and Northern) in the zone. Activities undertaken include an informal survey, soil characterisation, and assessment of the degree of erosion and mapping, crop yield analysis, and production of land management maps.

Six catchment areas were selected for socio-economic studies to understand the environmental circumstances of farmers and how those affect their operations, their thinking about soil conservation and the actual farming systems practises they follow and the ensuing problems. Evaluations of soil conservation practises were initiated in three catchments.

Applications

Known soil fertility data were regenerated through applications in the field. Dissemination of research results was done at workshops at which farmers, extension personnel and NGO's were invited. At these workshops, farmers would present their problems, which then would be discussed and common solutions found. Field days were also organised to demonstrate some of the techniques for soil and water conservation in actual practice. Interventions on farmers' fields are undertaken only when farmers show interest or request for them. The service is provided free of charge as part of the project.

One observation of the Soil Research Institute is that extension staff do not see the soil problem as a serious threat to agricultural production. They emphasise more the availability of improved varieties, while soil fertility is taken for granted. As a consequence, the Institute has taken it upon itself to train extension staff on soil fertility management and water conservation practises.

In this respect, front line extension staff of the Ministry of Agriculture in the Upper West, Upper East and northern regions plus the extension staff of the NGO, TRAX in the northern region have been involved in the training sessions.

Comparing the Approaches of the Two Institutes

The two research projects presented above represent two approaches used in formulating a research problem, conducting the research and disseminating the results. The two approaches resulted in different rates of success in influencing policy. Whereas the water hyacinth project has been regarded as relatively successful, the soil fertility research tended to be regarded less so. Below, we identify and discuss the possible factors that may have influenced the outcome of both projects.

Short term nature

The water hyacinth project, although conceived by a research institute, tackled a problem of international importance, because of its potential devastating effect on the environment and the livelihood of people in the short term.

It can be said that at the onset of the research, the problem was not well known in Ghana, but due to the prominence both the print and electronic media gave it, it did not take long for the problem to become a national issue. Water hyacinth affects a public good, water, which is exploited for private gains. Thus, both the body politic of communities and the individuals themselves become interested in the problem and demand a solution to it.

Therefore, when the Water Research Institute came out with its preliminary findings, through the media, pressure was brought on the politicians and government to act immediately in order to stop what was seen as a potential threat to the economic survival of some of their electorates.

Short-term political gains

Alternatively, soil fertility management also affects the productivity of a public good, and is also exploited for private gains. However, the detrimental effects of soil degradation and declines in soil fertility will only be felt in the long term, as would any remedial activity.

Because politicians are only interested in short term political gains, interventions that will show a return on the investment in the long term do not have high priority on their political agenda (Faber and Vijfeiken, 1994). Thus, the soil degradation problem will not command the same level of attention as the water hyacinth case for reasons of political short-sightedness and self-interest.

Social relevance

Additionally, although agriculturally important, the interior savannah zone, which is geographically and politically far removed from the political centre of Ghana, does not represent a highly vocal group in Ghana. The zone may therefore not have the capacity to canvass the necessary public and political support needed for a large-scale rehabilitation programme for soil and water conservation.

Project consultation and formulation process

The process for formulating the two projects in the two institutes was different. Whereas the soil and water conservation project was fully developed at the Soil Research Institute without consultation with the eventual implementing agency of the results - the Ministry of Food and Agriculture - the water hyacinth project had an input from the Environmental Protection Agency and other stakeholders. This gives a clear indication of the need for alliances to be developed and awareness raised, which eventually will be of decisive importance in obtaining approval of the projects.

Commitment and ownership

From the comparative analysis, it has become clear that underlying the above-mentioned notion of awareness and allegiance, there is another important difference between the two cases: the building of commitment to and ownership of the identified problem. In the water hyacinth case, WRI structurally involved policy makers and practitioners in the process from the very beginning. In doing so, they were made aware of the potential problems, of the need for action at the national and local levels, and of the necessity of funds. At the same time, the general public opinion was mobilised to know about the potential danger and the need to eradicate the weed.

Funding

The water hyacinth project was allocated government funds from the early stages of the project. Because of awareness raising efforts among the international donor community, additional donor support further facilitated mobilising the necessary resources to begin an intervention programme.

The soil and water conservation project was initially funded out of a credit from the World Bank through the National Agricultural Research Project. It was expected however, that because of the nature of the problem, the Ministry of Food and Agriculture would become more involved in the execution of the project. However, as noted above, the lack of active involvement from policy makers and politicians in the early stages of the project, eventually caused the lack of the necessary government support and thus provided no further basis for NRM oriented policy change.

Institutional linkages

Because of its multi-disciplinary nature, natural resources policy formulation and policy implementation requires the active involvement of all relevant departments and ministries. Effective horizontal consultation and co-ordination between NRM related ministries and departments may facilitate the formulation and implementation of policy.

From the analysis, it appears that such an institutional relationship exists between the CSIR institutes and the Ministry of Environment, Science and Technology (which the EPA is part of) which exercises oversight responsibility for the Council. No formal relationship however, exists between the CSIR institutes and the Ministry of Food and Agriculture, and therefore the Soil Research Institute did not benefit from such an institutional linkage and so could not properly inform its most relevant partner.

Networking and effective partnership

In addition to pure research aspects, both projects defined specific intervention measures, involving each research institute in the control programme. However, again, the Soil Research Institute did not involve its network and develop an effective partnership but rather acted in isolation from other relevant institutions and organisations. The Water Research Institute did involve other interested relevant national organisations at this stage. As a result, the National Water Hyacinth Committee was set up to oversee the control programme for water hyacinth.

Demand-driven approach necessary but not sufficient

It is of interest to note that the approach to the problem was fundamentally different: the intervention on water hyacinth eradication was proactive and initiated through government, and therefore rather top down; the soil and water conservation problem emanated from and was based on requests from farmers, and thus bottom up. From theory, it could be argued that the latter case would have a greater chance of success, as it involved the target group, and some of the important actors and stakeholders: farmers and community. Yet, the opposite is the case.

The top down approach appears to have been more successful, because the project built commitment and ownership of the problem by taking it from the national level to the local level, suggesting that a properly managed supply-driven approach may work as well as a demand-driven project. Alternatively, a limited demand-driven approach, which fails to build allegiances and linkages at higher levels, will not suffice. Commitment from the (national) policy makers must be ensured.

Public education and awareness raising

Policies are usually made in order to enhance the well being of the nation as a whole. However, in most cases the potential benefits may not be obvious or the issue may be too abstract or complex for the public at large.

In the case of the water hyacinth, a national public education campaign was launched contributing to the understanding of the problem identified, informing the public about its potential hazards, and the necessity of their cooperation. With support of the EPA, it was possible to put up posters nation wide, warning people about the dangers inherent in water hyacinth and pointing out the illegality of growing, transporting or trading in the weed.

The soil and water conservation project did not involve the media to any great extent. Although it organised occasional workshops and field days, it did not have an impact on national policy makers through these media.

Capacity building

Could the results of this analysis be generalised, or are they peculiar to the two case studies, because they represent natural resource management projects? From a cursory examination of research in Ghana and impact on policy, it may be concluded that only a few projects are known to have influenced policy and shown the impact expected from them. While Ghana has a well established research system, technical skills and know-how are not available in sufficient quantity to ensure effective implementation of policy measures or technical measures.

Remuneration

As in most other countries, academic and research institutions in Ghana place relatively much weight on refereed publications and reports as regards remuneration and promotion. Such a system does not reward researchers who consult with policy makers in identifying and defining relevant natural resources management problems nor to write research outcomes in concise and clear languages for policy makers.

As long as researchers are promoted for publishing in scholarly journals, which may not even be available in Ghana on problems that may have no social relevance or national priority in the Ghanaian situation, the researcher-policy maker interface will fail to effectively address the real problems.

Conclusion

A growing population and increased per capita incomes provide a real challenge for the food and agricultural system to keep pace with the demand for food and agricultural products. While at a global level, agriculture has been successful in meeting this challenge, in individual countries, agricultural output has fallen behind demand. For example in Ghana, resource problems such as deforestation, nutrient mining, soil erosion, eutrophication of surface waters, infestation, etc. can be directly related to increased pressure on land and to intensification of agricultural practises. As these problems have grown over the past two decades, Government has tried to find a balance between agricultural growth and a sustainable environment.

Natural resources oriented agricultural research is one of the means that can be used to achieve this goal. However, implementation of policy changes based on research findings often requires a well defined intervention programme, facilitated by policy makers.

In order to learn lessons of best practice, two case studies were analysed. Based on two different approaches of formulating and prosecuting research projects, two research institutes of the CSIR studied two problems and implementation of their results.

This paper has demonstrated that success of the two projects in arousing public awareness and influencing public policy depends to a large extent on the perception of politicians and of the public as regards the societal relevance and the seriousness of the problem at hand as well as the efforts of the researchers and policy makers to turn research into effective policy change.

It has been shown that the vertical compartmentalisation of ministries and departments prevent effective consultations and co-ordination causing a waste of resources, duplication of efforts, and ineffective

sectoral policies. Effective horizontal consultation and co-ordination mechanisms should be established in order to enhance the capacity for developing coherent and effective natural resources management policies through relevant and qualitative research.

Of crucial importance in developing research projects and ensuring implementation of research results is the commitment and ownership of individuals and organisations at all levels that will eventually be involved in the policy formulation and implementation process. The policy process is an integrated system that will not function if crucial links are missing or not satisfactorily incorporated in the process.

Of interest is also the finding that the approach to identifying and defining the problems and the development of a solution, seems to be independent of a supply-oriented or demand-driven process. Either case will be successful in achieving its objectives if it has carefully involved all the necessary institutions in the problem solution continuum.

Finally, the study found that in the present situation in Ghana, there is serious doubt whether the government has created an enabling environment for researchers to work on government prioritised NRM problems or for allowing a close and effective consultation and co-ordination between different institutions in developing solutions for NRM policy change.

In order to enhance such consultation and collaboration, the government should review its academic and research remuneration and promotion policy. The present lack of an effective interface between researchers and policy makers is a direct result of rational behaviour on the part of researchers: it does not pay to work with government policy makers.

For an effective research-policy interface, policy should influence the research agenda and research should help in the formulation of pragmatic policies and be used to monitor and evaluate these policies. Thus, the loop will be closed to the benefit of long term sustainable development.

Annex - The WRI Experience⁹

The Water Research Institute (WRI) is a component institution of Ghana's Council for Scientific and Industrial Research (CSIR). The CSIR "operates" several government assisted research institutions, some of which are engaged in agricultural research (e.g. the Soil Research Institute, the Crops Research Institute, The Food Research Institute). An organigramme of the Council is provided in Figure 6.4. The mandate of WRI is:

".... to provide the information and services needed for sustainable development, and the utilization and management of the resources to support socio-economic development..."

⁹ This section is based on a contribution prepared by E.K. Abban, C.A. Biney, and K.A.A. de Graft Johnson

For a better focus on its responsibilities, the WRI defines water resources to include:

- inland surface waters;
- inland underground waters;
- waters in the marine - terrestrial inter-phase zone (lagoons and estuaries);
- the inhabitants of these waters (e.g. phyto-plankton, invertebrates and fish); and
- ecosystems adjacent to and influenced by the waters (mangroves and flood plains ecosystems).

This definition of “water resources” justifies the comprehensive mix of both physical and biological water related scientists as core professionals at WRI.

Like all institutes or units of the CSIR, the WRI has an eleven member management board, which constitutes the first action stage in the process by which research results contribute to the establishment of a policy or influencing policy (Fig. 5.2).

For this purpose, many governmental and private (constituting 40% of the total) sector agencies that have a stake in water resources use and development are represented on the Management Board of the WRI.

For the Water Resources Institute, governmental agencies represented on its management board include the Ministry of Works and Housing, Ghana Water and Sewerage Corporation, Ghana Irrigation Authority, Volta River Authority, the Environmental Protection Agency, a director of another CSIR Institute and a member of the Council.

All research activities at WRI are related to water. The activities may be related to water availability (surface or groundwater, its current use, and development), or to the quality of available water or its physical, chemical or biological inclusions such as aquatic plants, invertebrate and vertebrate organisms. All research functions of the Institute can be directly or indirectly related to agriculture. However, some research activities of the Divisions are more oriented towards the management of wastes or their inclusions as natural resources for development of agriculture.

All the results of research or research proposals based on preliminary results locally or elsewhere have led to policies or influenced existing ones.

For individual researchers to have results that influence policy is, according to the established national mechanism, up to the Institute’s Management Board (see figure 5.2). In addition to researchers presenting results and recommendations through the Institute director to the Management Board, the Board may call on the researcher to personally present and explain issues involved, prior to the Board carrying recommendations to the Council for Scientific and Industrial Research (see Fig. 5.3).

However, WRI has often used the media to reach a large audience, and indirectly gain public support to influence policies. Also, the various public and private sectors on the Institute's Management Board have, by their position of having obtained information first hand, taken action earlier which also contributed to research results influencing policy.

Institutional factors

The institutional organisation of research-policy linkages is important in bringing research results to policy makers, in order to bring about policy change. However, the internal institutional aspects of the research institute are also important because this determines how an institute functions. Several aspects of the WRI will be considered in this section, including research funding, dissemination of research results, reputation of the institute and collaboration with other institutes.

Research Funding and its status

Currently, research activities that may influence policy could be expected to be 100% financed by government. However, in Ghana the government has aspired to bring more “market” into research. The present policy impressing upon research institutions is to generate at least 30% of their research budget by the year 2000. Research funding by the government has become tight, and is becoming even tighter. During the past five years, Table 5.1 exemplifies the status of research support from government to WRI. Briefly, the table indicates that the average funding ratio by the government per researcher per year is about 25% of total amount budgeted.

Table 5.1: Researcher / funding status (Million Cedi)

Year	No of Researchers	Amount Budgeted by Institute	Amount Approved (by Govt.)	Amount Received out of Approved	Ratio of Amount Budgeted by Int./ Researcher	Ratio of Amount Received per Researcher	% of Total Budget Received
1997	33	1392	227	0	42.2%	0.0%	0.0%
1996	32	580	207	161	18.1%	5.0%	27.8%
1995	31	515	180	82	16.6%	2.6%	15.9%
1994	31	366	157	140	11.8%	4.5%	38.3%
1993	31	567	200	104	18.3%	3.4%	18.3%

Mean percentage of amount budgeted / received: 25.10

The situation from the Institute's view in relation to research on management of natural resources is not satisfactory. Broadly, funds are not adequate to generate results that could assist government or appropriate agencies to support the development of policies that would contribute to developing sustainable exploitation strategies of natural resources. However, the WRI has been relatively successful in generating funds. There is evidence that institutions have generated perhaps more than the 30% of their budgets already. This can be attributed to the performance of staff. More than 90% of research staff have performed creditably (according to CSIR external staff appraisal auditing report 1996) during their careers. Resources have generally been generated through collaborative projects with other agencies outside the country with support from international donor agencies. Although resources generated would be mostly in kind and may not have been considered as "research revenue".

Not only has funding been tight, more importantly, it has also been insecure. Anyone considering to engage in any activity needs to plan and obtain adequate resources prior to commencement of the activity. This situation is also true for research activities. Where the research is related to natural resource management the situation is more crucial. This is because of the often-critical situation of natural resources. Not intervening may aggravate the situation. The water-hyacinth case made this clear; if the WRI had not undertaken any action, the water hyacinth would have spread even more and the situation of Ghana's waterways would have been worsened. Not intervening can therefore create a situation in which future natural resource management is more expensive or less probable.

Inadequate and insecure funding, in real terms could have any or all of the following consequences:

- Need for extra time to readjust plans.
- Constitute a waste of what may have been spent.
- Always makes research more expensive.
- Is sure to produce inconclusive results and thus a waste of time and effort.

With respect to insecure and inadequate government funding, a major consequence could be lack of clear research policy.

Dissemination of research results

Research results from WRI have been disseminated through several channels or by a number of strategies, including:

- Institutional refereed reports (Institute Technical Reports) - distributed to identified possible users and funding agencies.
- Presentations at the Institute or externally organized seminars.
- Through refereed international journals.
- Versions in popular press.

With reference to research results and policy change, perhaps many institutions including WRI have not been conscious of the influence their results could have on policy. Thus, no special effort has been put to translating reports into “Policy-maker friendly” papers, i.e. policy briefs that are no longer than 1 or 2 pages and are written in a clear and concise manner, leaving out research jargon.

A major reason for this is that researchers have the generally wrong opinion that their research is relevant for policy makers and that their research results will (automatically) be incorporated into policies.

WRI's reputation in the field of research

WRI, as an institution and on an individual researcher basis, has a fairly good reputation in the field of research. This assessment is based on the number of international and national research organizations to which the Institute and its research staff are invited to participate in.

Some of the activities are:

- Consultative meetings to establish international strategies in research.
- International research planning initiatives.
- Participation in international, regional, subregional and national research programs.
- Assessment of International research results.
- Training of international and national project staff.
- Request for services to national and international companies and agencies.

WRI also collaborates with local universities, government subject matter specialist departments and institutions. Internationally, WRI has collaborated and continues to collaborate with agencies and institutions, including WHO, GTZ, UNIDO, DANIDA, FAO, and some universities and research institutions in Europe.

Figure 5.2: Current route of NRM - oriented agricultural research results or proposals influencing policy in Ghana.

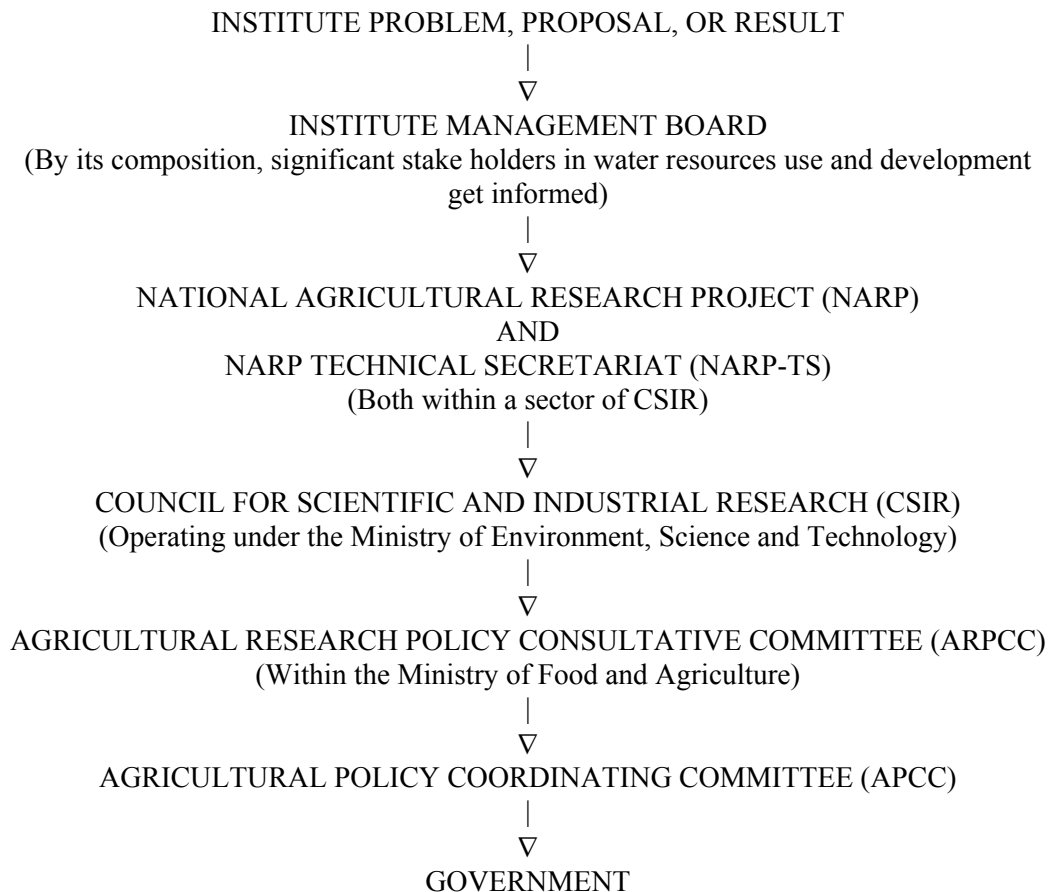


Figure 5.3: Evolution of policy from institutional research

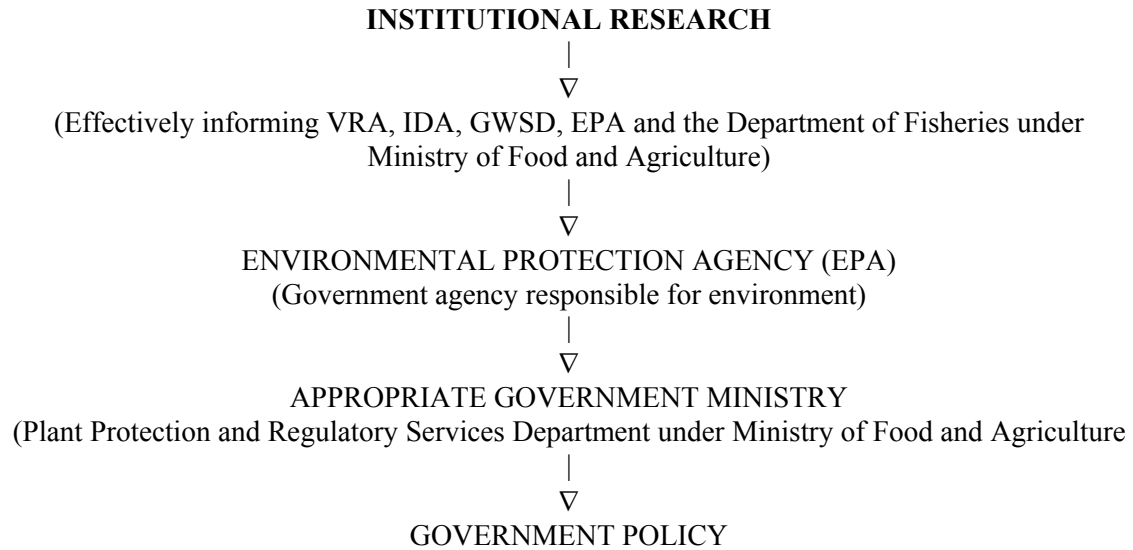
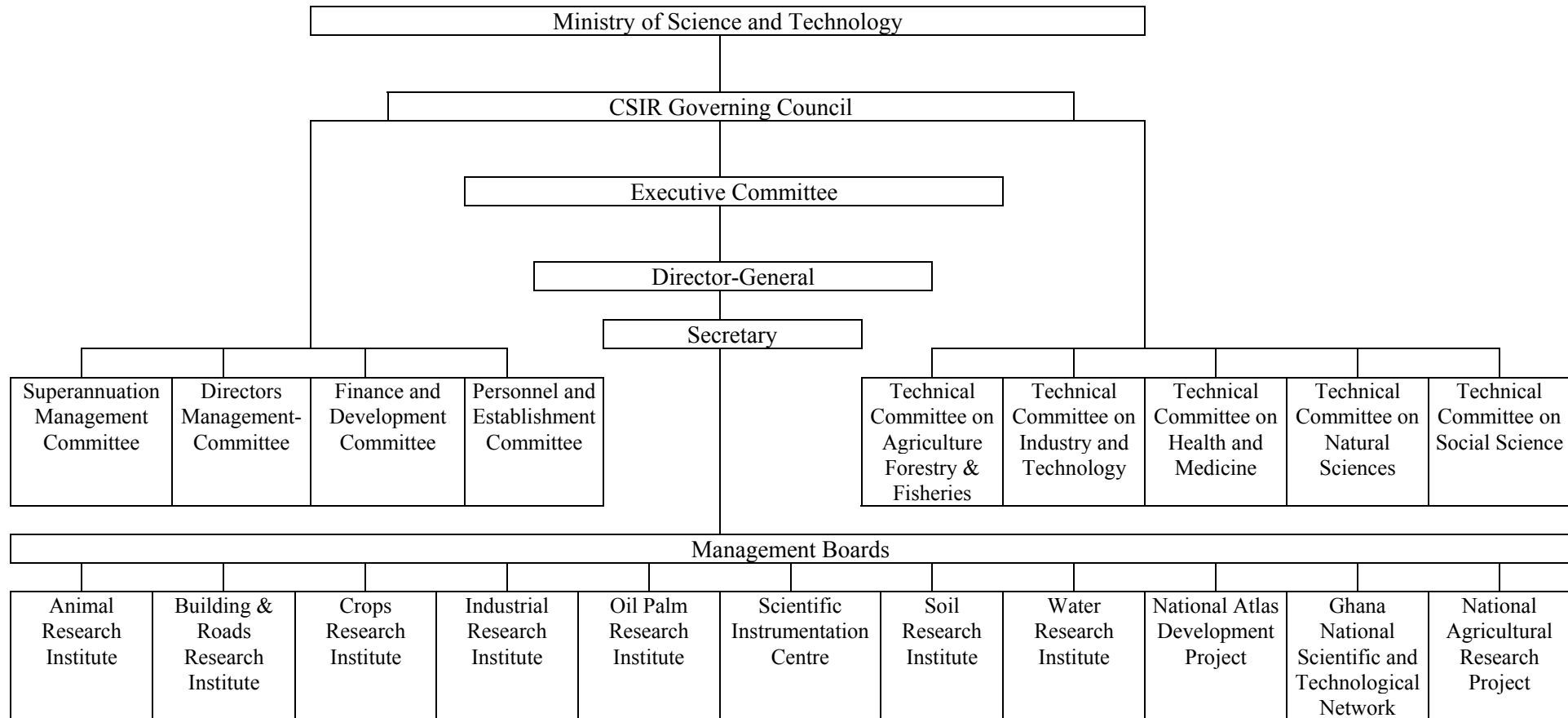


Figure 5.4: Organisational Chart for the Council for Scientific and Industrial Research (CSIR)



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Chapter 6

The Role of Research in Fisheries Management: Conserving Dolphins in the Eastern Tropical Pacific and Exploiting Southern Bluefin Tuna in the Southern Ocean⁵²

Harry Campbell and Dale Squires

Introduction

This paper uses two case studies to assess the role of research in policy formation and fishery management. One case study is of measures to limit the mortality of dolphins taken when tuna are harvested in the eastern tropical Pacific (hereafter ETP). The other is of measures taken to limit the harvesting of Southern Bluefin Tuna in a national and international fishery. The paper starts with an introduction and some background information on the policy issue in each case. It then deals with the development of research, the introduction of management measures and the importance of research in each case. Finally, some lessons from the case studies about the role of research in policy formation are drawn.

Background and history of the tuna-dolphin issue⁵³

The fishery for yellowfin tuna (*Thunnus albacares*) in the ETP is one of the most important in the world, with around 25 percent of the world's yellowfin tuna production. Both yellowfin tuna and skipjack tuna (*Katsuwonus pelamis*) occur in large schools, often together. They are caught with purse seine nets deployed by large, specially designed vessels.⁵⁴ The catch is primarily used in the international, multibillion-dollar canned tuna trade.

Yellowfin tuna is the only one of the six principal tuna species in the world to form close associations with dolphins (principally spotted dolphin *Stenella attenuata* and spinner dolphin *Stenella longirostris*, but also common dolphin *Delphinus delphis*, striped dolphin *Stenella coeruleoalba*, and others) (Sakagawa 1991). This symbiotic association usually occurs between large yellowfin tuna and dolphins.

Only in the ETP is the association so tight that herding the dolphins does not disrupt it, so that the yellowfin tuna continue to follow the surface-swimming dolphins (Perrin 1969).

Purse-seiners have used this bond between yellowfin tuna and dolphins in the ETP for catching yellowfin tuna since about 1959, giving rise to a fishing technique known as dolphin fishing. Dolphins must come to the surface to breathe, thereby making themselves visible to spotters on vessels or aboard helicopters. Fishers herd dolphins and yellowfin tuna with speedboats and helicopters, encircling the tunas and

⁵² The authors are grateful to Robin Allen, Elizabeth Edwards, Tim Gerrodette, Martin Hall, John Hampton, Sam Herrick, Larry Jacobson, Dick Neal, Bill Perrin, Gary Sakagawa, and Tim Smith for comments suggestions, and/or interviews. The authors remain responsible for any remaining errors or omissions. The results are not necessarily those of the United States National Marine Fisheries Service.

⁵³ For a history of the early years of the industry up to the late 1970's, see Wolff (1980).

⁵⁴ A purse seine net is a net weighted on one end and buoyed on the other and used to encircle a school of fish. The bottom of the net is closed by drawing a line through rings attached to the weighted end, much like a woman's purse (giving rise to the name), trapping the fish inside. These nets in the ETP tuna fishery are about one mile long and forty fathoms deep (Joseph 1977).

dolphins with a purse seine net, then releasing the dolphins, and subsequently loading the tunas onto the vessel (Joseph 1994, Sakagawa 1991).

In the process, some dolphins become entangled in the net and die before they can be released (Barham et al. 1977). The spotted and spinner dolphins are the dolphins most frequently killed by dolphin fishing (Smith 1983).

This incidental dolphin mortality rate was very high in the 1960's, when the dolphin fishing technique was first developed. The annual incidental mortality of dolphins in the ETP tuna fishery may have been over 500,000 animals in the early 1960's and slightly less by the late 1960's (Smith 1983).

The large-scale incidental mortality of dolphins due to the association between dolphins and tunas in the ETP has become an increasingly important international environmental issue in recent years, especially among the nations of Latin America and the United States.⁵⁵ The principal force behind this growing controversy has been the United States. A strong environmental and animal rights constituency and widespread public support successfully pressured the U.S. Congress to act on this matter (Cullet and Kameri-Mbote 1996, Joseph 1997, Musgrave and Stephens 1993).

Internationalisation of the tuna-dolphin problem stemmed primarily from a growing world-wide concern with the protection of marine mammals, especially the overexploitation of the great whales, and the subsequent drive to halt the hunting of whales through the International Whaling Commission, the controversy regarding harp seals in Canada, and efforts to ban the taking of fur seals.⁵⁶ The dolphin-tuna issue became an object of international diplomacy after it was submitted for consideration by the dispute resolution mechanism of the General Agreement on Tariffs and Trade (hereafter GATT).

⁵⁵. The eastern tropical Pacific is the area of the Pacific Ocean bounded by 40 degrees N. and 40 degrees S. latitude and 160 degrees west longitude and the west coasts of north, central, and south America.

⁵⁶. The environmental movement of the 1960's played a crucial role in limiting the catch of whales (Knauss 1997). The United Nations Conference on the Human Environment (Stockholm Conference) in 1972 favoured the environmentalists' approach, calling for a ten-year moratorium on commercial whaling.

The international efforts to resolve the problem of dolphin mortality in the ETP tuna purse seine fishery and

the associated concern for incidental mortality of other marine animals (sea turtles, mahi-mahi, seabirds, billfish), have led to a proposed resolution called the Panama Declaration. This declaration establishes annual dolphin mortality limits for the entire tuna fishery, which are then used to set annual dolphin mortality limits (hereafter DMLs) for each individual fishing vessel⁵⁷ These DMLs are a quasi-property right rather than a pure property right, since ownership is not conferred.⁵⁸ DMLs are not transferable from one holder to another.

The duration of a DML is one year at which point it is reissued, with the amount depending on the number of candidate vessels and the total dolphin mortality set for the entire ETP tuna fishery.

DMLs represent a major step forward in the property rights structure associated with ETP tuna fishing and dolphin conservation, and for management of the global commons in general. Many of the provisions were unprecedented in the management of multinational fisheries (Joseph 1994). Two key novel features were the allocation of limits to individual vessels of different nations by an international organization and the composition and function of the International Review Panel.

DMLs can be viewed as lying between open access and private property. However, vessels from countries not a party to the agreement are not subject to constraints on dolphin mortality in the ETP, so that the property rights regime for these vessels remains open access when fishing outside of the extended economic zones (EEZs).⁵⁹

⁵⁷. When yellowfin tunas are harvested with dolphins, dolphins and yellowfin tunas are joint products with yellowfin a "good" output and "dolphins a "bad" product because dolphins have an associated external social cost. Yellowfin tunas have a private use value as a consumptive good with an established market value. Dolphins also have a private use value as a consumptive good to yellowfin producers which does not have a market value. Dolphins also have a social value for existence or preservation and other non-consumptive uses to society which is not directly incorporated into the market price, giving an external social cost to yellowfin tuna caught in conjunction with dolphins. Thus, dolphins involve elements of both an international private or consumptive good and a public good, i.e. they are mixed goods. Even if economic efficiency is achieved by the tuna industry in exploiting the yellowfin tuna resource, without some form of regulation, market failure would still result due to the public goods characteristics of the dolphins. This market failure of this mixed good tends to lead to excessive mortality of dolphins without regulation, which is what the Panama Declaration provides. Some would argue that the social value, and hence the external social cost, of dolphins is so high that dolphin mortality should be zero, even if this leads to complete cessation of yellowfin tuna harvesting in conjunction with dolphins.

⁵⁸. Quasi-property rights refer to a system that gives individuals the incentive to behave as if use rights to a resource exist, without the government actually surrendering its control of the resource.

⁵⁹. Prior to the DMLs, the property right structure was a mixture of regulated open access (Homans and Wilen 1997) and state use rights. A distinction can be made between "pure" open access and "regulated" open access (Homans and Wilen 1997). A "pure" open access fishery can be defined as one in which property rights are ill defined, or non-existent, and in which there is an absence of regulations governing the exploitation of the resource. A "regulated" open access fishery can be defined as a fishery with ill-defined property rights, in which the authorities rigidly control the global harvest to conserve the resource, but in which they do not exert effective control over vessel participation in the fishery.

Background and history of the southern bluefin tuna fishery

The Southern Bluefin Tuna *Thunnus maccoyii* (hereafter referred to as SBT) stock spawns in the tropical waters south-west of Indonesia and the fish subsequently move south to temperate waters. The stock exploited by the Australian fishery migrates down the coast of Western Australia and then east through the Great Australian Bight and into the Tasman Sea. Fish caught off Western Australia are 0-2 years old and weigh around 3.5 kg, off South Australia they are around 2-4 years old and average around 8 kg, and fish caught in the Tasman Sea tend to be 5 years of age or older, and in excess of 20 kg in weight (Caton 1986)⁶⁰.

The Australian fishery started as a small troll fishery off New South Wales in 1938, developed into a pole-and-line fishery and then switched to the use of purse seine gear starting in 1974. The Japanese fishery, which started in the 1950's, is an oceanic longline fishery. The Australian vessels targeted surface swimming schools of predominantly juvenile fish, whereas the Japanese vessels targeted deep-swimming adult SBT schools.

The Australian purse seine fishery was a coastal fishery whereas the Japanese vessels fished a wide area from the Cape of Good Hope to New Zealand between latitudes 30 and 50 South.

A small number of New Zealand vessels entered the fishery in 1980 and in recent years Taiwan and Indonesia, and to a lesser extent Korea, have participated in the fishery. Australia and Japan were the only two countries involved in the fishery in any significant way in the 1950's and 1960's. Total catch rose rapidly from 820 tonnes in 1952 to its peak in 1961 of 81,169 tonnes. By 1971 total catch had fallen to 45,191 tonnes, and the average size of fish caught had fallen from 55 kgs in 1961 to 29 kgs. As noted above, a number of other countries began reporting catches of SBT after 1971 - Korea, Indonesia, Taiwan and New Zealand - but Australia and Japan continued to account for the bulk of the catch.

The total catch held steady during the 1980's but the average size of fish caught declined from 29 kgs in 1971 to 23 kgs in 1981. The Australian quota system was introduced in 1983, and from 1985 onwards Australia, Japan and New Zealand operated under a set of agreed catch limits.

The total catch limit was reduced after 1987, when the actual catches of the three participating countries were falling short of the total allowable catch; for example, in 1986 the quota was set at 38,650 tonnes and the corresponding catch was 27,796 tonnes, with world wide catch estimated at 27,872 tonnes. Catches continued to decline in the early 1990's, with the latest available figure for world wide catch estimated at 13,245 tonnes in 1994.

In response to scientists' concerns about the SBT stock, the Australian government imposed a limit of 21,000 tons on the Australian catch in the 1983-84 season (October 1983 - September 1984), and New Zealand imposed a limit of 10,000 fish on its fleet. In 1984-85 the Australian quota was reduced to 14,500 tons and the Japanese were asked, but refused, to limit their catch to 16,000 tons. In the following and subsequent seasons agreement was reached by the three countries on overall catch limits for their fleets.

As noted above the quota was initially set at a non-binding level of 38,650 tonnes in 1985, and was progressively reduced to 11,750 tonnes in 1989. Catches from 1989 onwards have been approximately at the level set by the quota. Scientists reportedly would have preferred a global moratorium on fishing in 1990-91, but this was opposed by Japan in the trilateral negotiations (Australian Fisheries 1990).

⁶⁰. See Hampton (1989) for a discussion of alternative models of SBT migration.

The Australian tuna industry was reporting improved numbers of small fish off South Australia, probably as a result of increased escapement from the Western Australian fishery; it was also reluctant to accept a moratorium (Australian Fisheries 1991a).

The Conservation of Dolphins in the Eastern Tropical Pacific

The development of dolphin research

The development of a management regime aimed at managing the mortality of dolphins in the ETP purse seine fishery, as well as other incidental catches from log fishing such as sea turtles and billfish, depended heavily on the results of basic biological research.

This research is aimed at:

1. technological advancements to reduce the mortality of dolphins in dolphin fishing and species incidentally caught in log fishing;
2. monitoring the size and structure of dolphin and yellowfin tuna stocks;
3. studying the life history of dolphins to calculate parameters such as natural mortality, age at first maturity, maximum recruitment rates, and rates of growth;
4. creating yield per recruit models of tunas that can be used to estimate the optimum size of harvest;
5. studying the life history of tunas, such as size and age of sexual maturity, and evaluation of a stock-recruitment relationship;
6. measuring discards of tunas from log fishing, and determining ecological and population impacts of tuna discards;
7. conducting food web and general ecosystem dynamics research as the emphasis shifts towards exploiting all species not just tunas;
8. completing genetic studies to determine the number and separation of dolphin stocks; and
9. conducting research to establish the extent of the bycatch problem from log fishing.

Research during the early stages of the dolphin-tuna controversy - the mid-to-late 1960's and the 1970's - was led and primarily conducted by National Marine Fishing Service (NMFS). The basic issues were:

1. the actual dolphin mortality
2. the size of the dolphin population and how long it could withstand fishing mortality; and
3. finding a technological solution to reduce dolphin mortality through improved gear and fishing practices.

Early NMFS research on taxonomy and geographical distribution of dolphins helped to provide fundamental biological information. Formal research began in 1969 with funding to assess incidental dolphin mortality and ways to reduce it. In 1972 a major NMFS review by the Tuna-Porpoise Committee led to increased research, programme expansion, and new hirings. Research expanded beyond research on gear and fishing methods to include stock assessment and fundamental biological research on reproduction and growth rates used in stock assessments. Gear research was eventually phased out, but NMFS research on various aspects of population dynamics and stock definition has continued to the present.

One of the early pieces of NMFS research established a dolphin mortality rate used to assess the number of dolphins killed; subsequent research further refined this rate.⁶¹ Technological and gear research developed and refined dolphin-saving procedures. This research evaluated fishing practices and gear technology (including development and use of selective, environmentally safe and cost-effective fishing. For example, it was found that dolphin mortality increased substantially when purse seines were set late in

⁶¹. See Smith and Lo (1983) and Lo and Smith (1986).

the day or in the evening, which led eventually to a ban on "sundown sets". This technological and gear research was conducted in conjunction with the fishing industry. Life history studies were also an important part of the early research, providing information and biological parameters for models used to estimate population abundance. Some of the life history research included ageing to determine natural mortality, age and size at first maturity, maximum recruitment rates, and rates of growth.

The U.S. industry also financed and conducted research. A private consulting company, Living Marine Resources (hereafter LMR), often using the Freedom of Information Act to obtain information and data, sought to replicate and thereby verify NMFS population modelling.

This scientific process of replication contributed to the scientific integrity of the research. Vessel owners and skippers also concentrated on technological research to limit dolphin mortality, leading for example, to the Medina panel.

The U.S. Marine Mammal Protection Act (hereafter MMPA) helped initiate and shape research. The requirement for mandatory observer coverage if requested by NMFS led to better dolphin mortality rate estimates.⁶²

Further emphasis was given to research giving reliable estimates of population abundance.⁶³ Other types of research received less emphasis as a consequence of the MMPA, such as the social structure of dolphins, and physiology.

In response to concern from the public and environmental groups and requirements of the MMPA, the U.S. government initiated action within the Inter-American Tropical Tuna Commission (hereafter IATTC) that established the Tuna-Dolphin Programme to address the tuna-dolphin problem, beginning in 1977 (Edwards 1989, Joseph 1994).⁶⁴ This programme was for scientific studies of dolphins to: "(1) estimate the extent of dolphin mortality caused by the international fleet; (2) assess the impact of this mortality on the dolphin populations; (3) conduct gear and behavioral research and provide dolphin-saving techniques to fishers involved in the tuna fishery under its authority; and (4) maintain ETP dolphin stocks at or above levels that assure their survival in perpetuity with every reasonable effort being made to avoid needless or senseless dolphin mortality." As a first step, in 1978 the member governments moved to establish an observer programme similar to that of the NMFS but on both non-U.S. and U.S. vessels, with the first observers going to sea in 1979. The observer programme is not limited to member countries.

In 1986 non-member country participants joined, considerably extending the scale of participation

⁶². Joseph (1994, page 3) states, "Prior to the passage of the MMPA in October 1972, few data were available on the level of dolphin mortality caused by the yellowfin tuna industry. From 1959 until the passage of the act information on mortality was available for only 9 out of a total of about 4250 fishing trips. This limited information was used to calculate a rough estimate of total dolphin mortality due to the fishery.... Data collected from 1972 to 1976 resulted in estimates of dolphin mortality of about one-third the levels estimated for the period prior to 1972."

⁶³. One recurring problem related to sources of data. One or more of three types of data were frequently used, aerial survey, research vessel survey, or observer data from commercial tuna vessels. A recurring issue in many studies concerned how to accommodate the spatially non-random distribution of dolphin school observations, since data from aerial surveys and observers on commercial tuna vessels were not randomly sampled replicates. Moreover, the later data are subject to non-independent sightings, errors in recording sighting distances and angles, seasonal differences, and other factors (Edwards 1989).

⁶⁴. The IATTC is an international body created by treaty in 1949 to study tunas and tuna-like species in the eastern Pacific and formulate recommendations to the member governments for responsible exploitation of the resource.

sufficiently to satisfy the objectives of the IATTC programme.⁶⁵ Currently, IATTC observers accompany all U.S. and non-U.S. purse seiners capable of fishing for dolphin-associated tuna, except for half of the trips made by Mexican vessels, which are monitored by a Mexican national programme (Scott 1996).

Two ways to estimate dolphin population abundance are from abundance surveys independent of industry, giving estimates of abundance, and from observer data, giving trend estimates. NMFS abundance surveys use vessels following predetermined line transects.⁶⁶

The last of these surveys (MOPS) covers 1986-1990, giving five years of data and estimates of absolute dolphin abundance (Wade 1994, Gerrodette and Wade 1995).⁶⁷

The IATTC uses data from observers on tuna vessels to provide an estimate of trends and relative abundance of dolphins.⁶⁸ The two approaches track one another reasonably well over the years when the NMFS and IATTC estimates overlap, giving an estimate of stable relative abundance over the past 20 years (Wade 1994, Gerrodette and Wade 1995).

Bycatch data from log and school fishing have been assessed by both the IATTC and NMFS. A bycatch data base was established by the IATTC in 1992-93. It became apparent that the bycatch mortality with log fishing was substantial.⁶⁹

Research conducted by NMFS also examined bycatch data from log and school fishing. Results from the US fleet were extrapolated to the international fleet. (Edwards and Perkins forthcoming). The research results indicated that yellowfin tuna discards are 0.1 ton when dolphin fishing, 1 ton from school fishing, and 10 tons when log fishing. Many of the discards, especially from school and log fishing, are pre-reproductive tuna.

Dolphin mortality in the range of 0.1 - 0.2 percent of the total ETP dolphin population has led to a shift in research focus.⁷⁰ One new research topic undertaken by NMFS is stress in dolphins. Vessels tend to target

⁶⁵. A major incentive for voluntary participation in the observer program by non-U.S. countries has been to be able to enter the U.S. market (Edwards 1989).

⁶⁶. Surveys were conducted intermittently between 1974 and 1983. During the years 1986-1990, five annual surveys were made, each survey involving two vessels surveying simultaneously from late August through early December. These five surveys were replicates (essentially identical, so that data from different years could be combined or compared) from one year to the next, surveying the same areas with the same effort patterns during the same time of the year.

⁶⁷. The estimates are the average abundance from the series of five annual surveys. The estimates were made after pooling all five years of data and therefore provide estimated abundance during 1988, the middle year of the five-year series. There have been no research surveys to estimate ETP dolphin absolute abundance since 1990 and current best estimates refer to abundance ten years ago, in 1988. The trend in estimates from IATTC data indicate stability during the past decade, but the continued absolute stability of the stocks cannot be confirmed with surveys.

⁶⁸. IATTC's estimate of trends in abundance tracks apparent relative changes in abundance but does not provide an estimate of absolute abundance because the non-random movements of tuna vessels can cause serious biases in the estimates.

⁶⁹. Scott (1996, page 19), using IATTC data, gives comparison of the bycatches in equal numbers of dolphin sets and log sets. For each dolphin killed in dolphin sets, the kill rates in log sets are: (1) 15,620 small tuna; (2) 382 mahi-mahi; (3) 190 wahoo; (4) 21 sharks; (5) 1 billfish; (6) 12 other large fishes; (7) 1,228 triggerfishes and other small fishes; and (8) 0.04 sea turtles.

⁷⁰. Scott (1996, page 18) notes that NMFS and IATTC scientists and a panel of the National Academy of Science have agreed that the current mortality is sustainable. With the exception of two depleted Dolphin stocks, all

the largest dolphin schools when dolphin fishing; but most dolphins are in small schools and hence are never targeted and are not subjected to stress from yellowfin tuna harvesting (Perkins and Edwards 1997).

In addition, about 10,000 sets have been applied over the last 20 years. Research theoretically indicates that dolphin populations have been reproducing at the maximum rate to replace the dolphins killed, implying that stress has not decreased reproduction and survival of the dolphin populations as a whole.⁷¹ If dolphin populations as a whole have not been unduly stressed, then the stress response by individual dolphins remains the key question.

In the future, it is possible that research on stress as an issue will be funded because stress of individual dolphins is a key concern for opponents of the current U.S. bill in Congress, that ratifies the Panama Declaration.⁷² In addition, because some environmental and animal rights groups do not have the fullest confidence in the "official" science, it is possible that the current bill before the U.S. Congress will require the IATTC to share data more fully, thereby opening up additional research possibilities.

The Dolphin-Safe Research Programme of NMFS is an on-going programme assessing whether there are commercially harvestable quantities of large yellowfin tunas in the ETP which are unassociated with dolphins. Since 1992, this programme has addressed three basic questions. The first question is whether or not dolphins and tunas are unassociated. Based on tagging, the answer is yes, at times. The second question addresses whether there are detection devices available to find large yellowfin tunas unassociated with dolphins in the ETP. The answer is yes.

There are two basic systems, each useful under different circumstances. The first system is LIDAR. The second system is a long-range (2-20 miles) acoustic detection system, using active sonar with a towed hydrophone array.

The third question addresses the actual spatial distribution of unassociated large yellowfin tunas. The first two questions had to be answered before turning to the third question.

There are currently six active contracts addressing the spatial distribution of large yellowfin tunas. One source of funding for this research is directly from the U.S. Congress to the NMFS Dolphin-Safe Research Programme as a line item in the federal budget. Another source is the Small Business Innovation Research programme of the U.S. government. A third source is Salenstall-Kennedy research funds. Moreover, the Dolphin-Safe Research Programme will participate with the U.S. Office of Navy Research to study the effect of anthropogenic noise on marine mammals to determine what the effect is upon dolphins when an acoustic system is used to find tunas.

To plan research, the NMFS Dolphin-Safe Research Programme uses research planning workshops. The 1985-1990 five year dolphin abundance survey (MOPS) and a physiological stress project also used this approach.

stocks are already below the Zero Mortality Rate Goal that the MMPA requires U.S. fisheries to achieve by 2001. The depleted populations, however, have remained stable since at least the mid-1980's, despite the decline in mortality. The reasons for the continued depletion are unknown, but could include: (1) the length of time required to recover for an animal with comparatively delayed age of first sexual maturity and comparatively late recruitment into the fishery (14 years for spotted dolphins, 6-7 years for eastern spinner dolphins); (2) the difficulty in detecting recovery since the mortality has been below 5,000 for only three years; and (3), the substantial uncertainty of population abundance assessments precludes detection of small population changes; and (4), possibly stress.

⁷¹. Wade (1994) and Gerrodette and Wade (1995) found that absolute abundance of populations of the two most affected dolphin stocks, the northeastern spotted dolphin and the eastern spinner dolphins, experienced steep decreases 1959-1973 followed by population stability 1973-1994.

⁷². A key problem in any stress research is establishing the baseline information for comparative purposes. If stress is a factor, then capture of dolphins to evaluate their stress levels would give confounded results, since this capture itself induces some stress.

Small groups are convened of the most highly qualified specialists. These specialists are presented questions to be solved before and at the start of the meeting and constraints peculiar to each question. Suggestions are solicited for appropriate projects and research directions. A workshop report is developed and sent to participants and outside reviewers.

Transfer of research results has occurred through several venues. One of the most important has been extension programmes for skippers. These extension outreach programmes reach from three to eighty skippers at a time, and since 1987 have reached every skipper in the entire (international) fleet at least once. Extension seminars provide ideas and new ways to reduce mortality, even when these suggestions are untested. Seminars in the U.S. and Latin America, scientific meetings, and annual meetings of the IATTC reach the environmental community, industry, and all national government members of the IATTC.

There have been over 100 seminars alone, and they can stimulate much debate. Refereed scientific papers have played a role, albeit a lesser one. These papers help establish and verify methodology, although empirical results are not verified in these papers.⁷³

Management of dolphin mortality

U.S. Marine Mammal Protection Act (MMPA)

High dolphin mortality in the purse seine fishery created considerable consternation among conservation-minded scientists, environmentalists, animal rights groups, and the public. This concern, coupled with the fact that U.S. registered vessels accounted for almost all dolphin fishing in the ETP, was instrumental in the passage by the U.S. Congress of the MMPA in 1972 and subsequent reauthorizations (Joseph 1994, Sakagawa 1991).

The MMPA requires that all marine mammal populations be managed for their "optimum sustainable population," and imposed a moratorium on the taking of marine mammals, with the exception of species or populations that were not endangered and taken for subsistence or traditional purposes by Native Americans and incidental capture during commercial fishing operations (Joseph 1994).

The MMPA was amended several times to allow the continued exploitation of tuna associated with dolphins and to set annual limits on dolphin kills. In 1988, the MMPA required all foreign countries that export yellowfin tuna and fish products to the USA to adopt comparable tuna-dolphin regulations and to schedule a reduction in their dolphin kill rate comparable to U.S. vessel performance (Cullet and Kameri-Mbote, Sakagawa 1991).⁷⁴

The MMPA also provided for a ban on the importation of commercial fish or fish products which have been caught with commercial fishing technology resulting in the incidental kill or serious injury of ocean mammals in excess of U.S. standards. Any nation failing to meet these requirements is potentially

⁷³. The IATTC has, however, invited scientists to evaluate procedures.

⁷⁴. To ensure that U.S. fishermen would not be placed at a comparative trade disadvantage, import restrictions were imposed against countries whose average rate of incidental mortality of marine mammals was 1.25 times the maximum permissible limits under the MMPA (Cullet and Kameri-Mbote, Joseph 1994). By the end of 1990, and in subsequent years, it cannot exceed 1.25 times the U.S. rate. The amendment also established maximum mortality levels for eastern spinner and coastal spotted dolphins of 15 and 2 percent, respectively, of the total incidental mortality. The mortality rates are to be monitored by the IATTC observer program or an equivalent international program, with a level of coverage equal to that of the U.S. program during the same period (Joseph 1994).

subjected to a primary embargo prohibiting importation of that nation's yellowfin tuna and yellowfin tuna products to the U.S. A further secondary embargo is imposed on any intermediary nation trading with the embargoed nation and the U.S. (Joseph 1994, Musgrave and Stephens 1993)

Initial regulations under the MMPA were nominal, but by 1975 regulations became more demanding as fishing gear, dolphin-saving procedures, and observer requirements were specified. Starting in 1981, the annual U.S. kill quota was set at 20,500 animals, with special limits for some species and stocks.

Dolphin-safe policy

The environmental community persuaded both the U.S. canned tuna processing industry and the U.S. Congress, that dolphin mortality should be halted regardless of the consequences for the fishery, the ETP ecosystem, or the nations involved (Joseph 1994). A consumer-oriented public-relations campaign and threatened boycotts of the products of companies canning tuna caught in association with dolphins produced the desired results.

On April 12, 1990, the largest U.S. canned tuna company (Star-Kist Seafoods) no longer purchased tuna from purse-seine vessels fishing in the ETP unless such tuna was accompanied by a certification from the IATTC or the U.S. Department of Commerce that it was not taken in association with dolphins. Other U.S. canners (Van Camp Seafoods and Bumble Bee Seafoods) immediately followed.

These three processors were the largest in the U.S. and together accounted for 80 percent of domestic production. This pledge and the fact that most of the U.S. catch from the ETP fishery is taken on dolphins effectively terminated all U.S. purse-seine deliveries of ETP tuna to U.S. processors (Sakagawa 1991).

In addition, the U.S. Congress passed the Dolphin Protection Consumer Information Act in 1990, which provided for the use of a "dolphin safe" label on cans of tuna not caught in association with dolphins, and subsequently the International Dolphin Conservation Act in 1992. (Joseph 1994, Musgrave and Stephens 1993, Scott 1996).

The dolphin-safe policy had several effects. First, it dramatically altered world trade in tuna, with huge shifts to Europe along with price declines (Joseph 1994). Second, most of the U.S. vessels left the ETP to fish the western tropical Pacific, where dolphins do not commonly associate with tuna schools; or many were sold or became inactive (Joseph 1997).⁷⁵ These vessels no longer considered it economically attractive to harvest tuna in the ETP unless they could harvest tunas in association with dolphins. Third, dolphin fishing continued by vessels from other nations, with the nations embargoed from the U.S. market finding alternative markets. The dominant fishing countries are now Mexico, Venezuela, Vanuatu, Colombia, and Ecuador (Scott 1996). With the exception of Ecuador, these countries have been embargoed by the U.S. under the MMPA. Panama, Belize, Costa Rica, Japan, and Italy have also been embargoed (Scott 1996).

In a fourth response to the dolphin-safe policy, most U.S. vessels remaining in the ETP, along with vessels of other nations, switched from dolphin fishing to greater reliance on log and school fishing (Joseph 1994, 1997). School fishing relies on sightings of tuna schools swimming sufficiently near the surface to be sighted from vessels or helicopters. These sightings follow heavy bird action and frothing water when tuna feed on the surface. Since these signs are less prominent than surface-breaking dolphins, and since they occur only when the tuna feed, they are less reliable spotting aids than dolphin herds. No dolphins are caught, but the catch consists primarily of small tunas swimming closer to the surface rather than the larger and more mature fish.

In log fishing, the purse seine nets are set around natural logs or other floating debris that may be natural or man-made. Log fishing relies on the natural attractiveness of floating objects to tuna and captures the tuna attracted to the debris fields. Compared with dolphin fishing, school and log fishing capture predominately smaller, less valuable tropical tuna. All three methods involve the same basic gear and fishing techniques and can be conducted during the same fishing trip. U.S. fishers prefer dolphin fishing for reasons of price rather than for ease of spotting.

The dolphin-safe policy impacted the incidental or unwanted catches (bycatch) and mortality of both dolphins and other species. The replacement of U.S. dolphin fishing vessels by non-U.S. vessels affected dolphin mortality since these other fishers do not have two decades of experience in lowering dolphin mortality and do not face as many dolphin-protective regulations. Nonetheless, the IATTC dolphin programme has lowered dolphin mortality by 50 percent from 1990 to 1991, with an overall reduction of about 80 percent from 1986 (Joseph 1994).

The intensified log and school fishing by U.S. vessels raised the bycatch of other species, including sharks, mahi mahi, sea turtles, and billfish such as marlins and swordfish. By the time the net is retrieved and the tuna loaded aboard, nearly all of the other animals caught in the net are dead. The bycatch is highest in log fishing (Joseph 1994).

For some unknown reason, floating objects adrift in the ocean attract large numbers of marine species, which tend to stay around these objects and form relatively persistent aggregations or communities.⁷⁶ Increased log and school fishing also increases the catches of younger, smaller, and non-marketable yellowfin tuna. This shift in the age and size of catch lowers the overall catch of yellowfin tuna.⁷⁷ Because yellowfin grow rapidly, their early capture has the potential to reduce the total harvest on a weight basis, depending on the mortality rate. On average, the yellowfin caught are below the age of first sexual maturity (Joseph 1994), so that their capture prevents spawning and may lead to insufficient

⁷⁵. Catch rates are higher in the WTP, but the yellowfin are smaller than those in the ETP and the still smaller skipjack tuna are more abundant than yellowfin in the WTP. Since smaller tuna bring a lower price, the WTP fishery tends to be a higher volume and a lower price fishery than the ETP fishery.

⁷⁶. The effects of log and school fishing upon the ecosystem are not quantifiable. Joseph (1994, page 22) notes, "...the complex tropic dynamics of the ocean ecosystem suggests that the ecological impact could be significant."

⁷⁷. Technically, this is growth overfishing.

replenishment of the species.⁷⁸

U.S. tuna embargo and GATT

No actions were undertaken to ban tuna imports under the MMPA until 1990, when the U.S. environmental organisation Earth Island sued the United States Secretary of Commerce in Federal Court. This lawsuit, after several rounds of hearings, led to the U.S. National Marine Fisheries Service (hereafter NMFS) applying the intermediary embargo provisions of the MMPA (Musgrave and Stephens 1993).

In a challenge to the legality of the U.S. embargoes, Mexico, in January 1991, requested that a Dispute Settlement Panel be convened by the GATT (Joseph 1994, Musgrave and Stephens 1993).⁷⁹ Several other nations supported the Mexican position, arguing that the MMPA was disruptive to trade and protectionist. The panel decided in favor of Mexico on September 3, 1991, declaring that the U.S. import restrictions against Mexico were inconsistent with the provisions of GATT.

Environmental groups in the U.S. soon criticized the GATT ruling as a danger to the environment and further heightened the debate about the environmental effects of other trade agreements, including the North American Free Trade Agreement (Musgrave and Stephens 1993, Campbell et.al. 1997). Shortly after the GATT panel findings were announced, Mexico agreed not to pursue its complaint with the GATT and the U.S. and Mexican governments have subsequently worked together to resolve their dispute without further proceedings in the GATT (Musgrave and Stephens 1991).

The GATT Council has not adopted the report but the European Union (represented by the Netherlands) filed a new complaint with the GATT panel in August 1992, and a dispute settlement panel was established (Musgrave and Stephens 1993). On May 20, 1994, the GATT panel confirmed its ruling of the Mexico vs. USA case.

Nonetheless, while both Mexico and the European Union have successfully challenged the U.S. tuna embargoes at the panel level, neither has proceeded to pursue the challenges before the full GATT body or GATT's successor, the World Trade Organisation (Scott 1996).

In related actions, Mexico announced a ten-point programme to protect dolphins, including expanding observer coverage of Mexican vessels, funds for research into means of reducing mortality, and strict penalties (Joseph 1994). In addition, the member governments of the IATTC, meeting in Costa Rica during September 1990, agreed in principle to achieve a significant reduction in incidental dolphin mortality in the short term and to reduce it to insignificant levels approaching zero and, if possible, to eventually completely eliminate it (Joseph 1994).

The La Jolla agreement

At the 1992 IATTC meeting in La Jolla, California, the IATTC members signed the Agreement for the Conservation of Dolphins, known as the La Jolla Agreement, which calls for a progressive reduction in

⁷⁸. This could endanger recruitment of yellowfin tuna to the fishery by reducing the spawning biomass (recruitment overfishing). However, a conclusive relationship has not been demonstrated between the size of the spawning stock and recruitment for the levels of population abundance observed in the fishery (Joseph 1994).

⁷⁹. On September 7, 1990, the U.S. National Marine Fisheries Service (NMFS) had made the findings required to lift the ban on Mexican tuna (Musgrave and Stephens 1993). Earth Island Institute, a leading U.S. environmental conservation group in the dolphin-tuna controversy, sought a temporary restraining order banning importation of tuna from Mexico. This was subsequently converted into a preliminary injunction and upheld on appeal. NMFS began to apply the intermediary embargo provisions of the MMPA. Shortly after, the district court entered its initial order prohibiting imports from Mexico, Mexico filed its protest.

dolphin mortality to zero in ETP tuna fisheries (Joseph 1994, Cullet and Kameri-Mbote 1996). The dolphin mortality limits were set at 19,500 animals in 1993 and ratcheted down to less than 5,000 by 1999.

The La Jolla Agreement also calls for ecologically sound means of capturing large yellowfin tunas not in association with dolphins, 100 percent observer coverage whether fishing on dolphins or not, research programmes to improve and modify existing fishing gear and techniques, and training to improve dolphin-safe harvesting practices.

The La Jolla Agreement also established the International Review Panel, which meets three times a year and to which the IATTC reports (Joseph 1994, 1997). To encourage trust and participation, the review panel includes membership of government, industry, and environmental organisations. During meetings, observer logbooks are reviewed and the panel decides whether or not there were any violations. Findings are reported to each state, which then decides upon the response and reports back to the panel.

The La Jolla Agreement also provides for the establishment of a Scientific Advisory Board of technical experts. This board is to advise the IATTC regarding research on purse-seine technology aimed at reducing dolphin mortality and alternative methods to harvest large yellowfin tuna (Joseph 1994).

It was agreed that dolphin mortality limits be divided into individual vessel quotas for those vessels intending to fish for tunas associated with dolphins and that met certain requirements regarding fishing equipment and procedures and crew training (Joseph 1994). These vessels could apply for individual dolphin mortality limits (DMLs), which would be calculated by dividing the annual limit by the number of vessels requesting DMLs. Those vessels that reached their annual DML would have to abandon this type of fishing for that year.

The DML approach was adopted to provide **incentives** to conserve dolphins (Joseph 1997). Each vessel would compete not against other vessels for a share of quota, but rather against its own ability to reduce dolphin mortality, and careful operators would not be penalised for the actions of careless ones (Joseph 1994).

The La Jolla Agreement worked better than expected. In the first year (1995), there were fewer than 4,000 dolphins killed during tuna fishing, which is below the 1999 target level. The 2,754 dolphin deaths due to tuna fishing in 1996 were well below the 9,000 limit.

The U.S. Congress passed the International Dolphin Conservation Act of 1992. This act calls for a 5-year moratorium on encircling dolphins with purse-seine nets beginning on March 1, 1994. Latin American fishing states rejected the moratorium, contending that the most rational and appropriate way to resolve the problem is through international cooperation rather than by unilateral action.

The single largest factor reducing dolphin mortality has been improvement of the tuna harvesting process to reduce dolphin mortality per set (Scott 1996). Mortality per set declined 96 percent from 1986 to 1995.

Panama declaration

In October of 1995, many governments with ETP fishing interests, including the U.S., sought to build upon the La Jolla Agreement and to avert the potential defections of dissatisfied Latin American States (Cullet and Kameri-Mbote 1996).⁸⁰ Meeting in Panama, these governments produced the Panama

⁸⁰. These participating governments were Belize, Colombia, Costa Rica, Ecuador, France, Honduras, Mexico, Panama, Spain, U.S., Vanuatu, and Venezuela. They met on October 4, 1995, in Panama City, Republic of Panama. The La Jolla Agreement is entirely voluntary and is set to expire in 1999. Providing impetus to the Panama Declaration, five environmental groups had grown impatient with the lack of progress in resolving the

Declaration. This declaration reaffirms the commitments and objectives of the La Jolla Agreement, and seeks the transformation of a voluntary dolphin protection programme that is based primarily on decreasing annual quotas into a binding international accord.

One of the most controversial aspects of the Panama Declaration is a change in the U.S. dolphin-safe standard that would allow tuna caught during dolphin fishing to be marketed and internationally traded as dolphin safe.

Under the proposed standard, dolphin-safe catches of yellowfin tuna would be identified by the set (deployment) of the purse seine net and not for all of the sets made during a fishing trip as under the current standard. Dolphin safe would mean the absence of dolphin mortality in a set and not the absence of potentially dolphin-harmful techniques or dolphin mortality on a fishing trip. Written verification would come from IATTC observers. Tuna would be sorted on board according to whether the set is dolphin safe or not. The Panama Declaration would also make it possible to trace every can of tuna back to the harvesting vessel (National Wildlife Federation 1996).

The Panama Declaration modifies the La Jolla Agreement's annual DMLs. The governments have committed themselves to a total annual mortality that cannot exceed 5,000 (Canadian Fishing Company 1996), with a goal of zero mortality. As with the La Jolla Agreement, DMLs are set for each vessel based on the annual dolphin mortality.

It is anticipated that the Panama Declaration, when it goes into effect, will provide incentives to fishers to lower the dolphin mortality rate (Joseph 1997). Each vessel would be competing not against other vessels for a share of quota, but rather against its own ability to reduce dolphin mortality and careful operators would not be hurt by careless ones (Joseph 1994).

The use of incentives also induces vessels to adopt the most effective fishing methods, and over the longer term, can induce new methods of dolphin fishing. The DMLs for individual vessels are not transferable. Allowing for transferability implies the right to kill, and this implication would have compromised the support of environmental groups (Joseph 1997).

The Panama Declaration seeks ecologically sound means of capturing large yellowfin tunas not in association with dolphins. The declaration adopts conservation and management measures that ensure the long-term sustainability of tuna stocks and other stocks of living marine resources in the ETP.⁸¹ Such measures are to be based on the best scientific evidence and adhere to the precautionary approach (Food and Agriculture Organisation of the United Nations 1995). Measures shall be designed to maintain or restore the biomass of harvested stocks at or above levels capable of producing maximum sustainable yield, and with the goal of producing maximum sustainable yield (Greenpeace 1996).

The Panama Declaration places greater emphasis on science-based management and conservation of tuna, dolphin, and other marine life in the ETP. Provisions of the declaration strengthen the existing scientific review process and promote greater interaction between the scientific communities of the nations participating in the ETP.

The provisions also place greater reliance on scientific data to support the conservation and management of the fishery and the incidental take of dolphins and marine life (Norris et al. 1996).

tuna-dolphin issue and entered into discussion with Mexico (Scott 1996). These groups are Greenpeace International, Center for Marine Conservation, Environmental Defense Fund, World Wildlife Fund, and National Wildlife Federation.

⁸¹. The Panama Declaration establishes species or stock-specific annual dolphin mortality limits at 0.2% to 0.1% of the minimum population estimate up to 2001 and less than 0.1% thereafter. Recent estimates of recruitment are 2%-6% per annum. .

Specifically, the Panama Declaration establishes or strengthens National Scientific Advisory Committees, or the equivalent, of qualified experts operating in their individual capacities, to advise their respective governments on mechanisms to facilitate research, and on the formulation of recommendations for achieving the objectives. Membership on these committees includes qualified scientists from the public and private sector and non governmental organisations (e.g. environmental and animal rights groups).

The committees shall: (1) receive and review data; (2) advise and recommend to their governments conservation and management measures; (3) make recommendations to their governments regarding research needs, including ecosystems, fishing practices, gear technology (including development and use of selective, environmentally safe and cost-effective fishing gear); (4) conduct scientific reviews and assessments by the year 1998 regarding progress toward the year 2001 objectives; (5) consult other experts as needed; (6) assure the regular and timely full exchange of data among the parties and other committees for research and enforcement objectives; (7) establish procedures to hold public meetings and maintain the confidentiality of proprietary data (Greenpeace 1996).

The Working Group discussed at length trade measures against non-complying nations. These measures could include embargoes or other restrictions on the imports of tuna, other fish products, other marine products, or other products (Greenpeace 1996). Such measures were recognised as extremely delicate and an evolving policy issue for which few guidelines exist in international law. The Working Group noted ongoing discussions concerning this issue in other international trade forums. In light of these considerations, the Working Group agreed that trade measures should receive further review (Greenpeace).

U.S. ratification requires legislative changes to the dolphin-safe standard in the Dolphin Protection Consumer Information Act. The proposed changes include replacing the intentional set rule with the performance-based approach based on dolphin mortality in a given set. The legislation would lift the 1990 ban on imported tuna.

On July 30, 1997 The U.S. Senate passed legislation to lift the embargo on imports of yellowfin tuna caught in compliance with the Panama Accord; the U.S. House of Representatives had already passed comparable legislation (Dunne 1997). The Senate bill was a compromise with environmentally minded senators as it provides for a three-year study of the effects of encirclement on dolphins. If it is found that encirclement does not have a "significant adverse impact" on dolphins, then a dolphin safe label would be allowed on cans of tuna caught where there is no mortality or serious injury to dolphins (Dunne 1997). The U.S. President has now signed the legislation.

Within the USA, opposition to the Panama Declaration and implementation of the U.S. legislation is led by animal rights activists and most environmental groups.⁸² Groups opposing the revised dolphin-safe definition contend that it ignores the effects on dolphins of unobserved mortality, injuries, and physiological effects from the stress of repeated capture (Payne 1996, Myrick 1996). These opposition groups state that dolphins released alive may later die from injuries sustained during chase and capture; they argue that stress from repeated capture disrupts dolphin societies and causes physiological harm.

These opponents also emphasise concern over observer reliability and mixing of tuna in different holds aboard fishing trips, which could risk confusion and could encourage misleading reporting (Payne 1996, Myrick 1996).

Also, opponents contend that vessels currently fishing without setting of nets on dolphins would be encouraged to resume the chase, capture and killing of dolphins (Earth Island 1996). Opponents also contend that regulations pertaining to infractions under the voluntary La Jolla Agreement are not being enforced (Scott 1996).

Opponents further believe that lax enforcement and compliance may follow (Earth Island 1996). That is,

⁸² Opposition groups include Earth Island, Humane Society, Sierra Club, Defenders of Wildlife, Friends of the Earth, Fund for Animals, Ralph Nader's Public Citizen, and many U.S. consumers.

observers are from a vessel's own nation, which some opponents think will lessen enforcement and compliance. Opponents also contend that the bycatch issue with log and school fishing diverts attention away from the dolphin issue.

Proponent groups in the U.S., including some environmentalists and industry, argue that the current dolphin-safe standard is environmentally and ecologically unsound.⁸³ They argue that the current dolphin-safe techniques have higher discards of immature tuna and higher incidental catches of other unwanted species. They also argue that dolphin fishing with the new dolphin-safe standard would have insignificant levels of dolphin mortality.

For these proponents, the new standard is a favourable environmental trade-off. They also view the current system of an unregulated international fishery with voluntary dolphin protection as untenable and favour a regulated and closely monitored international fishery with binding dolphin protection.

Countries currently embargoed by the U.S. have warned that unless the U.S. changes its laws, they will no longer abide by the dolphin mortality limits or carry IATTC observers (Scott 1996). Mexico announced in November 1996 due to the lack of action by the U.S. Senate, that its fleet would no longer abide by the DMLs of the La Jolla Agreement nor will it punish those making the infractions (Scott 1996). Nonetheless, the Mexican fleet continues to carry IATTC observers, although at a significantly lower coverage level (Scott 1996).

⁸³. The proponent groups include Greenpeace, Center for Marine Conservation, Environmental Defense Fund, National Wildlife Federation, World Wildlife Fund, and foreign and U.S. fishing fleets.

The importance of research

Research has made a significant contribution to the regulation of dolphin mortality. Without research, decisions would have been made solely on the basis of politics. With research, decisions remain fundamentally political in nature, but they are moderated by science and final decisions are based on clear messages from research modified by politics. All groups have used the research findings in formulating their positions. Each side has tended to take from the research findings what it wants to bolster its position. Research on dolphin mortality, population size, and sustainability of the resource all helped make possible the current bill in the U.S. Congress pertaining to acceptance and implementation of the Panama Declaration.

Science and research helped frame and focus the debate, discussion, and policy formation among nations, environmental and animal rights groups, industry, and other interested parties. Research helped to establish or verify facts, to clarify the nature of the problem, especially dolphin mortality and status of the dolphin problem, and helped identify possible solutions. By doing so, solutions and agreements became more mutually acceptable among different, and sometimes acrimonious, parties. For example, it is difficult to reach a solution if there is disagreement on the nature of the problem, such as the number of dolphins killed.

In this regard, the integrity of the scientific process, especially the role of verification and replication, is crucial.

Nonetheless, there are definite limits to the contribution of research in defining the problem and indicating possible ways to address this problem. Some ways to address the problem are more closely related to research findings, such as which dolphin stocks to protect, than others, such as the impact of U.S. embargoes on dolphin mortality.

Research will be increasingly important for identifying, monitoring, and managing bycatch of not only dolphins from dolphin fishing, but other species incidentally taken when log and school fishing. Data are still not fully developed in this area, the association of different species with floating debris is not full understood, and the understanding of the ecosystem remains in its infancy. Research has made a much lesser contribution to the quasi-property rights, DMLs. Research had a very limited impact on the establishment and functioning of the DMLS because of the nature of the right.

DMLs are not a true property right and are set not from an overall quota or total allowable dolphin mortality determined by research, but are instead extrapolated from the past. The overall dolphin mortality limit, used to set DMLs, derives much more from social norms than from notions of sustainability. Research does assure, however, that the socially derived DMLs do not impinge upon issues of dolphin stock conservation. Research also contributed in the sense that it contributed to resolution of the dolphin mortality issue. In contrast, in fisheries regulated by transferable harvest rights - individual transferable quotas - the actual size of the property right held by firms depends very strongly upon population assessment research.

This applied research plays a fundamental role in assessing the population size and in setting the overall total allowable catch based on notions of sustainability and sometimes biological or economic optimality. In turn, when the firm's property right is expressed as a percentage of the total allowable catch (the usual case worldwide), then the absolute size of the firm's annual property right depends directly on population assessments or other applied research.

Research and researchers played an instrumental role in bringing the dolphin-tuna issue to the public's attention. A U.S. National Marine Fisheries Service fisheries biologist demonstrated the extent and

severity of the issue (Perrin 1968, 1969).⁸⁴ NMFS fisheries biologists were initially aware of the need to scientifically assess the status of tuna and dolphin populations and set dolphin mortality rates and limits, and more generally, the requirement that politically and socially **legitimate** policy and resource use largely conform to the strictures placed by scientific research. Public and private research has made several other contributions. Research helped find new ways to change the tuna harvesting process to reduce dolphin mortality.

While many of the gear improvements and changes in harvesting practices arose out of the industry, research by official government agencies helped to verify or to make publicly acceptable these improvements. Currently, research plays a key role in assessing which dolphin stocks are most seriously endangered. This requires stock assessments and monitoring the number of dolphins killed while harvesting yellowfin tuna. Applied research has helped design at-sea observer programmes.

The Exploitation of Southern Bluefin Tuna in the Southern Ocean

The development of SBT research

Australian scientists at The Commonwealth Scientific and Industrial Research Organisation (CSIRO) initiated an Australian government-funded SBT tagging programme in 1959 (Majkowski and Murphy 1983). A total of 51,740 fish was tagged up to 1980. Data obtained from this programme, together with catch and size composition data obtained from long-term sampling programmes in both the Australian and Japanese fisheries, were used to develop a cohort analysis of the SBT stock which provided estimates of the abundance, age structure and exploitation rates of the population.

A tagging programme carried out in 1983-84 was aimed at up-dating estimates of mortality and yield per recruit under current conditions (Majkowski and Murphy 1983), and a subsequent tagging programme, conducted in cooperation with the Japan Marine Fishery Resource Research Centre, tagged 16,000 fish in the period 1990-92 (Australian Fisheries 1992).

American and Japanese biologists were also studying the bluefin tuna populations and an opportunity for an exchange of views occurred at a 1979 workshop in Shimizu on the state of selected tuna and billfish stocks in the Pacific and Indian Oceans organised by the NMFS Southwest Fisheries Center, Honolulu, and the Fisheries Agency of Japan's Far Seas Fisheries Research Laboratory, and sponsored by FAO.

In 1981 Australian scientists published research indicating that the SBT stock was already fully exploited - meaning that further increases in fishing effort would not result in increases in total catch (Murphy and Majkowski 1981). This work, which was subsequently accepted by Japanese and New Zealand scientists, suggested that the spawning stock had been reduced to around 50 percent of its virgin level and stressed that there was a significant time lag between a decline in the spawning stock and its detection through cohort analysis; a reasonably complete sample of data on the cohort is not available until 10-11 years after the cohort is first fished (Murphy and Majkowski 1981). Taking the fishery in its entirety the research suggested that yield per recruit would be maximized by postponing capture until 4-5 years of age - a move which would have virtually eliminated the Australian fishery.

Hampton, Majkowski and Murphy (1984) found that a global catch of 32,000 tonnes could be sustained by an equilibrium population at its 1980 level, but that the current catch of 40,000 tonnes was unsustainable. Based on their earlier work Hampton and Majkowski (1986) published the results of

⁸⁴ In 1968 data on the magnitude of the problem were collected when this scientist, who had accompanied a tuna-fishing trip made by a U.S. purse seiner, reported on the dolphin mortality he observed during that trip. As a result of these reports, the possibility that high dolphin mortalities were caused by the fishery became public knowledge.

computer simulations of the SBT parental biomass under the 1982 fishing regime.

While their model eventually stabilized at around 17 percent of the estimated unexploited level, they raised serious concerns about recruitment at such a low stock level. Hampton (1989) concluded that in steady-state equilibrium Australian and Japanese catches of 11,000 and 28,000 tonnes respectively would have equal impact on the parental biomass and would be consistent with maintaining as assumed safe level of that biomass.

Similar concerns about the Northern Bluefin Tuna (NBT) stocks had been expressed since the early 1970's. By the early 1980's, the total catch from the western Atlantic stock *Thunnus secundodorsalis* had fallen to less than 50 percent of the 1960's level, and the stock was estimated to be around 15,000 tonnes, or 15 percent of the 1960 level. In 1982 the International Commission on the Conservation of Atlantic Tunas (ICCAT) warned that severe reductions in catch were necessary if the western NBT stock was to recover (Australian Fisheries 1982).

A series of annual meetings of biologists, fishery managers and industry representatives from Australia, New Zealand and Japan was launched in Wellington in 1982. As research was up-dated on the basis of tagging, catch and effort data, scientific opinion about the state of the SBT stock became more pessimistic. At the third Trilateral Meeting in Canberra in 1984 the view was put that the spawning stock was as low as 25 percent of virgin biomass.

At the seventh Trilateral Meeting in Wellington in 1988 scientists concluded that the only safe catch would be zero, but that if management imperatives precluded this option total catch should be reduced by at least 50 percent in the 1989-90 season (following a 60 percent cut in the 1988-89 season). While this view was disputed by industry, it was recognized that the fishery faced serious problems of adjustment (Australian Fisheries 1989).

At the ninth Trilateral Meeting in Hobart in 1990, it was concluded that the parental stock would reach its lowest level in 1990 or 1991. Most models predicted a recovery to 1980 levels by 2010, but at least one model predicted a continuing stock decline (Australian Fisheries 1991b). While scientists from Australia and New Zealand regarded a moratorium as the safest option, the current quota regime was maintained. The eleventh Meeting in Tokyo in 1992 adopted as a long-term goal the restoration of SBT stocks to their 1980 levels (Australian Fisheries 1993a).

Experimental work on the breeding and rearing of Northern Bluefin Tuna began in Japan in 1970 (Australian Fisheries 1981a) by Teruo Harada of Kinki University. A paper describing this work was translated and circulated by the Southwest Fisheries Centre Honolulu Laboratory of the NMFS in 1981. Research on SBT farming in Australia started in 1989, and in 1991 joint research was launched by the Japanese Overseas Fishery Cooperation Foundation, the Australian Tuna Boat Owners Association and the South Australian government.

Funds were also provided by the Commonwealth government directly and through the Fishing Industry Research and Development Council (FIRDC) (Kreuger 1991). By 1993 seven companies had 750 tonnes of SBT in 24 pontoons at Port Lincoln, and the experimental tuna farm was ready to attempt to spawn SBT in captivity (Australian Fisheries 1993b).

Economic research on fisheries was directed toward with developing bioeconomic models which could be used to work out harvesting plans which maximised the value of fish stocks, and with developing management regimes which could ensure that the optimal harvesting plans could be achieved. Attention had come to be focused on management measures based on property rights, as opposed to those based on direct regulation of fishing effort (Neher, Arnason and Mollett 1988).

Economic research on the SBT fishery was focused on issues of total catch, distribution of the catch

among participants, and the age composition of the catch. A Bureau of Agricultural Economics report in 1983 (quoted in Rohan 1984) concluded that at 1980-81 prices the Australian fleet would need to land 36,000 tonnes of SBT per annum (the 1983-84 Australian quota was 21,000 tonnes), or alternatively would need to receive a price in excess of \$1075⁸⁵ per tonne (canning quality SBT was fetching \$600-750 per tonne). Given the pessimistic view of the scientific reports on the status of the SBT stocks, it became obvious that the Australian industry would need to achieve higher prices through producing sashimi quality fish. This could be done by targeting mature fish, or by farming immature fish to sashimi size and quality. The industry expected to receive upwards of \$35 per kg for farmed sashimi fish as compared with the then average price of \$10, of which \$7 went to meet air freight charges (Krueger 1991).

Bioeconomic modelling was used to evaluate the value of alternative harvesting plans. Kennedy and Watkins (1985), whose research was funded by FIRDC, based their economic analysis on the results of biological studies of the fishery by Murphy and Majkowski (1981), Shingu (1981) and Hampton and Majkowski (1983).

Since there was no discernible trend in the combined weight of Australian and Japanese catches over the period 1975-80, they assumed that the 1978-80 harvest level was a sustainable equilibrium. Their deterministic model suggested that the negative feedback effects on harvesting incentives of falling stocks were sufficient to prevent a stock collapse in the immediate future. However, they recognised the validity of stochastic models, such as that of Hampton and Majkowski (1983), which suggested that a stock collapse was a real possibility. They found that an overall quota on the Australian catch of 8-10,000 tonnes would contribute to an increase in total returns from the fishery. The reduction in the Australian quota would increase the value of the Japanese fishery in the Australian Fishing Zone (AFZ) and access fees could be raised accordingly.

Kennedy (1987) further investigated the economic relationship between the Australian and Japanese SBT fleets. A bioeconomic model based on the population analysis by Hampton and Majowski (1986) was developed to predict duopoly and joint profit maximising outcomes for an SBT fishery exploited by Australia and Japan. The model suggested that, because the Japanese vessels targeted larger SBT with a higher unit value, joint profit maximisation could be achieved by Australia reducing its catch to zero and sharing in the value of the Japanese catch. Under a duopoly regime individual country returns would be maximised by Japan taking 8-10,000 tonnes per year, and Australia taking 5-8,000 tonnes. The total profit under duopoly was predicted to be around 88 percent of the level under joint profit maximisation. The implication is that 12 percent of the potential value of the fishery is available to motivate the development of a cooperative management regime.

Kennedy and Pasternak (1991) extended the analysis of the duopoly regime, again using stock parameters published by Hampton and Majkowski (1986). Their model suggested that it would be in Japan's interests to purchase and freeze (i.e. not catch) Australian quota; following negotiations in 1986 Japan did, in fact, agree to purchase and freeze 3000 tonnes of Australian quota for three years starting in 1987. While the model takes account of Australia's ability to control Japanese access to the AFZ, this makes little difference to the outcome from Australia's point of view.

The authors find that Australia's best strategy is participation in the fishery; the duopoly results in higher present value of profits for Australia as compared with joint profit maximisation, mainly because the latter regime involves a three-year moratorium on the Australian catch.

In work funded by The Australian Bureau of Agricultural and Resource Economics (ABARE) and the Fishing Industry Research Trust Account, Geen and Nayer (1989) developed a bioeconomic model which suggested that in the absence of Individual Transferable Quotas (ITQs) a reduction in the total Australian catch from 21,000 to 14,000 tonnes would have involved a reduction in the south-eastern sector of the

⁸⁵ Australian dollars are referred to throughout this section of the paper: AUS \$1.00 = US \$0.75 approximately.

fishery and an expansion of the Western Australian fishery. An aggregate quota would have generated rents of around \$1.6 million per year, whereas under the ITQ scheme potential rents from the Australian fishery are estimated at \$6.5 million, assuming the maintenance of a healthy fish stock. The ITQ scheme provides an incentive to target larger fish with a higher unit value, and provides government with a management tool which allows ready adjustments of catches to current information about the status of the stock.

However, given that the ability to target is not perfect, the ITQ regime may encourage discards of smaller less valuable fish. Geen (1990) published ABARE-funded research which suggested that access to SBT tuna stocks in the AFZ was worth \$12 million per year to the Japanese fishery, as compared with the 1989 access fee of \$4.6 million. This estimate was based on a comparison of catch rates in the AFZ and contiguous zones. The access fee for 1990 was raised to \$5.7 and then to \$7 million for 1991.

Management of the SBT stock

Prior to the 1970's the SBT stock was lightly exploited by the Australian fishery and there was little concern over the total level of exploitation. In 1971 the Japanese longline fleet accepted seasonal closures in areas off New South Wales, South Australia and Western Australia, where immature fish predominated. A freeze on entry to the Australian purse seine fishery was introduced in 1975 and purse seining was banned in Western Australia. A freeze on entry of additional pole vessels in the south eastern segment of the fishery was introduced in 1976.

The decline in SBT stocks became a matter of immediate concern to the Australian tuna industry in the early 1980's as a result of a decline in catch rates off Tasmania (Collins 1982) and the publication of Australian research and the results of the first Trilateral Meeting in 1982. A Tuna Task Force consisting of representatives from the Commonwealth and State governments, CSIRO and industry was established in 1983 (Australian Fisheries 1983a). An interim management plan incorporating a limit on the total Australian catch was adopted for the 1983-84 season.

The Industries Assistance Commission (hereafter IAC), a government economic research department, was commissioned to develop a management plan for the fishery. This plan, which was adopted in 1984, replaced the interim management plan.

It allocated ITQs to vessel owners according to past catch history (75 percent) and capital investment in vessels (25 percent), and the TAC was set at 14,500 tonnes. Because of enforcement problems, it was decided not to impose quotas on particular sizes or age groups of fish. However a sub-quota of 1000 tonnes and seasonal closures in Western Australia were introduced to protect juvenile fish.

The IAC found that a case had not been made for adjustment assistance (a subsidy to restructure the industry), that the costs of administering and policing the management programme should be met by the quota holders, and that the option of private ownership and collective management should be investigated (Australian Fisheries 1984a). Legislation providing for the collection of levies from fishermen to contribute to the cost of management programmes and related research was subsequently introduced in 1984 (Australian Fisheries 1984b). The Plan was amended in 1986 to enable fishermen to use their quota entitlements as security for loans (Australian Fisheries 1986).

Trading in SBT quota was very active following the introduction of ITQs. At the end of the first season 46 percent of quota had been transferred, with half these sales involving interstate transfers from New South Wales and Western Australia to South Australia, and the other half representing transfers among vessels within States. The interstate transfers were reflected in the subsequent harvests of SBT by the various states.

The Western Australian fishery, which was based on immature fish in the 5-6 kg range, peaked at 5,478

tonnes in the 1982-83 season and subsequently declined to 17 tonnes by 1991-92.

The New South Wales catch also declined significantly from 1982-83 onwards, although it has revived somewhat in the 1990's.

The average weight data reflect the catch history of the Australian fishery. Prior to the late 1960's the fisheries in South Australia and New South Wales were catching mostly larger fish averaging around 14 kg and 12 kg respectively. Average catch weights in South Australia fell dramatically from 1968-69 onwards, reflecting an increased reliance on recent recruits to the fishery. At the same time the Western Australian fishery, targeting immature fish around 5 kg in weight, began to take significant catches. The New South Wales fishery retained its focus on larger fish but total catch weight fell significantly. The fall in average catch weight in South Australia from the mid-1960's up until the early 1980's is evidence of the effect of heavy fishing pressure altering the age structure of the population towards younger cohorts.

The increase in the average weight of fish taken in the South Australian fishery after 1980-81 probably reflects two factors: first the decline in numbers of both small and large fish due to fishing pressure and a consequent increased reliance on the 4-5 year age groups; and secondly, a change in fishing patterns as a result of management measures. Early control measures involved the adoption of size limits for the Australian fishery but these had resulted in wastage and were abandoned in favour of voluntary restrictions backed up with the threat of further reductions in overall quota if average size was not increased (Caton 1987).

Some observers argued that, while the ITQ scheme had succeeded in reducing the Western Australian harvest of juveniles, it had failed to return the bulk of the fishery to New South Wales where the larger fish congregate.

As sashimi quality fish were selling for perhaps \$20,000 per tonne, as compared with \$600-750 for canning quality product (Australian Fisheries 1983b) a shift of attention to larger fish had been expected. The reason quota became concentrated in South Australia, as opposed to New South Wales, was probably the substantial investment made there in vessels and processing capacity, and the fact that the New South Wales fishery had declined drastically in the early 1980's. While SBT in South Australian waters are relatively small, there is evidence that the industry there intends to maximise the value of its quota by farming. Also, there is no great difference in the distances from New South Wales and South Australia to the south-eastern fishing grounds.

Australia declared the 200-mile Australian Fishing Zone (hereafter AFZ) in 1979 and commenced charging Japanese vessels an access fee calculated at 5 percent of the anticipated value of the catch. The 1980-81 access fee was set at \$AUS 1.8 million, and was reduced to \$1.4 million in the 1981-82 season because of increasing restrictions on fishing effort and lower fish prices (Australian Fisheries 1981b). Subsequent access arrangements were designed to monitor fishing activities and to provide some return to the community: for example, the 1992 agreement provided for a payment of \$3.8 million, around 10 percent of the expected gross value of the catch, with around 75 percent of that sum being spent on monitoring, enforcement and research (Exel 1992). The annual Trilateral Meetings of scientists from 1982 onwards continued to recommend limits to the global SBT catch. Australia limited its catch in the 1983-84 season, but was unable to persuade Japan to do likewise.

As a result Japan was excluded from the AFZ south of 34 degrees South (the main SBT fishery) in 1984 (Australian Fisheries 1984c), and its catch of SBT in the AFZ fell from 2,131 tonnes in 1983-84 to 8 tonnes the following year (Australian Fisheries 1985a). Japan was subsequently re-admitted after it agreed to a limit of 23,150 tonnes on its global catch (Australian Fisheries 1985b). New Zealand had also imposed limits on its catch from the beginning of 1984, and the three countries agreed on a global catch limit of 38,560 tonnes in 1985-86.

As noted above, Japan agreed in 1987 to pay Australian quota holders to forgo catching 3000 tonnes of the 14,500 quota for a period of three years 1987-90 in order to relieve some of the fishing pressure on immature fish. In 1989 a joint venture company, Australia-Japan Tuna Ltd, was formed to lease 12.5 percent of the Australian quota to Japanese longline vessels fishing in the AFZ. Australia was to receive a share of the profits and training in Japanese fishing techniques. In the 1989-90 season, 400 tones of quota was allocated to the joint venture (Australian Fisheries 1991a), but the arrangement was terminated in 1990 because of under-reporting by Japanese vessels. The skippers of two vessels pleaded guilty to misreporting catch, falsifying logbook records, exceeding quota and breaching license conditions. One of the vessels valued at over \$6 million was forfeited to the Commonwealth (Rigney 1990). In 1990 Japan agreed to pay Australia not to catch 1000 tonnes of the Australian quota in 1991; this was a continuation of the arrangement established in 1986, but was seen by Australia as compensation for the under-reporting of Japanese catches in 1990.

In 1993 the quota-setting arrangements were formalised when Australia, Japan and New Zealand signed the Convention for the Conservation and Management of Southern Bluefin Tuna (CCSBT) as part of the UN Conference on Straddling Fish Stocks and Highly Migratory Fish Stocks (Harwood and Carayanides 1993). Negotiations on the CCSBT had been taking place since the mid 1980's. The series of Trilateral Meetings terminated after the 1994 Meeting and were replaced by the Scientific Committee of the CCSBT in 1995 (Caton and Williams 1996).

In 1989 the Australian government launched a new approach to Commonwealth fisheries management (Commonwealth of Australia 1989). The major fisheries were to be managed by Management Advisory Committees (hereafter MACs) consisting of industry representatives, biologists, economists and representatives of the public interest. Each MAC was to prepare a management plan which was to be approved by the government before being put into place. In addition to setting catch limits and conditions, the MACs also determine management-related research priorities within each fishery.

In 1994 the SBTMAC Research Sub-committee identified thirteen priority research areas involving collection and analysis of data on the SBT stock, SBT farming, and economic studies of the Japanese tuna fisheries (Australian Fisheries 1995). Research and management costs were to be at least partially funded by an industry levy.

The importance of research

The development of a management regime aimed at preventing commercial extinction of the SBT stock depended heavily on the results of basic biological research on the size and structure of the SBT stock. This research began in the 1950's, two decades before the over-exploitation of the SBT stock became apparent. Given the time of 10-11 years required to gather the data for a full cohort analysis, the development of basic research needed to lead its application by at least this number of years if it was to be available to contribute to developing a management plan.

Given this time frame, and given the widespread nature of the benefits of a well-managed SBT stock, the basic research had to be publicly funded. Substantial credibility attaches to the work of a publicly funded research organisation with an international reputation for quality research and, while the task of persuading participants in the fishery of the need for radical changes in the degree and pattern of exploitation of the SBT stock was not an easy one, industry resistance to change weakened in the face of research results generated by a highly regarded public institution such as CSIRO.

Publicly funded research on bluefin tuna farming, which also started well before any problems emerged in the wild fisheries, also made an important contribution to securing industry agreement on management measures to protect the SBT stock. The survival of the Australian SBT fishery under the new management regime depended on finding higher valued uses for the catch, and SBT farming was a significant option. Once research on SBT farming moved into the development phase industry money started to be

contributed as well.

The new regimes of property rights over fish stocks which developed in the 1970's as a result of basic publicly funded research on natural resource management played an important role in developing an efficient SBT management system. As a result of changes in international law Australia and New Zealand were able to control fishery resources out to their 200-mile limits from the late 1970's onwards, and this gave them some bargaining power with Japan. The degree of control exercised by the Australian government on SBT fishing in the AFZ can be contrasted with the U.S. Government's inability directly to control access to its NBT fishery which is managed by ICCAT.

Subsequent research on the management of straddling fish stocks helped to formalise management arrangements for the SBT stock which had developed through negotiation. At the national level, the introduction of ITQs played a significant role in reorganising the Australian fishery. As noted above, the transfer of ITQs from vessels engaged in a low-valued use of the SBT stock in the western part of the fishery to vessels in the east was an important step in reducing fishing pressure on young age groups in the stock. By contributing to security of supply, ITQs encouraged industry investment in SBT farming. Since ITQs were accepted as security for loans, industry was able to raise the capital required to engage in higher-valued harvesting, processing and marketing practices.

This made it possible to reorganise the fishery without a significant level of direct subsidies to the industry which would have been hard to justify in the economic climate of the time. An important feature of this reorganisation is the gradual move to constrained private ownership of the SBT stock with its attendant rights and responsibilities.

Publicly funded economic research on the SBT fishery built upon the results of biological research. It played an important role in several respects. First, the results of economic research showed that the Australian fishery could not return to sustainable patterns of exploitation of the SBT stock without a radical restructuring.

Secondly, research showed that, with industry restructuring, the SBT stock was potentially very valuable to the Australian economy, and this provided an incentive to develop a management plan. Thirdly, research also measured the value to Japan of access to the AFZ and this helped guide negotiations on catch limits and access fees.

Research Lessons from the Tuna-Dolphin and Southern Bluefin Tuna Issues

Funding of research

If governments or international organisations are to be able to predict and respond to severe over-fishing crises they need access to a stock of basic biological and economic knowledge about the fishery in question. This stock of knowledge is a public good - a good that benefits a large section of the community - and, consequently, needs to be publicly funded if it is to be provided at all. If industry can be reorganised in a way that confers significant property rights on individuals and firms, then some areas of applied research can be left to the private sector to fund.

The reduction of dolphin mortality is a pure public good: dolphins have an existence value and everyone benefits from a reduction in mortality. While some individuals will be willing to contribute to research and education about the dolphin issue, the amount collected through voluntary donations will fall far short of what is required. It requires publicly funded organisations such as NMFS to develop and maintain a stock of information which can be utilised when required.

In the case of SBT the structure of property rights has gradually been moving from open-access, through

common property to ITQs. In parallel with this process, the responsibility in Australia for research funding, and for management itself, has been gradually shifting towards private industry. Industry now contributes significantly to research funding and has a concomitant role in determining the research agenda. Research itself can even become privatised, as in New Zealand, owned by the state, industry, environmental groups, or other concerns.

Length of the research process

The length and complexity of the research process also impacts upon management. Some research answers may only be known over an extended period of time. For example, because dolphin populations grow comparatively slowly, a number of years are required, before it can be determined whether or not depleted dolphin populations receiving protection are recovering. In the case of SBT, in excess of ten years' tagging data are required to follow a cohort through the stages of its life which are critical for virtual population analysis. This extended length of the research process in turn can place considerable pressure on research to design research programmes for quick answers, but which ultimately are incomplete or deemed less than fully reliable.⁸⁶

For example, the twice-a-year for five years research cruises to assess dolphin populations were insufficient to fully assess changes in dolphin populations over time, but the five year time frame arose out of the management and political process. In this regard, it is necessary for scientific research programmes to have sufficient continuity to achieve at least a minimum of the stated objectives.

This extended length of time can help the management agency appear to be addressing the issue and by providing time for managers to develop a management strategy and to develop the political support required. This extended length, however, can work detrimentally if it is perceived as "sitting" on information that others may want quickly brought out into the public purview or that managers are deliberately stalling.

In a crisis situation, such as the possible imminent collapse of the SBT fishery in the 1980's, the time required for research means that decisions will have to be taken on the basis of very limited information. This reinforces the point made above - that a continuing and, by its nature, publicly funded programme of basic research is required if managers are to be able to react sensibly to perceived crises.

Managing risk and uncertainty

One of the most important lessons relates to how to deal with risk and uncertainty. Risk and uncertainty affect the type of research and who conducts it.⁸⁷ This issue relates to several questions germane to the problem of dolphin mortality. Who bears the burden of proof in establishing the nature and extent of the problem? Who gets the benefit of the doubt, the resource or the exploiter?

How does the public policy deal with the uncertainty of population assessments when implementing a property rights system? (Gerrodette and Wade 1997).⁸⁸ The burden of proof in establishing the extent of dolphin mortality in the ETP lays on the public sector, not the other parties concerned, including industry and environmental and animal rights groups. As a result, the public sector, such as NMFS or the IATTC,

^{86.} This is a recurring theme of Smith (1994).

^{87.} This issue is fundamentally the Precautionary Approach (Food and Agriculture Organization of the United Nations 1995).

^{88.} In addition to risk and uncertainty, a second basic question is that it can never be demonstrated that a major problem would have actually occurred had preventative measures not been taken (Clapham 1996).

had to demonstrate scientifically and sometimes legally that significant damages had occurred by dolphin fishing.⁸⁹

Sufficient uncertainty over the extent of damages or the size of populations potentially opens up the possibility for user groups to continue exploiting the resource at a rate that might not otherwise be acceptable, if there was less uncertainty. For example, the Australian tuna industry went through a substantial expansion, involving investment in vessels and on-shore plant at the same time as the SBT stock was lurching towards a possible collapse: scientists publicly warned that the stock was threatened (Murphy and Majkowski 1981) in the year prior to Australia's maximum harvest.

Uncertainty about the state of the SBT stock made it difficult for scientists and policy makers to argue with an industry which had recently undertaken substantial borrowings in order to expand.

In contrast, if the user, such as the tuna industry, bore the burden of proof to demonstrate that dolphin fishing, or heavy exploitation of juvenile SBT did not harm the resource according to some standard, the user group might have less latitude to exploit the resource until the proof was firmly established.⁹⁰

When the industry is already established, as in the SBT case, the burden of proof to firmly demonstrate damages is more likely to lie with opponents of continued resource exploitation.⁹¹ Alternatively, the burden of proof could rest solely with environmental and animal rights groups, who derive nonconsumptive value (existence and preservation value) from the dolphin resource and who, in many instances, place an infinite economic value on preventing dolphin mortality. Uncertainty over dolphin mortality and size and sustainability of the dolphin stocks could work in their favor to totally prohibit any dolphin mortality.

On a related issue, in the early stages of demonstrating dolphin or SBT stock depletion, a research framework may not be firmly established and data may be limited (sample sizes small or sampling designs not yet fully developed). These conditions contribute to the uncertainty discussed above and potentially allow continued exploitation in the face of inconclusive data. Until sufficient data have been collected and satisfactory research has been completed, the Precautionary Approach to harvesting has been advocated, specifying conservative rates of resource exploitation (Food and Agriculture Organisation of the United Nations 1995). In sum, the nature and extent of research is dependent on the choice of who bears the burden of proof about resource or environmental damages, and the choice of who sets the standards to assess damages, or even who determines what is damaged. As noted earlier, funding is another critical factor, since it determines the amount and type of research, and sometimes the ultimate result.

⁸⁹. A similar issue arose with whaling (Clapham 1996).

⁹⁰. NMFS was required to demonstrate that dolphin stocks were depleted with a small Type I statistical error (rejecting the null hypothesis is false when it is true) and low Type II error (not rejecting the null hypothesis when it is false). The smaller the probability of Type II error, i.e. the higher the power of the test, the better the test is in discriminating between true and false hypotheses. Thus, as long as the power of the test is comparatively low, which is more likely in the early stages of damage assessment, the greater the opportunity for the resource exploiter to continue utilizing the resource. If the burden of proof were upon industry however, they would have to demonstrate the absence of dolphin stock depletion with high power.

⁹¹. For example, in the USA the burden of proof lies on drug makers that new, unestablished drugs entering the market are not harmful according to some standard, rather than the burden of proof lying on the public sector. In contrast, tobacco companies do not bear this burden of proof since they are already established, whereas the public sector or citizen groups bear the burden of proof.

Organisation of research

After twenty-five years of mostly applied research, but also some basic research, on dolphins and dolphin mortality in the ETP, and half a century of work on SBT population biology, retrospective analysis could help provide insights into the research process. This would help lead to cost efficiencies, enhanced organisation of the research process, and better research results, including stock assessments.

Nonetheless, there are limits to the organisational efficiencies that can be imposed upon the research structure, depending on whether the research is aimed at directly supporting management or is more fundamental in orientation. Publicly funded research that is too tightly managed makes it hard to attract or keep the best and most creative researchers. Directors of research can help by buffering applied researchers in a contentious issue, sheltering them from political pressures and defending the integrity of results.

When research must function in a highly politically charged environment, such as in the early days of the dolphin assessments, or in setting overall catch quotas in the SBT fishery in the 1980's, mentors and experienced researchers can help guide and support younger researchers on the same research team.

Independence of research

Independence of scientific research and management can be important. Research and researchers that are too closely linked to management can lose effectiveness because they may no longer be seen as providing independent scientific research. Instead, research runs the risk of being perceived as solely serving the direct interests of management. This weakens the reliability and integrity of research findings. Moreover, if researchers are kept out of the direct management process and politics, these researchers and their research can be more readily defended. There is a chance that if the research is even just perceived as compromised that it then becomes ineffective.

Research and researchers, however, cannot keep aloof of the management process and away from constituent groups. Researchers, while kept solely to a research function if necessary, can help create confidence in themselves and their findings if they interact with constituents.

By meeting with constituents, researchers listen and gain further insights, and help demonstrate that they are open minded and interested in objective research. Explanations of research findings to constituents help garner confidence in these results, even if the findings do not meet the goals and objectives of constituents.

When scientific research is too tightly linked with resource management and policy, the possibility can arise for a suppression, intentional or unintentional, of scientific uncertainty and a failure to document and publicly debate legitimate differences in scientific opinion (Hutchings, Walters, and Haedrich 1997). Thus, a wide range of opinions can exist among scientists regarding the status of resource stocks. Dissenting opinion might be expressed at stock assessment meetings and a "scientific consensus" formulated.

However, when differing opinions are not formally acknowledged, or when sources of variability and their effects on the robustness of population abundance models (i.e. sensitivity analysis) are not reported and quantified, scientific information transferred to policy makers can bear little resemblance to the means by which scientific information is communicated, debated, and accepted by scientists in general (Hutchings, Walters, and Haedrich 1997).

One proposed solution that does not suppress scientific uncertainty and shields researchers from bureaucratic intervention is research funded by politically independent institutions (Hutchings, Walters,

and Haedrich 1997). International commissions would seem to fill this role. All scientific information would be released to the public at the same time it was presented to resource managers and policy makers (Hutchings, Walters, and Haedrich 1997). The public can then evaluate management for themselves.

Documents would explicitly contain scientific disagreements and sensitivity analyses would be conducted of scientific research. External, publicly available, scientific reviews would enhance this process.

When the management focus shifts to setting total allowable catches or mortality rates based on principles of sustainability and optimum yields, then research is likely to shift to a more applied focus, which more directly supports management objectives.

Methods of evaluating research may then shift to research effectiveness in meeting management priorities, subject to external reviews, and away from more individually determined priorities. Research directors are then required to more fully understand and monitor research, to justify research, and to switch research priorities as management priorities change.

The development of Management Advisory Committees (MACs) in Australia is a further step in the direction of tailoring research to management priorities. Each MAC has scientific, industry, public industry and government representatives, who together determine the research agenda, commission the research and pay for it with funds contributed by industry and government. Scientists maintain close contact with all parties with an interest in the fishery, and the MAC can be a forum for resolving disagreements before they spill over into the political arena.

International research cooperation

Research dealing with managing the global commons, transboundary resource stocks, fugitive resources like tuna and dolphins that migrate through EEZs and the high seas, or other international resource issues must necessarily contain an international component. Initially, dolphin mortality from dolphin fishing was a U.S. problem and was addressed nationally, but it became an international one as the proportions of tuna catch by flag states changed. This led to transfer of the bulk of the research to the IATTC. An international commission provides greater confidence in the research results to most parties involved.

The IATTC is unique because it has its own staff. Initially, the USA wanted national governments to conduct their own research, but Costa Rica (the original co-creator of the IATTC with the USA) wanted research conducted by an independent staff. The independence of research, and the confidence it develops, may be particularly important for less developed countries.

In contrast, Australia, Japan and New Zealand each conducted their own research on SBT. At the series of trilateral meetings scientists tended to be placed in an adversarial position, expected to make a case for their own country's claim to the resource. This situation militates against scientific cooperation such as data sharing and release of research results.

From the mid-1980's onwards the three countries worked towards the creation of an international commission which finally came into being in 1993 in the form of the CCSBT.

An important issue is whether to organise international research, especially commissions, with fully independent staff, such as that the IATTC, or an administrative staff relying on open discussions of scientific and administrative issues by sections representing the various countries and observers, such as CCSBT (Joseph 1997, Gulland 1978). There are several factors to consider. First, as mentioned above, factors can militate against scientific cooperation. Second, fully staffed commissions might provide clearer responsibility (Joseph 1977), although the decentralised approach may be equally effective, since the

ultimate responsibility for management measures will almost certainly lie with member governments (Gulland 1978). Third, arguments can be made that constraints of national policy affect an independent research staff less than a national staff (Joseph 1978), although it can be counter-argued that open review and debate of scientific research from a commission without a fully funded staff can provide the same effect.

A fourth issue relates to credibility (Joseph 1977, Gulland 1978). The scientific research emanating from a commission without a fully funded staff may be more exposed to the public view and more fully debated out in open discussion between several scientists and scientific groups (Gulland 1978), although there is nothing to prevent the scientific research from a fully funded commission to also be independently and/or openly reviewed and discussed; it depends on the openness of the institution and review process.

The relative openness of the IATTC as an institution, for example, helps give confidence in the results. This openness comes, in part, from foreign visitors, an international staff, and visits by the IATTC staff to different countries where lectures, seminars, and courses are given. IATTC staff also do some assessment projects for Latin American nations, which further contributes to transparency.

The annual meetings of the IATTC, which includes both member and observer nations and environmental groups, further contribute to openness. Militating against openness of the IATTC, and hence confidence in the results, is the sequestering of data.

The location and staffing of a fully staffed international commission can also impact upon its credibility (Gulland 1978). That is, the immediate environment can, at least to the public view, affect perceptions of research credibility. If the commission is located and staffed and even headed largely by the nationals from a single country, or group of countries with a high confluence of interests, this can raise questions of independence (Gulland 1978).

Even with an international commission which contains its own staff, national research capabilities require strengthening. Countries need the capability to evaluate options put to them by an international commission. This capability, however, requires not only training their own staffs, but even more difficult, retaining them. In many instances, limited wages and facilities induce researchers to leave their own country or to migrate to the private sector or take on higher level administrative positions in the public sector.

Managing researchers

The IATTC has traditionally attracted some of the world's premier population biologists, who have made fundamental contributions to the theory and methods of resource assessment and management. The original director, Milton Schaefer, not only attracted premier people, but did not encumber them with administration and bureaucracy and gave them a free hand.

The existence of good and plentiful data and challenging problems also attracted and helped retain premier scientists. Scientists are allowed to do outside consulting as long as it does not pertain to tuna. Scientists are required to become involved in outside affairs, teach courses, work with the United States National Academy of Sciences, etc. to maintain knowledge, interest, and enthusiasm. Recognition in their field is very important to scientists, and administrators at the IATTC help foster this. Nonetheless, scientists must remain focused on their statutory responsibilities.

The CSIRO has developed a strong reputation for research on fishery biology and management. However fisheries is only one of a wide range of CSIRO's responsibilities and research resources are limited. Recently government policy has been to try to recover research costs from the industries which benefit

from the research. While this has led to a tighter focus of research on management objectives it has tended to be at the expense of the basic research which only a publicly funded institution can perform.

While researchers at CSIRO are strongly encouraged to develop their role in their discipline, morale can be adversely affected by management imperatives which result in a focus that is strictly oriented toward commercial considerations.

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Chapter 7

Linking Research and Policy on Natural Resource Management: The Case of Pesticides and Pest Management in the Philippines

M.E. Loevinsohn and A.C. Rola

Executive Summary

In the Philippines, the use of pesticides expanded rapidly during the 1970's and 1980's, especially within small-holder agriculture. Over time, research in the Southeast Asian region and in the Philippines began to document the health and environmental impacts of these chemicals. By the mid-1980's, there was evidence that pesticides used by Philippine farmers were causing significant damage to their health and that of others coming into close contact with them. About the same time, it had been established that insecticide use in rice, the major consumer of these chemicals, was generally not economic or only at much lower levels than recommended and conventionally used. Research had also shown that residues of pesticides were widespread in the aquatic environment and in food, sometimes at levels above maximum recommended levels. Yet, it was not until 1992 that policy decisions were taken commensurate with the scale of damage that research was projecting. These included a ban or severe restriction on a number of popular but highly toxic insecticides and, in 1993, the launch of a nation-wide programme of farmer training in Integrated Pest Management (IPM).

This paper seeks to identify the causes for this marked delay in policy response. The changing socio-political and decision-making environments are described and the factors that were ultimately influential in bringing about the 1992-93 policy decisions are analyzed. The paper also considers the opportunities that may have been missed to advance these decisions. The objective is to draw lessons that may help in creating a more efficient flow of knowledge between research and policy.

The study draws on literature and interviews with 29 persons, centrally involved in the 1992 and 1993 decisions or with insights into the decision-making process. With respect to the regulatory decision, it was found that the most influential arguments were those based on health hazards. Much of this evidence had been available for some time. While in principle, the only risk assessment standard that FPA had to meet was that of "imminent hazard", in practice evidence of hazard had to battle against arguments for the productivity of pesticides. It was only in a changed political environment that accorded greater weight to the health of the rural population and allowed civil society groups into the policy process, that the balance was tipped in favour of regulation. The involvement of media and civil society groups was critical in bringing the issue onto the policy agenda and keeping it there, while the support of Secretaries and the President was essential, when the decision met strong resistance. Many of the same factors influenced the IPM decision of 1993. However, an important additional factor appears to have been policy makers' direct experience with small-scale achievements, on the ground. This suggested the feasibility of a new form of natural resource management and gave them the confidence to launch a large-scale programme.

While the changed political environment that followed the February Revolution of 1986 was found to be critical in bringing about the decisions, evidence suggests that individuals and institutions had earlier opportunities to advance the decisions, by making information available that had not been taken into account or had not been persuasively presented. These missed opportunities included:

- researchers and their institutions bringing to decision-makers' attention evidence that insecticides

- were generally unprofitable in rice, and the wider economic significance of this fact;
- government agencies seeking information on the “experiment” in pesticide regulation that Indonesia undertook in 1986 and its consequences;
- scientists making available findings from their own research on the health hazards farmers faced from pesticides; and
- NGO’s and other groups in civil society forming and maintaining coalitions to pursue some of the more difficult issues of policy reform, such as developing and implementing explicit procedures for risk assessment and for monitoring regulatory decisions and hazards in a devolved administrative environment.

These missed opportunities suggest practical actions that individuals and institutions can take to advance important and well-founded conclusions from research. It is clear from the study that pursuing these opportunities would in some cases have required personal courage and a willingness to act in inhibitory ways. These conclusions may be relevant to other situations, where research findings suggest policy changes that may be inimical to entrenched and powerful interests. As a nation’s institutions mature, as have the Philippines’ in the past decade, society will be better able to cope with “unpalatable” information and unconventional ways of bringing it to public attention.

Introduction

Pest management, as a branch of natural resource management, aims to enhance agricultural production benefits by reducing or avoiding pest damage in ways that maintain the integrity of the environment. In both North and South, agricultural intensification has been associated with increased use of pesticides, which are now widely recognized as having created a range of hazards. A number of approaches, known under different names, but to which we refer collectively as Integrated Pest Management (IPM), seek to improve farmers’ decision making and reliance on natural control processes. Experience has shown that the impact of these programmes depends critically on policies that help build capacities in farm communities, that reduce price distortions and that regulate chemical hazards. Reorienting policies, established at a time when pesticides were assumed to be essential to agricultural production, has not proved easy in any country, but has been particularly difficult where institutions are young and little experienced in dealing with the conflict that the emergence of a new understanding of reality inevitably entails.

In the Philippines, the use of pesticides expanded rapidly during the 1970’s and 1980’s, especially within small-holder agriculture. Early on, concerns were expressed by scientists and other observers about the environmental and health effects of pesticides. These concerns were based for the most part on information reported in the global and general literature. Over time, research in the Southeast Asian region and in the Philippines itself began to document health and environmental impacts from pesticides, the conclusions becoming more specific and comprehensive. On the policy side, a number of changes occurred, primarily in regulation, beginning with the establishment of the Fertilizer and Pesticide Authority (FPA) in 1977. Nevertheless, many extremely hazardous pesticides remained in the market through the 1980’s, while evidence accumulated of their deleterious effects on the economics of production, the integrity of rural environments, and on health, particularly of farm families.

It was not until the late 1980’s and early 1990’s, that policy decisions were taken appropriate to the scale of the damage research had been projecting. Chief among these decisions were the restriction of several widely used WHO category I chemicals in 1992 and the establishment of a nation-wide IPM training programme for small farmers in 1993.

The main objective of this case study then, is to identify the causes of this marked delay in policy’s response. We focus on the decisions of 1992-93, identifying the factors that were critical in bringing them about and assessing what prevented critical information from being acted on earlier. It is

expected that this understanding will provide guidance as to the measures that might in other situations permit a more efficient flow of knowledge between research and policy.

Hypotheses

Several hypotheses can be advanced to account for the delay in the Philippines. It is possible that policy-relevant information never got to policy makers; or that it got there but was not understood; or that it was understood, but not judged to be sufficiently credible or conclusive; or that the information was accepted but it took time to formulate and agree on an adequate response. We refer to these collectively as "flow" hypotheses.

However, what seems a more likely explanation is that relevant information was available and understood at the policy level, but that the concerns raised by the research were not influential because policy making was dominated by competing concerns raised by particular interest groups and coalitions. The ascendancy of these groups and coalitions was linked to their political sway and it was not until major political change diminished their influence, that policy makers were able to respond to the conclusions of the research. Specifically, during the Marcos era (1966-86), the interests of large industry were more powerful than those of farming communities which were most severely affected by pesticide impacts. It was not until the Aquino (1986-92) and especially Ramos (1992-98) regimes, that a broader coalition of forces gained influence. These had a stronger commitment both to more "rational" policy processes and to a more inclusive ideal of social welfare. For this hypothesis to be confirmed, the eventual policy decisions would have to be clearly tied to changes in staffing, procedures and institutional linkages. Further, the information on which the decisions were based would have to have been available for some time previously. We refer to this as the "influence" hypothesis.

"Flow" and "influence" hypotheses are not mutually exclusive. While the wider political environment may set limits to policy change and make change in certain directions unlikely, individual actors within research, policy making, or civil society institutions, may yet have opportunities to affect the timing and shape of policies. Several academic observers have asserted that unless a policy reform issue is linked to a perceived crisis and hence judged as urgent, it is unlikely to escape the "business-as-usual" bureaucratic stream of decision making and be taken up at the political level, where decisions are made more expeditiously, but where many issues compete for attention (Grindle and Thomas 1989). The relationship between the issue and the sense of crisis is, however, not fixed. With respect to knowledge emerging from research, actors may have opportunities to influence that relationship by, for example, the forthrightness with which conclusions are drawn, by the forums in which these conclusions are presented, and by the coalitions that are formed by those who bear that knowledge.

In the end, only some actors in the Philippines took the opportunities to affect the policy process. Is it possible to speak about the other opportunities that were missed? How does one know that they really existed?

We submit that it is possible in two respects, but that the standard by which a supposed opportunity should be judged is one of plausibility.

First, had the opportunity been acted on, is it likely that it would have had an influence on the policy process, and second, were the people and institutions involved indeed free and able to act in this way? While working with counterfactuals - "could have beens" - presents some risks, they are particularly important in a discussion of how better decision-making processes can be supported.

Methodology

Besides the published and gray literature, this study draws on interviews with 29 key actors within government, research and civil society institutions. The respondents (see Table 7.1) were people, who had played important roles in the 1992 and 1993 decisions or who could provide insight into the decision-making process. The interviews lasted on average for two hours. The questions were shaped by the role the person played and by the testimony of previous respondents, but followed a number of common themes:

- What information was available, when, within policy-making institutions and what credence was given to it?
- How were decision-makers linked to research, industry, public interest groups and farmer organisations?
- What was the impact on policy of NGO advocacy, media coverage and international or regional developments?
- What opportunities did particular researchers and their institutions have to increase the impact of policy relevant knowledge at the policy making level?
- What were the opportunities available to policy making institutions to seek better intelligence, when faced with partial but potentially important information?

The paper first lays out the trend in pesticide use in the Philippines, and the chronology of major research findings and policy decisions on pesticides and pest management. It then discusses the decision-making environment for pesticide and pest management policy, and describes the anatomy of the 1992 and 1993 policy decisions. Finally, the paper considers several opportunities that may have been missed to advance these decisions, then draws out the study's conclusions.

Table 7.1: Profile of Respondents for the Pesticide Research-Policy Link Study, 1997

Classification	Number
<i>Government</i>	
Cabinet Secretaries / Under-secretaries	5
FPA Administrator/Deputy Administrator	5
FPA / PTAC Chair	3
Other Government (DA)	1
<i>Civil Society</i>	
Academia / Research Institutions	
Health	2
Agriculture	4
Non-Government Organisations	
Rural	2
Consumer	2
Pesticide Industry Representatives	3
Media	1
International Community	
UN Agency	1
Total	29

Pesticides Research and Policy

Patterns of pesticide use in the Philippines

Prior to the 1970's, pesticides were primarily employed in the Philippines on plantation crops. Small farmers began to use pesticides intensively in the early 1970's, when they were promoted through a package of Green Revolution technology for rice and other crops. Data shows that importation of insecticides grew by 93% during the decade 1977 to 1987. Insecticide imports have grown more modestly in the years since, though the import of other pesticides has declined (Table 7.2).

Pesticide use is concentrated on three crops: vegetables, bananas and rice. Vegetable farmers are the most intensive consumers, but rice farmers, because of the area under cultivation, are the single biggest users of pesticides in the country (Table 7.3). They employed more than 6000 metric tons in 1992, most of it on the 3 million hectares of irrigated land. Philippine rice farmers use highly toxic pesticides, and, with the near absence of protective clothing and the rudimentary spray technology, are exposed to considerable hazard (Rola and Pingali, 1993). Though chemicals with lesser human toxicity, such as pyrethroids, have been taken up in recent years, older, highly toxic organophosphates (OPs) and some organochlorines (OCs) and carbamates, remain in widespread use. A number of newer "biorational" pesticides, generally more target-specific, await registration.

Table 7.2: Importation of Pesticides, Philippines, 1977-1991

	Volume (MT/KL)		
	1977	1987	1991
Insecticides	1556	3007	4707
Herbicides	760	1843	2044
Fungicides	874	5571	1327
Others	548	5480	2697
Total	3738	15901	10773

The pesticide industry in the Philippines is essentially oligopolistic. The Crop Protection Association of the Philippines (CPAP), a non-stock, non-profit organisation of companies engaged in the manufacture, formulation and marketing of agricultural chemicals controls about 90% of the total industry sales. Members of CPAP are mostly subsidiaries of multinational companies. They import two kinds of products: formulated products, and technical materials, which are formulated locally. Only the phenoxy herbicides are manufactured in the Philippines.

Table 7.3: Estimated Pesticide Use for Various Crops, 1992, Philippines

Crop	Usage (kg ai/ha)		Area (In 1000 ha)	in Mt ai
	Insecticides	Total Pesticides		Total Pesticide Use
Vegetables				
Cabbage	2.96	7.0	8.2	57.4
Onion	1.50	3.7	8.2	30.3
Fruit				
Mango	0.32	2.10	82.0	172.2
Banana	0.16	1.77	321.9	569.8
Pineapple	0.30	3.84	69.8	268.0
Grain				
Rice	0.57	1.57	3951.1	6203.2
Maize	0.47	1.16	2735.7	3173.4
Others				
Tobacco	0.37	0.43	57.4	24.7
Total				10,499.0

Note: a.i. = active ingredient

Research on pesticide impacts

In Table 7.4 we summarise the chronology of research on pesticide and pest management in the Philippines.

Productivity effects

By the mid 1980's, it had been established with some confidence that insecticide use is generally not economic in rice cultivation (Herdt 1979, Herdt et al. 1984) and that the yield-enhancing effects of pesticides are very small (Litsinger 1984). Insecticides were shown to induce resurgence of brown planthopper (BPH), a pest that had risen to prominence with the Green Revolution, by destroying its predators and parasites (Kenmore 1980, IRRI 1981, Reissig et al. 1982, Kenmore et al. 1984, Heinrichs and Moshida 1984).

Later work extended these findings. Epidemics of BPH and green leafhopper and their associated viral diseases were traced to chemical use and crop intensification (Litsinger 1987). Insecticides in rice ecosystems were found to cause resistance in the pests and destruction of a range of beneficial organisms (Magallona 1989). Abstaining from insecticide use (i.e. relying on natural biological control) was found to be the most profitable choice under normal circumstances (Smith et al. 1989, Rola and Pingali 1992). When the effects on health are taken into account, the net benefits of insecticide use in rice are more sharply negative (Rola and Pingali 1993). Studies on herbicides (Pingali and Marquez 1994) and molluscicides (Warburton and Pingali 1993) showed that these inputs are not yield increasing but rather labour saving.

Human health effects

By the mid-1980's, there were indications that pesticides were causing significant damage to the health of farming communities and others who came in close contact with them. Gonzales and Chua (1984) reported incidents of OP poisoning among farmers in Cebu, and these reports were confirmed and extended by Casanova et al. (1984), who also found poisoning among formulation plant workers. The latter authors concluded that medical personnel in hospitals and plants were not familiar with the diagnosis and treatment of poisoning. They found, as did Castañeda and Maramba (1986), that basic protective clothing was seldom worn by rice farmers. Accurate estimates of farmers' actual exposure to pesticides through handling and application with the common backpack sprayer were never generated in the Philippines, however numerous studies going back to the 1950's had done so in other countries and were available (e.g. Durham and Wolfe 1962).

Population-based estimates of the impact of pesticides were first available in 1987 from retrospective analysis of mortality records (Loevinsohn 1987). These were extended to other areas of the country by Bantilan et al. (1989) and suggested a major public health problem.

Pingali et al (1992) found the prevalence of several chronic conditions correlated with the degree of rice farmers' occupational exposure to pesticides.

Similarly, analysis of hospital records showed that the risk of occupational poisoning was greatest among age, sex and occupational categories most exposed (Rola 1989).

Table 7.4: Research on Pesticides and Pest Management in the Philippines

Health	Time	Economics / Environment
	1977	OPs in harvestable cabbage
	1979	Insecticide use not economic on rice
Poisoning cases reported across country; prevalence estimates from hospital records	1980	BPH resurgence from common insecticides; OC residues in plants, fish, and vegetables
Misdiagnosis of pesticide poisoning frequent	1985	Natural control is most profitable strategy in rice
Mortality impact due to occupational exposure to insecticides revealed; vegetable farmers more prone to poisoning than rice farmers	1987	Resistance, resurgence and toxicity to beneficial organisms, including fisheries
	1989	Insecticide residues in market-basket and farm samples
Evidence of chronic effects of pesticide use	1992	Insecticide residues in well-waters
	1993	Net benefits of pesticide use in rice is negative if externalities taken into account. Potable waters and groundwater suspected of residues
	1994	Herbicides and molluscicides have no effect on yield

Environmental effects / pesticide residues

By the mid-1980's, pesticide residues had been widely detected both in food and the aquatic environment. Residues of the persistent OCs were found in rice plants and in paddy water (Tejada and Magallona 1985) and bio-magnified within fish (Edwards 1973, Lucero 1980, Tejada 1983). Both OP and OC residues were found in vegetables (Magallona et al 1977, Zulkifti et al 1983). This work was primarily aimed at determining the residue burdens that farmers' pesticide use patterns give rise to.

While levels in excess of maximum recommended levels set by FAO/WHO were regularly encountered, the sampling was sporadic and no attempt was made to translate residue levels into estimates of hazard either for human consumers or for aquatic wildlife.

Recent studies on market baskets and farm samples of vegetables (Tejada et al. 1989) have extended understanding of the extent of contamination of food. Ground and drinking water are also found to harbour residues (Medina et al 1991, Tejada et al 1993, Bhuiyan and Castañeda 1995) revealed the presence of insecticide residues. However, it was not known whether these levels are toxic to humans. Monocrotophos and endosulfan residues were likewise found to be persistent in deep soil layers (Paningbatan et al 1993).

Pesticide residues on food crops, livestock and fish imply need for more stringent regulations (Bajet and Tejada 1995), and the particular consumption patterns of Filipinos make it necessary to adapt standard Maximum Residue Levels (MRLs) to local conditions. There is still a dearth of research linking residues to actual or potential health hazards.

Chronology and brief description of major policy decisions

Table 7.5 summarizes the chronology of major policy decisions in the Philippines. Wide and intensive use of agro-chemicals among small farmers was promoted, beginning in the early 1970's, by the 'Masagana 99' program for rice and similar programmes for maize and vegetables. These packages included timely availability of inputs, a fertilizer subsidy, credit, and farm management supervision. Purchase of fertilizers and pesticides was mandatory and tied to the credit scheme.

Table 7.5: Policy on Pesticides and Pest Management in the Philippines

Pest Management	Year	Pesticides
Prophylactic use of chemicals recommended for rice	1972	Rice production programmes linked government credit with agrochemicals
	1978	PD 1144 establishes FPA
	1980	Early bans on endrin and other compounds
IPM pronounced national crop protection policy	1986	Moratorium in registration of Cat. I pesticides
	1989	Ban on the Dirty Dozen/Restriction of endosulfan, organotin compounds
	1992	Ban on Cat 1 insecticide; methyl parathion and azinphos ethyl; restriction on monocrotophos and endosulfan
IPM National Programme implemented	1993	

To support these programmes, the Fertiliser and Pesticide Authority (FPA) was created by Presidential Decree 1144 in May, 1977. Its purpose was to assure the supply of fertilisers and pesticides at reasonable prices, to protect the public from the risks inherent in the use of pesticides, and to educate the agricultural sector in the use of these inputs. However, early on, the FPA focused mainly on the provision of adequate supplies of these inputs. Programmes of farmer training have only been developed in recent years.

Among the different aspects of pesticide regulation recognised by PD 1144, registration of products and licensing of persons engaged in the pesticide industry and trade have been the major focus of FPA activities. Its other regulatory functions are to restrict availability and use of chemicals deemed to constitute an "imminent hazard", or to be causing serious damage to crops, fish or livestock, to the public health or to the environment; to set maximum residue limits in food and feeds; and to monitor the handling and use of pesticides.

FPA decisions in 1981 and 1983 banned seventeen pesticides for use in the Philippines. These included, among others, Paris Green, the OCs DDT (in mosquito coils), DBCP and endrin, the OPs parathion ethyl, and, and some sodium compounds. These regulations followed decisions in many other countries and were not much contested. Some of these products, at the end of their life cycles and whose patents had long since expired, were voluntarily withdrawn by the companies.

In 1989, the list was extended to a total of 24 products, including most of the so-called 'Dirty Dozen', a term popularised by the international Pesticide Action Network. Some were banned outright, the use of others was restricted: chlordane in construction, endosulfan away from aquatic ecosystems, DDT for malarial control, paraquat for institutional use, and methyl bromide and other fumigants for use by certified fumigators only. Most of these restrictions were not followed, which served as grounds for further regulation.

In 1990 the FPA ordered an immediate halt to the importation, sale and use of organotin compounds, because of their human toxicity. These chemicals had not been registered and were being used primarily against the introduced pest, the golden kuhol (snail), which was devastating rice-fields. At the same time, the FPA stated that it would continue to evaluate data submitted to contest the ruling. In the absence of better alternatives to the organotins, many farmers turned to the insecticide endosulfan. This practice violated the 1989 regulation on endosulfan and constituted a use inconsistent with the product's registration. Hence, in December 1991, another circular was issued to prohibit the use of endosulfan formulations for the control of golden kuhol in rice.

FPA's 1992 decision banned or restricted a number of Category I (extremely or highly hazardous) insecticides. These included several, that were widely used and commercially important. Unlike previous decisions, this one met considerable opposition from the industry, including legal action. Five years later, company representatives, we spoke with, still contended that the Government had not had the evidence to justify the decision. Among the products banned were those containing azinphos ethyl and methyl parathion, while the earlier ban on organotin compounds was confirmed. Such severe restrictions were placed on endosulfan (formulations of 5 percent or less) and monocrotophos (permitted only for the control of beanfly on legumes) that the companies concerned did not consider the remaining niches commercially viable. It was not until September 1993 that the regulatory decision was ratified by the FPA Board, following which industry had a six months phase-out period for trade in the products.

However, unclear policy and procedures on retrieval and withdrawal of banned pesticides meant that these chemicals were apparently still used by farmers years later in some remote areas.

Complementary to the regulatory decision, a programme of small farmer education in Integrated Pest Management (IPM) was initiated by the Department of Agriculture in 1993. Although IPM had been declared national policy for crop protection in 1986, there was little effective implementation until the 1993 decision. Known as Kasakalikahan, this programme aimed to train 300,000 rice, maize and vegetable farmers by 1997 in the art of growing a healthy crop, with minimum damage to the environment, using pesticides only as a last resort.

There remain, however, a number of inconsistencies in present policies in this area. Other DA production programmes continue to prescribe pesticides for rice and maize. It is only in recent months, that the Land Bank, the principal source of formal credit for small farmers, has cut the links between its loans and insecticide purchase. While subsidies for pesticides have been abolished, favourable exchange rates and the quota system have encouraged importation of pesticides.

Policies: the Environment and the Decisions

The policy environment for pesticides and pest management

In this section, we describe how policies in the area of pesticide and pest management have been made and implemented over the past 20 years. We consider both the immediate environment within the agencies concerned, the FPA and the DA as well as forces from outside that have influenced decision making and implementation. In the latter category are included the national leadership, a range of groups within the civil society: non-government organisations, the media, professional societies, and the pesticide industry as well as regional and international actors.

The fertiliser and pesticide authority

Regulatory decisions of the FPA must be endorsed by its Board, which is chaired by the DA secretary and composed of representatives from the Departments of Health, Environment and Natural Resources, Finance, and the National Economic Development Agency. Management can act without Board approval on registration requests, on the advice of an Evaluation Committee. Other regulatory decisions, such as bans and restrictions, usually begin with a set of recommendations by the Pesticide Technical Advisory Committee (PTAC). Of late, the PTAC has also been asked to review registration applications for Category II (moderately hazardous) pesticides. A moratorium on the registration of Category I pesticides took effect in 1986.

The first three FPA administrators were drawn from the top ranks of the Philippine agrochemical industry. However, when the post was last filled in 1996, NGO's lobbied for someone with a health background. Possibly as a compromise, the Secretary of Agriculture designated a nutritionist with strong social science credentials. There have also been changes in the composition of the influential PTAC. Drawn mostly from academics in its early years, a more varied membership has been evident since. In the period 1986-1992, representatives of civil society groups, including the NGO's and the private sector, were appointed.

However, the NGO representative no longer participated in the committee after the 1992 decision. In our interview, he claimed that once that decision had been achieved, other issues in the agricultural sector were of higher priority. In 1997, PTAC was transformed into PPTAC, the Pesticide Policy and Technical Advisory Committee, to highlight the current emphasis on policy.

Formally, FPA's decision making is governed by the "Pesticide Regulatory Policies and Implementing Guidelines and Procedures" or "Green Book". Published in 1985 and since revised, it was drawn up by foreign and local consultants, including industry representatives. While the "Green Book" details the data requirements for product registration, it does not provide a clear basis for decisions on banning or restriction. In practice, this has left room for both arbitrariness and special pleading in these decisions. The problem has been recognised for some time, and in 1994, FPA management commissioned two groups of researchers, one to review and revise the "Green Book" generally, the other to develop procedures and standards for risk assessment specifically. Their reports, submitted in 1995, are still under review.

The FPA's links to the research community have always been close. As already noted, the principal advisory body, PTAC, has largely been composed of scientists drawn from plant protection disciplines, chemistry, toxicology and economics. Researchers also serve on the Evaluation Committee that reviews registration requests. Scientists from the state colleges and universities have also been retained by the industry to conduct experiments and generate the data needed to support their registration applications. The FPA has established a process for accrediting researchers whom the industry can hire to conduct these trials. However, it has yet to establish procedures to ensure that such scientists are not also involved in the review of registration applications, which would create a conflict of interest.

For most of its existence, the FPA has not been effective in commissioning research to meet its information needs. Up to 1992, only one study, on operator exposure, was commissioned. As noted above, the FPA has recently commissioned two studies to develop improved guidelines for decision-making. Presidential Decree 1144 established a link between FPA and PCARRD (the Philippine Council for Agriculture, Forestry and Natural Resources Research and Development), but the Agency has not exploited it so far.

Until 1992, the major activities of the FPA were registration and licensing. Post registration activities were hardly pursued, especially before 1986. The FPA did not have provincial offices, which could assure the monitoring function. In areas of intensive pesticide use, FPA deputised representatives, mostly DA employees, to monitor dealers' compliance with registration conditions, labelling requirements and with restrictions and bans. Deputised representatives were also expected to assist the FPA in investigating problems caused by pesticide use. In the 1980's, pesticide residue laboratories were constructed in three areas of the country to check on the residues in food as a result of farmers' practices. These laboratories are the responsibility of the Bureau of Plant Industry, a sister agency within the DA.

Since 1992, when devolution came into effect in the Philippines, deputised officers have been more intensely sought after, especially to report on the availability of banned chemicals. These officers, however, neither themselves have the power nor the support to act on such cases. In the past few years, discussions have been held with NGO's concerning the involvement of peoples' organisations in the monitoring of pesticide hazards, poisoning and other impacts. There have been proposals to link with local government units (LGUs) to support community monitoring and to create a database at the national level that would provide a more reliable information base for policy. These discussions have yet to bear fruit and NGO's are pursuing initiatives independently along these lines.

Despite the recent changes in leadership, in the composition of the advisors, and the attempts to reform the decision-making process, evidence suggests that FPA continues to operate with a "preferred stakeholder", the pesticide industry. From our respondents we learned that information on issues under review by FPA has been circulated to the industry, but not to other groups actively concerned with pesticide issues.

The department of agriculture

Major policy decisions in the agricultural area are made by the Secretary, on the advice of Under Secretaries and other officials. Over the years, high profile initiatives such as the 'Masagana 99' programme and the launch in 1993 of the Kasakalikahan IPM initiative have been announced by the President, and to a greater or lesser extent, owned by him or her.

An important feature of decision-making within the Department of Agriculture and indeed within other government departments (Tolentino 1995), has been the rapid turnover of Secretaries and their deputies in the period since the 1986 revolution. The 6 Secretaries who have filled the post served for an average of less than 20 months. Several of our respondents observed that this rapid turnover has disrupted policy processes and contributed to delayed decisions. When faced with a difficult and contentious issue, a policy maker must have confidence that the balance of forces is favourable. Learning to read the signs outside the Department and to assert him or herself within the Department takes time. The transience of top officials during the Aquino and Ramos era contrasts with the relative stability of the Marcos regime, when there were three Secretaries over a 20-year period.

The 1986 revolution was followed by an opening of government to a range of civil society groups that had long been excluded from policy deliberation, although as the slow progress on issues such as land reform showed, older interests retained a great deal of influence. While wider consultation with groups outside government was and is prominently promoted, evidence from our respondents suggests that consultation within the DA is often quite narrow. Decisions are taken in specific programmes, or new programmes are established, while contrary policies may be pursued elsewhere in the Department. This has important implications for the persistence of new approaches to natural resource management, such as IPM.

Links between the DA and research have changed over the years. During the 'Masagana 99' era under Marcos, UPLB and IRRI scientists were the primary source of technical input to the productivity programmes. As many as 30 members of the UPLB faculty could be seen at the DA every week, one respondent told us.

The National Crop Protection Center (NCPC) was influential in the area of crop protection. In general, the contribution of research was primarily on the technical side, with very little social science content, and little policy advice. IRRI in particular was reticent to address policy issues, for fear of compromising its politically neutral position.

After the fall of Marcos, the close collaboration of technical research with the DA was broken. However, social scientists played a very visible role in the process of policy reform that was managed by the Under-secretary for Policy and Planning, helping to set priorities among the issues calling out for attention and to shape the new policies. Notable in this context was the contribution of the Philippine Institute for Development Studies and the Center for Policy and Development Studies to the Agricultural Policy and Strategy Team. Their influential "Agenda for Action for the Philippine Rural Sector" (APST 1986) treats a range of policy issues, both broad, such as agrarian reform, and specific, such as pesticides.

As part of the reform process, specialised task forces were set up to develop specific proposals and to bring the perspectives of civil society groups to the attention of DA policy makers. One of these was the Task Force on Pesticide Policy, established in 1990. A separate pesticide policy study group was formed at UPLB, again with the support of the Under-secretary for Policy and Planning and involving a Canadian consultant.

This group looked specifically at the structure of the FPA and the continued relevance of the rules contained in the PD 1144.

In the period since 1992, technical expertise is once more being tapped by the DA. It is also increasingly being recognised that the means must be found to ensure that policy-relevant research is expeditiously made known to policy makers. The ad-hoc Task Forces that served during the period of political change may not be appropriate to communicate the implications of research on a continuing basis. For example, PCARRD has recently established a Policy Advocacy Group whose task is both to respond to requests from legislators and government departments, and to pro-actively make available important findings, in concise and well-targeted form.

The DA is also making efforts to ensure greater policy coordination among agencies and programmes with similar functions. For example, the current FPA management is attempting to join with other DA programmes dealing with IPM and balanced fertilisation.

The national leadership

During the Marcos years, the overriding objective for the agricultural sector was self-sufficiency in rice, and agro-chemicals were seen as essential to the strategy of intensifying traditional small-holder agriculture. To raise concerns about the sustainability of this strategy was perceived as, to some extent, subversive. The Aquino era (1986-1992) was a period of economic stagnation, and the watchword for agricultural policy was maximisation of farmers' income. In principle, a cost saving approach like IPM was attractive. However, there was limited political will to confront dominant commercial interests (aside from the "crony capitalists" who had been closest to Marcos).

Several controversial policy decisions in the environmental area, made at the Department level, were rolled back by the President or her advisors. This may help explain why, for example, Aquino's 1986 pronouncement on IPM remained a dead letter.

At the start of the Ramos era, environmental concerns came to the fore. The Philippines was a signatory to Agenda 21, which was crafted in Rio de Janeiro in 1992. The Ramos Administration has, on the whole, upheld its commitments. The current Administration was seen by respondents as having a more empirical basis for its decisions and a clearer commitment to social welfare than its predecessors. Good management is enjoined at the cabinet level and ministerial decisions are seldom overturned.

Non-governmental organisations

The environment was not welcoming to NGO involvement in policy debates during the Marcos era. For the most part, therefore, NGO's focused their efforts at the grassroots where low external input alternatives to Green Revolution technologies were developed and adapted with farming communities.

A good deal of effort was put into raising awareness among farmers of the negative consequences of agrochemicals for health and the environment, as well as on working out farm budgets under high and low input conditions. MASIPAG's work in Central Luzon is an example. However, many academics viewed the NGO's as Luddites and their science as simplistic. Several of our respondents said the tendency of some NGO's to paint with the same brush all agro-chemicals, fertilisers as well as the much more hazardous pesticides, contributed to scientists' mistrust. Similarly, the links of some researchers to the pesticide industry contributed to mistrust in the other direction. Despite this, NGO's formed productive relationships with a number of scientists, with whom, for example, they explored decentralised approaches to varietal selection and alternative pest management approaches. At the same time, NGO's contributed to and benefited from international NGO initiatives, such as the Pesticide Action Network. These were important sources of information.

As a result, NGO's were prepared when, during the Aquino years, doors opened to them in

government. As mentioned earlier, NGO's participated in FPA's PTAC and in the Pesticide Policy Task Force at DA. The Pesticide Action Group (PAG) was formed as a coalition of consumer, environmental and rural-oriented organisations.

The strength of NGO commitment was tested at the time of the Hoechst litigation, when they rallied national and international support for the individuals and institutions attacked and helped prevent the reforms being rolled back.

In recent years, however, the coalition has weakened as individual NGO's have pursued their particular agendas. There is a sense among some, that the most important battles have been won with the regulatory decisions of 1989-92. Nevertheless, PAG remains active. Currently, it is planning a national consultation on a proposed bill to reform the FPA, which would separate the regulation of pesticides from that of fertilisers, and place the former function under the Department of Health. A community-based monitor of adverse health reactions to pesticides known as COMPADRE is also being developed. There was a feeling among the respondents that the NGO's are enjoying more and closer links with researchers, although mutual suspicions between the two communities linger. Some NGO's, that have been working with farming communities on the development of sustainable agriculture, are also working out relationships with national programmes. A case in point is the Kasakalikahan IPM programme, to which NGO's have made valuable contributions (Ravanera et al. 1996).

The media

During the Marcos years, there were scattered but not infrequent reports in the media of poisoning cases, or of environmental damage linked to pesticides. These reports were usually brief and relegated to the inside pages of newspapers. There was very little follow-up on the stories or attempt to trace out patterns among them. Our respondents pointed in explanation to the generally poor standards of journalism prevailing in the country at the time, and the fact that the media's clients were not very demanding: "Every paper was a tabloid". The story itself also lacked punch: a chronic toxic hazard like pesticides held little drama. And, in those days, investigative journalists who were too diligent courted arrest.

In 1992, the media played an important role in bringing pesticide issues to public attention and keeping them there for a sufficient time. The fact that journalists felt freer to pursue a story that might displease powerful interests, was in part responsible for this. A keener sense of involvement in national development seems to have motivated some journalists and some of their employers in the wake of the 1986 revolution, and investigative journalists began to find outlets for their work. Thus, a technical and complicated subject found its way into print, and onto the airwaves. But the story had also gained in drama: there was a conflict, one that grew sharper and more compelling when Hoechst launched its cases against a journalist, a researcher and the FPA.

For the media to function effectively, they need access to information, and access to knowledgeable people. Our respondents indicated that scientists have shown themselves more willing in recent years to provide journalists with leads to what may be important stories and to interpret technical aspects in lay terms. However, most scientists lack these interpretative skills. Some NGO's have shown themselves more adept in this respect.

Professional associations

Associations have been established for most of the disciplines that are active in the agricultural sector. In principle, they could be important actors in policy debates. Each association holds a yearly convention, where new knowledge from research is presented and discussed by national members, international guests and other interested persons. A set of recommendations is usually formulated at the end of the meetings. In the more mature societies, these recommendations are forwarded to the

relevant agencies. In practice, however, the professional societies have not been active players in the area of pesticide and pest management policy.

Very recently, one professional society has collaborated with the FPA in the training of pesticide dealers. The current FPA administration is eager to involve other professional groups in its training programmes.

The pesticide industry

As indicated earlier, information has flowed readily between industry and the FPA. Industry consultants helped draw up the initial set of guidelines and procedures for the Agency. For long, faster action on registration requests has been a principal industry demand, and a major concern of FPA administrators. The companies' perception of the early regulatory decisions in 1982 and 1989, was that they were, on the whole, justified and backed by adequate scientific evidence. However, the 1992 decision was not fair in their view: the basis for it was not clear, and the data that supported it was not specified. "A product is registered and then, one day, they phone you up and say: 'We have a problem'", one industry representative told us. The industry calls for a comprehensive risk-benefit analysis to guide decisions, one that takes into account local patterns of use. The FPA is aware of the weakness of its decision-making framework, and is developing risk assessment standards. As noted earlier, industry has had early access to these proposals. The call for the local use pattern to be considered is echoed by some researchers and NGO's: taking exposure levels, consumption patterns and other factors into account would often increase the assessment of risk compared to that in other, generally developed countries that have acted earlier to regulate the pesticides.

As in other countries, the Philippine industry promotes the safe use of pesticides, and CPAP is collaborating with FPA in a programme of farmer training. NGO's and the Kasakalikasan IPM programme have not joined in, as they contend pesticide hazards are not sufficiently emphasised. The local industry has resisted calls to introduce safer formulations (like dry flowables) and packaging that have been available in Northern markets for some time. The companies explained that they are constrained by the business plans of their multinational parents, which cannot be altered for one country only. The products, that remain at the heart of the Philippine industry's trade are chemicals discovered decades ago and developed primarily for Northern agricultural systems by the parent companies. Newer more target-specific "bio-rationals" await registration, and the companies are calling for efficient and less onerous procedures to be instituted than have been used for the earlier generations of pesticides. Guidelines are being developed that will take account of the new and complex risks associated with some bio-rationals, for example genetically modified organisms (GMOs).

The industry commissions a good deal of the adaptive research needed to support registration from the Philippine scientific community. The companies also conduct research on IPM, on a somewhat different model than that followed by the Kasakalikasan programme and the NGO's.

The international community

Decision making on pesticides and pest management in The Philippines has been affected to varying extents by developments in the SE Asian region and internationally. In the late 1970's, the experience of the US Environmental Protection Agency and the thinking that went into its creation influenced the structure and function of the FPA. American and Australian consultants were centrally involved in FPA's establishment and helped set its initial procedures.

Policy decisions in neighbouring countries and the reasons behind them have, over the years, been familiar to Philippine decision-makers. This has been assured both by bilateral links and, since 1982, by membership in the Regional Network of the Production, Marketing and Control of Pesticides in

Asia and the Far East (RENPAF), which groups together regulatory authorities under the aegis of UNIDO.

At the international level, staff and advisors to the FPA have participated in conferences and workshops organised by bodies such as FAO and WHO on pesticide and pest management issues. In the mid-1970's, WHO drew up the international classification of pesticides by hazard (WHO 1975). Based in the first instance on the acute hazard of pesticide formulations, the Classification makes no explicit recommendation about the precautions needed to ensure safe use, (although other WHO documents go much further in this direction), which it states must be determined in the light of use conditions. Nonetheless, the Classification has proven influential in the Philippines, and has shaped discourse on pesticides. Many participants in the policy arena speak of the 1992 regulatory action as the "Category I decision" (Category I being "extremely" and "highly" hazardous formulations), although not all Category I chemicals were restricted and some in Category II ("moderately" hazardous) were included.

The International Code of Conduct on the Distribution and Use of Pesticides (FAO 1986) sets standards for all organisations involved in pesticide regulation, manufacture and trade. Although entirely voluntary, the Code has been endorsed by all of FAO's member states and by the main international industry grouping GIFAP (now called Global Crop Protection Federation). Compliance with the Code has been assessed by Philippine and other developing country NGO's, in relation to issues such as labelling, promotion and use practices (Pesticides Trust 1989). In the late 1980's, the Code was amended to include a voluntary scheme of Prior Informed Consent (to which the Philippines adheres). Under this Code, an importing country must be informed by the exporting state each time a shipment is planned of a listed chemical. The information includes a range of toxicological and epidemiological data, along with the regulatory status of the chemical in different countries. In practice, PIC does not appear to have been influential in the Philippines as the chemicals so far listed were restricted by earlier regulatory decisions or were never widely used in the country.

Since the early 1990's, deliberations over permissible pesticide residue levels in produce entering trade have been pursued, in the context of the FAO Codex Alimentarius, which is now linked to the GATT / WTO processes.

In principle, rigorous monitoring of residue standards by importing countries or exporting authorities can serve to reduce the frequency and human toxicity of the pesticides used in the Philippines. In practice, respondents told us that some of the principle importers of Philippine produce (especially from the plantation sector) are also the exporters of the pesticides in question and so unwilling to be too severe in their enforcement. Concern has also been expressed by Philippine scientists and NGO's that the standards being set in the Codex process are in some cases below those in force in the Philippines.

Finally, the wide availability of information in the public domain through the Internet and the World Wide Web has had an influence on policy discussions since the early 1990's. NGO's, in particular, appear to have benefited from access to toxicological and regulatory information from international sites.

The anatomy of two decisions

In this section, we attempt to analyse the importance of the different influences on policy making described above in the two key decisions, the 1992 ruling regulating several popular Category I insecticides and the order implementing IPM the next year.

The regulatory decision of 1992

In the years prior to 1990, the policy debate concerning the regulation of commonly used, highly toxic pesticides took place behind closed doors. Pressure from civil society was sporadic and ineffective. The arguments put forward in favour of stricter regulation concerned the impact of these pesticides on health, particularly that of farm families and applicators. The information drawn on was mostly toxicology and clinical reports and hospital records of poisoning incidents. Those opposing stricter regulation argued that most of the poisoning incidents were due to suicide, and thus difficult to prevent.

Furthermore, they argued that restricting the availability of popular insecticides would force farmers to concentrate on a smaller number of products. This would hasten the emergence of resistance in the pests, and, because pesticides were essential to maintain production, would lead to economic losses. This argument was never directly challenged and it was the side opposing regulation that prevailed until the 1992 decision.

In 1990, policy debate emerged into a more public arena. The Pesticide Policy Task Force was established and brought together groups and points of view that had been excluded from the earlier deliberations. Public consultations ensured that the views of all stakeholders, including farmers and NGO's, were heard and the current scientific understanding of the issues was brought to bear. Media attention kept the issues in the public eye. This process was linked to a programme of policy reform in the agricultural sector that had been ushered in by the Aquino regime and to which it was held by groups that supported it. Recommendations were returned to FPA by the Task Force and could not be ignored.

It should be noted that the arguments for regulation were based for the most part on information that had been available earlier to PTAC and FPA. The health arguments drew on toxicology, mostly generated abroad, plus local clinical data. These arguments, respondents told us, were the most influential in the eventual decision. They were put forward with particular force by NGO members, who had access to international data banks through their networks.

Continued support at the political level for the emerging decision was critical, but the change of government in 1992, and with it the change of Secretary, put this in doubt. There was, therefore, strenuous lobbying, particularly by NGO's, to ensure that the new appointee was committed to the reform. That was assured when Secretary Sebastian took office. Coming from an agricultural background, he had seen the hazard farmers were exposed to when handling pesticides without protective clothing.

Moreover, he could endorse the decision confidently, because he had seen farmers' experiments in IPM Field Schools in which productive rice crops were grown without pesticides.

Once enacted, in September 1993, the policy came under attack from industry, particularly Hoechst, which brought legal action against the FPA and PTAC for lack of procedural merit in the decision on endosulfan. Other suits were brought against a journalist and scientist. NGO's mobilised local and international pressure in support of the defendants, while the media, and investigative journalists in particular kept the issues in the public eye and brought new facts to light. President Ramos stood by the decision of the Secretary when representations were made to hold the regulatory order. Although the company was successful in its suit against the government at the regional level, the Supreme Court ruled against it and ordered the case returned to the regional court, where it is still pending. The case against the individuals was dropped.

The IPM decision of 1993

The launch of the National IPM programme in 1993 gave teeth to policy proclaimed in 1986 and to

national commitments made with respect to Agenda 21. The decision process was simpler than in the pesticide regulatory case, which it followed and supported. Research showing that pesticide use was generally unprofitable in rice cultivation (Herdt, 1979, 1984) came to the attention of the DA and was apparently shown to the Secretary. However, the decisive factor in securing his support for the 5-year programme was, by his testimony, what he witnessed in the Farmer Field Schools, which had been conducted on a small scale. There were also contacts between the Philippines and Indonesia, which had launched its own national IPM programme in 1989. The Under-secretary for Policy and Planning visited the Indonesian programme in 1992 and came away favourably impressed.

A few key points emerge from this detailed analysis of two decisions:

- In principle, the only risk analysis standard that FPA had to meet in deciding to ban or restrict pesticides was that specified in the decree that established the agency: that there be “an imminent hazard”. In practice, evidence of hazard had to battle against arguments based on productivity. But the rules for weighing the two were never specified, and this probably contributed to the inertia in decision making.
- A policy response to the evidence of widespread hazard only occurred when the issue was taken up at a level above the FPA, in the Department of Agriculture.
- The entry into the policy process of different actors, NGO’s, farmer organisations and the media, was critical to building and maintaining a constituency for policy reform. Their participation was a direct result of political change.
- Existing knowledge was ultimately influential because threats to the health of rural communities were accorded a greater weight in the changed political environment.
- Direct experience of small-scale achievements was important in giving policy makers the confidence to launch a policy promoting a new and unfamiliar approach to natural resource management.

Discussion and Conclusions

Missed opportunities

The preceding section laid out the factors that were critical in bringing about the 1992 decisions. Such a retrospective analysis lends an air of inevitability to what happened. This is heightened by the tendency of people involved in the events to emphasise the importance of the role they played. However, we repeatedly asked during the interviews what prevented the decisions being made earlier? That is, might individuals and groups feasibly have acted so as to significantly hasten what eventually happened? As suggested earlier, the standard to apply in such cases is one of plausibility as judged by informed observers and by those close, but perhaps not too close to the events in question.

The economic argument

One opportunity that appears to have been missed, was to bring to bear on the policy discussions, particularly on pesticide regulation, the evidence that pesticides were generally unprofitable in lowland rice cultivation (this information had some influence, as we have seen, in the IPM decision, though belatedly). By the mid-1980's, it was common knowledge among agricultural researchers, that pesticides were generally not needed and often counterproductive in rice production. Yet, as many persons close to the decision making attest, it was not known at the FPA. Crucially, the knowledge was not brought to bear on the claims by industry that pesticides were essential to maintaining grain production levels. In the event, the pesticides decision was taken largely on the basis of health concerns, and these had to do battle alone against the industry's claims. Until there emerged a political regime that, implicitly, put greater value on the lives of rural people, health arguments were always inherently weak. A well buttressed economic argument, that touched the right notes (e.g. reducing import bills) might have shifted the balance several years earlier.

What prevented the economic case from being made? In Indonesia, a coalition of national and international scientists took these arguments to the Planning Ministry and eventually to President Suharto. The coalition was able to link the ecological and micro-economic evidence to a perceived political threat, namely that significant areas of the country's principal grain crop – rice - were being devastated by outbreaks of insect pests and the viral diseases they transmitted. In the Philippines, no coalition, however constituted, emerged. The scientific information employed in Indonesia was relevant to the Philippines (indeed a good deal of it was generated there). It required someone to recognise that published information was not reaching the policy-making audience. And it needed an ability to translate the conclusions of research into terms that spoke to policy makers' concerns.

Were people and institutions free and able to take up the challenge? The limited capacity for policy analysis at Philippine agricultural research institutions, and the lack of a mechanism to bring policy relevant information to the attention of policy makers have been discussed earlier. IRRI for long had a limited capacity for policy analysis, but possibly more importantly, the Institute long avoided explicit comment on national policy matters, citing its international character and technological mission. That changed somewhat in the 1990's. Some of the constraints that national scientists faced, at an individual level, are discussed below. What would have been needed, to make the case persuasively, was that individuals acted beyond their job descriptions and possibly beyond the mandate of the institutions they served. It would have required courage.

Regional learning

The FPA and the Department of Agriculture appear to have missed another opportunity by not seeking to understand the consequences for Indonesian farmers and rice production of that country's 1986 pesticide

decision. Whatever the differences between the two countries in decision-making environment and process, Indonesia provided the Philippines a natural experiment on the effects on rice production of restricting the availability to farmers of the most hazardous pesticides. Our respondents concurred that both the DA and FPA were largely unaffected by the information available from international sources that Indonesia was reaping substantial benefits from the ban (e.g. Oka 1990) and, if they doubted the credibility of these reports, they made no attempt to follow up on what was actually happening. The point was not that the Philippines had to replicate the Indonesian decision, but that it could learn something from it.

Was it feasible for national agencies, such as the DA and FPA, to follow up on the consequences of a policy decision in a neighbouring country? That this was indeed possible is suggested by the fact that in 1992, a senior official in the DA visited Indonesia to assess its experience with IPM training, three years after its inception and shortly before the Philippines launched its own programme. Beyond such visits, the agencies had numerous opportunities for seeking specific information from Indonesia, for example through the linkages established by RENPAF, the regional network of pesticide regulatory agencies. FPA on its own also had the ability to commission studies by Philippine institutions, as it had done at least once prior to 1992. In that case, it relied on donor funding, but it appears there were also possibilities for tapping into national research budgets. FPA has made use of its ability to “reach down” for information by commissioning studies at several points since 1992.

Self-censorship

There is evidence that some critical information regarding the danger posed by pesticides failed to enter into policy discussion because the scientists involved in the research opted to restrict its diffusion, practising a form of self-censorship. A case in point concerns a study initiated shortly after the 1986 revolution on exposure to organo-phosphate insecticides by operators of backpack sprayers. The study was, to that point, the first of its kind in the country and a potentially important element in rigorously assessing the risk that farmers ran under actual working conditions. The research was carefully planned, in line with the standard WHO protocol, and apparently well-executed. The report indicated that exposure was greatest during mixing and loading and that leaks and spills were frequent.

But when it came to calculating the overall exposure, which, according to the protocol, should have been expressed in units of milligrams per hour or per operation, the result was instead reported in parts per million per square meter, which makes no sense. Evidence suggests this was not a mistake. A later published version did not address absolute exposure at all, presenting only its distribution in percentage terms among parts of the body and among operations. It should be noted that the research was publicly funded and the results ought to have been in the public domain.

We wish to emphasise that our point is not to do an exposé, but to get at the larger question. What would motivate scientists to restrict the diffusion of their own research, whose significance they must have realised? The reasons in this case are difficult to establish so many years after the fact, but testimony by people close to the affair suggests that the scientists feared the use “extremists” might have made of the information. Indeed, credible evidence indicating that farmers were subject to a substantial risk when applying commonly used pesticides, if that is what the study’s results actually showed, might well have proven explosive in the environment of the late 1980’s. Would this have been a bad thing?

What is at stake here are two competing views of how policy processes should be organised. One, which holds that they must remain the province of experts because of the difficult technical issues involved. The other calls for an opening of the process to scrutiny and wider participation, because of the danger of special interests or bureaucratic inertia impeding decision making. From the former perspective, no opportunity was missed by not stating the study’s conclusions clearly and making them available for others to assess and employ as they might.

From the latter perspective, self-censorship kept information out of circulation, that could have been used to counter industry's claim that the pesticides in question posed no "imminent hazard" as commonly used. In the event, sufficient pressure was generated to counter this claim only by 1992. The study's findings might have made it possible to generate that pressure several years earlier.

It is also possible that the scientists feared that wide diffusion of information inimical to industry interests would prove personally threatening. The same may have applied to national agricultural scientists who did not vigorously advance the economic arguments. Certainly there was justification for this concern, as shown by the legal action that Hoechst brought against an individual scientist and a journalist. That suit, however, was eventually dropped, following widespread protest, and evidence that the allegations the scientist had made and the journalist publicised were well-founded. Of course, in other countries and contexts, researchers and, more often, journalists have been subjected to more serious and prolonged harassment.

Coalitions

Opportunities may also have been missed to form and maintain coalitions, formal or informal, in pursuit of a commonly held goal. In particular, coalitions among NGO's and between them and scientists have not proven durable. Scientists, who welcomed the presence of NGO's in the PTAC and who recognised the importance of public campaigns and media attention in bringing the pesticide issue squarely into the policy reform agenda, bemoan the "flash-in-the-pan" quality of NGO involvement. NGO participation in the PTAC ended shortly after the 1992 pesticide decision. In the view of concerned scientists, and some administrators, once the "easy victories" regulating the most toxic chemicals had been secured, the NGO's had no stomach for the longer and more difficult struggle to improve the policy process. Respondents spoke in particular about the need to develop and put in place a transparent and legitimate risk-assessment procedure and to tackle the problem of implementing and monitoring regulatory decisions in a devolved administrative environment. These issues are being pursued within the "business-as-usual" track in FPA and would benefit from the higher political profile that NGO involvement might bring.

Is the criticism of NGO's justified? Strictly speaking, no, because the supposed opportunities do not relate to the 1992-93 decisions. But have opportunities for achieving greater impact on these other policy issues, such as risk assessment, been missed? All the NGO's we spoke with, point to the multiple calls on their attention and limited resources. In the view of some, the priority of pesticide issues did indeed diminish with the 1992 decisions and they moved on to more pressing concerns. Others say they are maintaining their interest. As noted, the Pesticide Action Group, has drafted a bill that would reorganize the FPA, and is about to hold a national consultation on it. But whatever the structure, new or old, the content of regulation remains: risk assessment in the light of local conditions, and monitoring and evaluation of the effects of potentially hazardous materials. Different groups are talking about how these functions can best be assured. The opportunity is for these groups to explore ways to consolidate their efforts, and not to disperse them.

Conclusions

The evidence we have from the testimony of key actors and from the available literature suggests that the information, on which the pesticide regulatory decision of 1992 was principally based, had been available for many years. That information became effective in a political context which gave greater weight to its implications (i.e. that rural communities faced a considerable threat to their health) and in the hands of actors who had recently gained access to policy discussions. To that extent, our main, "influence" hypothesis is confirmed. At the same time, there was information that was not persuasively put forward to policy makers that, had it been, might well have advanced the decisions. This would have led to a reduced toll in death and illness, to lesser damage to the aquatic environment, and likely to increased rural incomes. Seizing these opportunities would, however, have

required individuals to act in inhabitual ways, outside the mandates of their institutions, and possibly at some personal risk. Is that plausible? We have suggested that it is, if we can expect people to display courage and act from a sense of shared responsibility.

Which larger lessons does this case hold? Well-founded research conclusions, whose implications for policy are not particularly contentious, may be expected to move fairly well through the usual channels that link research institutions and policy makers. But where research suggests policy changes that are likely to be inimical to entrenched and powerful interests, the bureaucratic business-as-usual linkages are unlikely to function efficiently. Other approaches, relying on indirect channels, via and through the civil society, will probably be unavoidable if research conclusions are not to be lost from view. As a nation's institutions mature, as have the Philippines' in the past decade, society will be better able to cope with "unpalatable" information and unconventional ways of bringing it to public attention. Hopefully, it will not require a revolution, as in the Philippines, for public policy to pay it heed.

There is another point that may have relevance beyond the Philippines. Not all opportunities were missed. At some point, decisions were made, decisions that went against the grain of a person's experience and an institution's habits. Pesticides had been widely thought as essential to agricultural production and they had long been promoted in government programmes. Decisions, that moved in the opposite direction and that built on farmers' experimentation, were not easy to make. Our sample size is very small, although there is some corroboration from elsewhere. It appears that what gave decision-makers the confidence to decide was direct experience of the new form of natural resource management. Learning-by-seeing and hearing was more influential than learning-by-reading. Doubtless not everyone learns in the same way, and the two forms of learning are not exclusive. But it suggests that significant achievement, even on a small scale, may in itself be a valuable resource that can be used, as a policy experiment, to help decision makers decide.

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Chapter 8

Policy Reform and Community-Based Programmes To Combat Cyanide Fishing in Philippines⁹²

Charles Victor Barber and Vaughan R. Pratt

Cyanide-Fishing: A Poison Tide on the Reef

Since the 1960's, more than a million kilograms of deadly sodium cyanide has been squirted onto coral reefs in the Philippines to stun and capture ornamental fish destined for the pet shops and aquariums of Europe and North America. More recently, a growing demand for larger reef food-fish has vastly increased the incidence and spread of cyanide-fishing. Chinese consumers in Hong Kong and other major Asian cities greatly value certain reef fish when they are plucked live from a tank, cooked, and served minutes later, and pay up to US \$300 per plate for some species. The combined demand for aquarium and live food-fish has spread cyanide-fishing throughout Indonesia and into neighbouring countries such as Papua New Guinea, Vietnam, the Maldives and Fiji. In the past year, officials in countries as far-flung as Eritrea, the Marshall Islands, and Tanzania have voiced suspicions that their fast-growing live-fish export industries may also be using cyanide.

Far from Hong Kong's restaurants and the pet stores of Europe and North America, fishermen in Southeast Asia, the Indian Ocean, and the Pacific dive into the sea with "hookah" tubes in their mouths - attached to air compressors on small boats - and makeshift squirt-bottles in their hands. These fishermen squirt cyanide into coral formations, thereby stunning and collecting their prey. Sometimes a crowbar is necessary to pry apart the coral heads and reach the stunned fish that hide in crevices. The rewards are high, with some cyanide divers making more than university professors in their countries; but so are the risks. Untrained in diving safety, many fishermen fall prey to decompression sickness ("the bends"). Contributing to this chain of poison are a variety of intermediaries - vessel and holding-tank facility owners, fish exporters and importers - and civilian, police, and military officials who look the other way for a cut of the profits.

Cyanide kills corals and reef invertebrates along with many non-target fish. Large percentages of the fish that are captured live die in transit, due to their poison-weakened state. Deadly in any marine environment, the spread of cyanide fishing is particularly tragic in the countries of the Indo-Pacific. As the global center of marine biodiversity for corals, fish, molluscs, and reef invertebrates, the region may justifiably be called "the Amazon of the Oceans". Cyanide fishing also threatens the livelihood of poor coastal people in the region, where dependence on fish protein is very high and fisheries provide millions with income.

⁹² This paper summarises data and conclusions found in *Sullied Seas: Strategies for Combating Cyanide-Fishing in Southeast Asia and Beyond* by Charles V. Barber and Vaughan R. Pratt, published by World Resources Institute and International Marinelife Alliance-Philippines, 1997.

The origin

The Philippines, birthplace of cyanide fishing, is also the only country with a programme in place to eradicate the practice. Since the early 1990's, the Bureau of Fisheries and Aquatic Resources and the International Marinelife Alliance-Philippines (IMA), an NGO, have jointly developed and implemented the Cyanide Fishing Reform Program (CFRP).

Experience with the CFRP over the past five years shows that cyanide fishing can be reduced through: a combination of the right policies and laws, beefed-up enforcement efforts, enhanced public awareness, cyanide testing of live-fish exports, training of cyanide-fishermen in cyanide-free live-fish capture techniques, and the development of sustainable community-based resource management and livelihood alternatives, that transform local fishermen into the front line of marine stewards and protectors.

One key aspect of the CFRP's initial success has been initiation of policy reforms in both source and consumer countries to create anti-cyanide fishing incentives and enforcement mechanisms. A second important element has been development of effective partnerships with fishing communities themselves, focusing on the transfer of non-destructive technology and improvement of local livelihoods.

This paper identifies the key actors in the live-fish trade and analyzes their roles and interests. It then looks at the process by which research and advocacy, that first exposed the cyanide fishing problem in the Philippines during the 1980's, has been transformed into a new policy framework and programme of action on the ground. The paper then elaborates the policy reforms that governments, of both exporting and importing countries, must take to establish incentives for a cyanide-free live-fish trade, and examines the community-based strategies that lie at the heart of the CFRP's efforts to counter this ominous threat to the very heart of the planet's marine biodiversity.

Actors in the live reef-fish trade

The live reef-fish industry in Southeast Asia has an estimated annual retail value of at least \$1.2 billion, about \$1 billion from the live food-fish trade (mostly with Hong Kong), and nearly \$200 million from exports of aquarium fish to Europe and North America. Not all of the fish in the trade are caught with cyanide (Australia's live reef fishery, for example, is cyanide-free), but most of them are. To understand the dynamics of this trade, it is necessary to understand the various actors involved and the incentives that currently shape their behaviour:

Cyanide Fishermen

The number of cyanide-fishermen operating in Southeast Asia and neighbouring countries is unknown. Based on estimates in the Philippines, where there are probably about 4,000, the number of hard-core cyanide-fishermen throughout the Indo-Pacific region probably does not exceed 20,000. In short, cyanide fishing is not an ubiquitous problem, like slash-and-burn farming, practiced by millions of poor farmers, nor is poverty the root cause of cyanide fishing, although many cyanide-fishermen are certainly very poor. Rather, cyanide-fishermen are a fairly small and discrete group responding to very specific incentives: a new technology, a ready market for the product, lax government enforcement of anti-cyanide laws, and the lack of viable livelihood alternatives.

Experience in the Philippines suggests that when cyanide-fishermen are introduced to cyanide-free techniques for live-fish capture and ensured a fair price for their catch, they are willing and often

eager to give up using the poison and to talk about ways to ensure the long-term sustainability of their local reefs and fisheries.

Development of reliable alternative sources of income strengthens these incentives, and strict government enforcement of anti-cyanide-fishing laws further reinforces them.

Live reef-fish exporters

The number of companies involved in the live-fish export business in Southeast Asia is also unknown, but it appears to be expanding rapidly. In the early 1960's, for example, there were only three companies exporting aquarium fish from the Philippines and export of live food fish did not yet exist. By the 1990's there were some 45 aquarium fish exporters in the country, and eight companies exporting live food-fish. At least 10 companies run holding tanks for live food-fish in Bali, Indonesia, a major transshipment point. Conservative estimates of the annual volume of Asian trade in live food-fish alone range between 20,000-25,000 metric tons, mostly from Indonesia, and the real total may be far greater. Philippine government statistics show that as many as 6 million aquarium fish were exported in 1996, and Indonesia is catching up quickly.

Exporters of cyanide-caught live food and aquarium fish are responding to a strong market demand and the lack of meaningful law enforcement and monitoring by governments. Partnerships with the exporters for more sustainable live fisheries are only possible when source-country governments take strong action to eradicate the export of cyanide-caught fish and importing countries demand proof that incoming fish were not caught with cyanide.

Live reef-fish importers

Businesses that import live food and aquarium fish are in essentially the same position as exporter without government pressure to ensure that the fish they import were not caught with cyanide, they have little incentive to take action on the issue. As one large importer of live food fish argued: "We, the Hong Kong importers do not participate in any catching of fish or its activities. We just finance the people by equipping them with boats and fishing gear. We just buy fish from them. The production side is left to them".

Live reef-fish consumers

Consumers have an important role to play in pressuring the aquarium-fish industry to take action on imports of cyanide-caught fish.

Indeed, publicity and ensuing consumer pressure in Europe and North America has had some impact on aquarium-fish importers, and led to efforts, like the Marine Aquarium Fish Council in the U.S., discussed below. Consumer pressure against cyanide fishing is virtually non-existent among the Chinese consumers of live food fish, though. As one Hong Kong observer noted, "being endangered actually seems to spur demand".

Divers and dive operators

Scuba diving and snorkelling on tropical reefs is a big and growing business throughout the Indo-Pacific. Divers and dive operators have a strong interest in maintenance of coral reefs and healthy fish populations, and are often vocal in their support for marine conservation.

Effective mechanisms have not yet been developed, however, to fully tap this group for political and financial support in combating cyanide fishing, although some efforts, such as PADI's Project Aware, are working to instil greater general environmental consciousness in divers and dive operators.

Engaging these actors in efforts to combat cyanide fishing requires two basic elements. First, government policies must provide a structure of negative and positive incentives, which make cyanide fishing unattractive for the whole range of actors involved in the trade and make sustainable alternatives attractive. Second, partnerships must be developed directly with fishing communities currently using cyanide, to assist them in abandoning the cyanide-fishing tradition and adopting techniques, technologies, and economic strategies which improve their livelihoods while protecting their rich marine environment.

From Field Research to Policy Reform: The Philippines Cyanide Fishing Reform Program

Stopping cyanide fishing - like other kinds of natural resources management reforms - requires careful field research to document the problem and explore possible solutions. The harder task, though, is to translate good field data and policy prescriptions into action. Policies must be changed, programmes must be established and managed well, and action in the field must move forward, if the problem is to be overcome. The genesis and development of the Philippines' Cyanide Fishing Reform Program (CRFP) over the past 15 years illustrates the factors which facilitate the transformation of research into action by policymakers and, ultimately, action in the field.

In the early 1980's, cyanide fishing in the Philippines was widespread and unchecked by government action. In 1982, an American aquarium fish collector, Steve Robinson, went to the Philippines in search of specific species of fish for his business. While living and diving with Filipino collectors, he discovered and extensively documented the practice of cyanide fishing for the aquarium fish trade.

His findings were published in a series of articles in aquarium hobbyist trade magazines in 1983 and 1984. In 1985, Robinson teamed up with another American, Vaughan Pratt, and a Canadian, Peter Rubec, to found a new NGO, the International Marinelife Alliance (IMA).

IMA immediately initiated a campaign to expose the widespread misuse of cyanide in the Philippines and its role in supplying the growing demand for aquarium fish in North America. Mincing few words, IMA elaborated the ecological costs of the aquarium hobby and accused major industry players of turning a blind eye to - if not openly abetting - the destruction of the Philippines' marine resources.

IMA's strategy was to appeal to members of the pet industry, to show them that they were ultimately losing out from the use of cyanide (because of bad publicity and high fish mortality) and, ultimately, galvanize them into a potent lobby group to reform the live fish trade.

In 1986, coinciding with the fall of the Marcos regime and the new administration of President Corazon Aquino, IMA registered as a new Philippine NGO and launched an initiative to bring the cyanide fishing problem into the mainstream of Philippine national consciousness.

This public awareness campaign helped win the support of the Aquino administration. During the next six years, IMA and the Bureau of Fisheries and Aquatic Resources (BFAR, within the Department of Agriculture) cooperated to achieve the following results:

- Use of fine-mesh nets for aquarium fish collecting was legalised, thus providing fishermen a true alternative to cyanide;
- A pool of trainers to teach fishermen the cyanide-free live-fishing tradition was organised;
- Net-skills training programs were conducted;
- Alternative livelihood programs for cyanide fishermen and their families were created; and
- A computerised test for detecting the presence of cyanide in fish tissues and organs was developed by IMA and the Bureau of Fisheries and Aquatic Resources (BFAR), and adopted by the government as an enforcement tool against cyanide fishing.

Since the 1992 election of President Fidel Ramos, these steps have come together in the Cyanide Fishing Reform Program (CFRP), a partnership between IMA and BFAR—discussed in detail in the next section of the paper. BFAR has adopted the CFRP as its master plan for combating cyanide fishing and provides funding for the laboratory, research, and inspection services carried out by IMA. All agencies sitting on the multi-sectoral Presidential Committee on Anti-Illegal Fishing and Marine Conservation have endorsed the CFRP. Both the U.S. Agency for International Development (USAID) and the Asian Development Bank (ADB) are supporting the CFRP, an important step in terms of both secure funding and prestige within the government bureaucracy. Cyanide fishing has by no means stopped in the Philippines as a result of the CFRP, but it has been significantly reduced, and the CFRP is now providing a model - as well as technical assistance - for other governments (Indonesia, Federated States of Micronesia, Republic of the Marshall Islands) to address their cyanide fishing problems.

The CFRP experience suggests that there are both internal and external variables affecting the success with which field research - such as that begun in the 1980's on cyanide fishing in the Philippines - can be turned into concrete policy reforms.

Internally, it is very important to carefully document research results, and strategically disseminate them to the right audiences. The fact that much of the early 1980's investigation results were published in aquarium hobbyist magazines, for example, was a key factor in getting the attention of the aquarium fish import industry - since their customers were reading those magazines and becoming disenchanted with buying Philippine aquarium fish. IMA's 1997 collaboration with the World Resources Institute to publish *Sullied Seas: Strategies to Combat Cyanide Fishing in Southeast Asia and Beyond* (from which this article is drawn) is the most recent attempt to carefully communicate the results of research and work in the field to key audiences of policy makers, donors, and other concerned groups. Significantly, the Chinese National Environmental Protection Agency (NEPA) is publishing a Chinese language version of *Sullied Seas* targeted at both policy makers and consumers involved in the live food fish trade in Hong Kong and other parts of southern China

Second, IMA relentlessly exposed the problem in the general press and other fora both in the Philippines and abroad. Journalists picked up on the story and kept reporting it when provided with new and reliable information from various parts of the country.

Since IMA collects extensive data on live fish exports, court cases against cyanide fishermen, and the like, they are able to provide the media with interesting, useful new information on a regular basis, thus keeping the issue in the public eye.

Third, IMA developed a practical plan of action that recognised the economic realities faced by poor fishermen and the need to ensure that protecting their livelihoods was a major part of the solution.

Fourth, IMA first implemented a pilot programme that was used to show policy makers that there is indeed a solution to the problem and thereby gain their support. Finally, by entering into a strategic working partnership with BFAR, IMA was able to work with the government bureaucracy in crafting supportive regulations and getting them passed into law.

External factors, however, have also been important for the development of the CFRP. The fall of Ferdinand Marcos and re-establishment of democracy in 1986 was an important catalyst for development of the CFRP, allowing for more freedom of action by NGOs and communities, and giving birth to a stronger environmental consciousness in the country and the government. The change of government also led to an improvement in the quality (and honesty) of local leaders in many areas, and allowed for a much freer press which has reported repeatedly on cyanide fishing as well as many other environmental threats.

A second important external factor has been rising international concern about the fate of biodiversity in general, and Southeast Asia's coral reefs in particular. Those in the international community concerned about coral reefs can look to the Philippines and see a clear and well-documented threat – cyanide - as well as a straightforward action program to deal with the threat - the CFRP. In this way, large donors like USAID and ADB have both begun to fund the CFRP and to put pressure on the government to take stronger action generally to protect the country's globally significant coral reefs.

In short, moving from investigation and research in the field to policy reform and action has been a multi-faceted process involving systematic data-gathering, continuous promotion and advocacy, behind-the-scenes negotiation with government officials to develop new policies and regulations, development of on-the-ground programs with fishing communities, and cultivation of government agencies and international donors for their financial support.

Most importantly, the CFRP experience shows the inter-dependency of data gathering and analysis, policy reform, and action on the ground. Research, on its own, may be of intellectual interest, but it does nothing to solve real-world problems. Action on the ground must be informed by careful research to ensure that the programmes and institutions created are appropriate for the task and change as conditions change. And policy reforms must build on research and experience on the ground, while at the same time providing a supportive environment for the institutions carrying out both research and field programmes.

Policy Reforms to Combat Cyanide Fishing

Cyanide fishing will not end until governments set in place effective policies to eradicate it and to encourage sustainable live-reef fisheries. The use of cyanide to catch fish is illegal in virtually every country of the Indo-Pacific, but the big profits to be made, combined with lack of enforcement and other supporting actions mean that with the exception of the Philippines, these laws do not much discourage cyanide-fishing. "Policy reform" in this context, therefore means more than passing laws.

It also involves establishment of effective institutions to monitor the live reef-fish trade, to enforce the laws, and to provide economic incentives for fishermen, traders and consumers to shift to ecologically sustainable, cyanide-free reef fisheries. Experience with the Philippines' Cyanide Fishing Reform Program suggests the following priority areas for policy reforms to combat the growing threat of cyanide fishing in the many countries of the Indo-Pacific region:

Policy reforms in live reef-fish source countries

Establish cyanide detection test (CDT) laboratory facilities at all major live-fish collection and trans-shipment points

A simple test to determine the presence of cyanide in live fish was developed by IMA and the Bureau of Fisheries and Aquatic Resources (BFAR) and has been in use for over five years in the Philippines. Currently five laboratories test over 6000 samples annually. An effective CDT testing network is key for a strong effort to reduce cyanide fishing. Without testing, authorities cannot determine whether fish have been caught with cyanide or obtain convincing evidence to prosecute violators.

To be successful, CDT laboratories must also be backed up by a larger network of agencies and monitoring posts, and staff trained in sampling prospective live fish shipments and rapid sample transport. Such a network requires directives on participation in sampling and monitoring from central agencies to their local offices, and on training in correct sampling and shipping-to-lab procedures.

Although testing is not a panacea, it is the best technical tool currently available to identify cyanide-tainted fish and provide hard evidence with which to prosecute violators. Countries that want to provide incentives to stop cyanide fishing must be serious about developing their capacities to systematically test live fish intended for export.

Establish a national system of data gathering and monitoring

In order to monitor and regulate the live-fish trade, governments need accurate and appropriate data. Many national systems for collecting fisheries and export statistics do not adequately desegregate data, making it impossible to tell, for example, how many individuals of a particular species were collected in a particular location, exported in a given month or year, or who did the collecting and exporting. There is no way to regulate cyanide use in the live-fish trade until such data are regularly collected.

The Philippines now collects live-fish data in ways that allow the government to keep a watch over total numbers of particular fish species moving through domestic and international airports and major international seaports, activities of exporters, and other relevant information. IMA collects the data through its CDT and monitoring network, and provides it to all relevant national and provincial government offices.

Establish a firm legal framework to detect and prosecute cyanide-fishing and trade in cyanide-caught fish, ultimately requiring mandatory testing and certification of all live reef-fish exports

While fishing with cyanide and other poisons is banned in virtually every country in Southeast Asia and the Pacific, a much firmer legal framework is needed to make these bans effective. Once a CDT laboratory and monitoring network is established, all prospective exporters should be required to submit to random sampling and testing, inspection, and government licensing. All shipments should require a certificate showing the origin, volume, and species composition of the shipment, and certifying that it has been subject to random CDT procedures and is cyanide-free.

A mandatory certification system (as was established by law in the Philippines in late 1997) provides key positive as well as negative incentives for exporters. On the one hand, uncertifiable fish become liabilities. On the other hand, certified fish can obtain an “environmental market premium” in markets where importing governments regulate imports and consumers prefer fish caught without cyanide.

Enforcement procedures and penalties must be fairly applied, and should focus on punishing the larger players in the trade, such as exporters and corrupt officials, and not unduly persecute the cyanide divers themselves. Governments might consider enacting strong forfeiture provisions to prosecute large operators. With this approach, violators would lose not only fish, which test positive for cyanide, but also equipment such as boats and holding facilities proven to have been used for cyanide-fishing.

Nonetheless, local cyanide divers should be educated that what they are doing, for whatever reasons, is illegal, and that repeat offenders will be punished harshly. This will only be perceived as just, however, when local fishermen see the big operators prosecuted first. Targeting the big cyanide-fishing interests also reduces incentives for local divers to join in the trade.

Ban or restrict the export of especially vulnerable species

Blanket bans on the live reef-fish trade are both unwise and unworkable and just drive the trade underground. When the Philippines attempted a ban in parts of Palawan province several years ago, cyanide fishermen continued to use the poison, but killed the fish after capture and sold them on the fresh fish market. Also, bans deprive local communities of one of the most lucrative sources of income to be found in the coastal zone. The cyanide-free capture of live fish at sustainable levels with a fair return to local fishermen should be the objective of live fishery policy.

That said, the pressures on particular species may become so great that governments may want to ban altogether their capture and export. For the Napoleon Wrasse, highest-valued of the live food-fish species, over-exploitation may soon reach critical levels, warranting a complete ban. A ban is unlikely to stop the Napoleon Wrasse trade altogether, but it may reduce the total volume.

Regulate the import, distribution, and use of cyanide

Cyanide has many legitimate uses in industry, but a considerable amount of the poison is diverted into the live-fish collection business. In most countries of the Indo-Pacific region, import, distribution and use of cyanide is virtually unregulated. To remedy this problem, a draft “Sodium Cyanide Act” that would strictly regulate the import and use of cyanide, was introduced in the Philippine House of Representatives in late 1996. The draft bill requires all cyanide imports to be authorised in advance by the government, and requires the poison’s sale to be “strictly controlled”. Control elements include requirements for traders and end-users to seek authorisation from the Department of Environment and Natural Resources (DENR) to purchase, distribute, or use cyanide, and to file weekly reports on the sale or use of the substance. Both traders and buyers would be subject to spot

checks by the government. Penalties under the Act are stiff, with prison terms for unauthorised possession or importation of cyanide ranging from 6 to 12 years, and fines set at a minimum of \$10,000.

While this type of law will undoubtedly be difficult to enforce, it should nonetheless increase the price of cyanide on the black market, thus making non-destructive techniques of live fish capture more economically attractive to fishermen currently using cyanide.

Address corruption within vulnerable government units

The ease with which government officials in many places, charged with regulating the live fish trade, can be bribed, works against all of the other incentives that source-country governments might put in place to stop cyanide-fishing. But with so much money at stake in the cyanide-based live fish trade, corruption is a recurrent problem. Governments can only eliminate corruption if officials at the highest levels take firm public stands against it, and when corrupt officials are dealt with harshly under the law.

Heads of vulnerable agencies like fisheries, the navy, and customs must establish firm policies, that those convicted of involvement in cyanide fishing will be summarily fired and permanently barred from civil service or military positions. National police agencies and prosecutors can make it known publicly that they will seek the maximum penalties available under the law to prosecute corrupt officials.

The media can help by exposing instances of corruption related to cyanide fishing in the press. Even in societies where the press is restricted, firm government policy statements against cyanide-fishing and related corruption should give the press a freer hand in reporting abuses. Finally, an effective CDT lab and monitoring network, backed up by community-based monitoring, can provide government with a great deal of information about potential corruption problems.

Mount public awareness campaigns in the media and schools

NGO's and government leaders should work systematically to build public awareness about the threat of cyanide-fishing and the steps that must be taken to stop it. Press releases, symbolic public events, and the steady provision of information to journalists are all tools that can raise public awareness and strengthen other anti-cyanide-fishing incentive measures.

In the schools, information on the values of marine resources and biodiversity, the effects of cyanide fishing, and the tools available to stop it, should be integrated into curricula from primary school onward. Cyanide fishing is a learned behaviour that becomes a tradition over time.

By teaching the cyanide-free tradition in coastal-area schools from an early age, countries can help to ensure that children are fully aware of the alternatives to cyanide-fishing and their positive consequences.

Divers are also potential allies in raising awareness and gathering information. In the Philippines in 1994, IMA initiated a voluntary Status of Coral Reefs (SCORE) survey, using a simple questionnaire on reef conditions which divers were asked to complete and return by mail. By mid-1996, 200 of the 4000 survey forms distributed by IMA had been completed and returned, providing the first new primary data on the condition of Philippine coral reefs since a survey done in 1983, including reports on suspected cyanide-fishing locations.

Policy reforms in live reef-fish importing countries

As in any transnational trade, source countries for live reef fish need the cooperation of importing country governments, if their efforts to stem cyanide use at home are to be effective. At present, no importing country requires proof that imported live fish were not caught using cyanide, or penalises firms that import fish caught with the poison. Key steps for setting up more helpful incentives in importing countries include the following:

Monitor imports of live fish and provide data to exporting countries

Importing country governments should establish data collection and storage systems to keep track of the number by species of live fish imported, and the country of origin. They should then share that data with relevant government agencies in source countries. In this way, monitoring agencies in source countries can compare their own export statistics with import statistics and thus determine the validity of those export statistics - provided exporting countries begin to collect detailed export data, as the Philippines is already doing.

Phase in a legal requirement that all live reef-fish imports be certified as cyanide-free

When live fish exporting countries require cyanide-free certification for all exports, as the Philippines is about to do, importing countries should reciprocate by requiring all live-fish importers to provide certification from the source-country government that the fish they are importing have been certified as cyanide-free. Since Indonesia and other exporting countries do not currently have testing and certification systems in place, it is probably unrealistic for importing countries to immediately impose a ban on imports of non-certified live fish. But importing country governments, and importers, can move in this direction by gradually phasing in a prohibition on non-certified live-fish imports, and simultaneously working with exporting countries to develop testing and certification procedures, laws, and technical capacities. Importing governments will also need to establish cooperation with groups such as IMA and the Marine Aquarium Fish Council (discussed below) which can provide independent, third-party monitoring of the certification systems that national governments set up.

Assist live-fish exporting countries to combat cyanide-fishing

Live-fish importing countries that are providers of development assistance (such as the United States, Canada, Japan, and the countries of the European Union) should offer financial and technical assistance to exporting countries, to assist them in developing cyanide-fishing reform programs and certification procedures. The Asian Development Bank has set a good example in this regard, providing some \$2.7 million for the Philippines' CFRP as part of a new Fisheries Sector Loan slated for implementation in early 1998. The U.S. Agency for International Development is also providing support for the Philippines CFRP, and is currently developing anti-cyanide-fishing activities as part of its Coastal Resources Management Project in Indonesia, in collaboration with IMA.

Box 8.1. Establishing Partnerships with Live-Fish Exporters and Importers

Along with establishing partnerships with fishing communities, effective policies to combat cyanide fishing must also cultivate support from other private sector actors in both source and importing countries. Some of the most important steps in this regard include the following:

Ensure that testing of fish for cyanide is done rapidly, fairly and efficiently: Establishment of cyanide-detection testing (CDT) capacities and requirements is an essential incentive to discourage cyanide fishing. But speed is essential if cyanide testing is to gain the support of legitimate exporters who do not want their business unduly delayed by red tape. To that end, laboratories need to function seven days a week, returning test results to the exporter (with a cyanide-free certificate if the tests are negative) within 24-36 hours. Equally important, the agency managing CDT labs must be trusted to be fair, efficient, and incorruptible by the fish collectors and exporters.

Provide and publicise official cyanide-free certification: As demand for cyanide-free live fish grows in overseas markets, fish that exporters can claim as reliably cyanide-free can command a higher price. This was proven in the 1980's when aquarium fish from the Philippines, tainted with that country's cyanide-fishing reputation, began to command a lower price than the same species from Indonesia - thought to be cyanide-free at the time. Preliminary evidence from the grouper fishery in Coron, Philippines indicates that a similar market premium is beginning to operate in live food-fish markets.

Governments therefore need to formalize and publicize their certification process, both at home and abroad. For the aquarium-fish trade, this could be done at the industry's conventions, and in its trade magazines. Food-fish importers, mostly in Hong Kong and southern China, are less organized and less concerned about the environmental impacts of their trade, but this situation is likely to improve over time, as it did in the aquarium trade during the 1980's. Already, the Hong Kong Fisheries Department, World Wildlife Fund-Hong Kong and other groups are working to raise consumer awareness in Hong Kong, which is the single largest market for Indo-Pacific aquarium fish.

Partnerships with the private sector in live-fish importing countries are also important for slowing cyanide fishing. The best current example of such a partnership is the newly formed Marine Aquarium Fish Council (MAFC) in the United States, which is the single largest market for Indo-Pacific aquarium fish. In 1996, a number of U.S. conservation organizations and aquarium trade groups met to develop the MAFC as a body that would serve as an industry-independent governing council to establish standards and oversee environmental certification of aquarium fish imports and sales in the United States.

Composed of aquarium-fish importers, scientists, and environmental NGOs, the MAFC will establish standards for certifying aquarium fish with reference to collection methods, suitable and non-recommended species, size limits, holding and transportation methods, and other standards of practice. Costs would be borne by a percentage of the sales price, although grant funding would have to cover start-up costs to develop and test applicable certification procedures. Actual certification would be carried out by certification institutions accredited by the MAFC and adhering to the MAFC standards, not by the MAFC itself. The MAFC would require that collectors, traders and retailers adhere to all standards continuously and would identify appropriate enforcement mechanisms, including the monitoring of the chain-of-custody from reef to retailer. The council would work closely with the American Marine Life Dealers Association to reach more retailers and consumers.

Strengthen consumer awareness about the impacts of cyanide fishing

As in other areas of environmental certification, it is crucial to build consumer awareness. Where consumers themselves increasingly demand assurances that the fish they are buying have not been caught with cyanide, the pressures on live-fish exporters and the governments that regulate them to take action will grow rapidly.

It is important to note that *testing of live-fish imports on their arrival in importing countries is not an effective strategy, and is likely to be counterproductive*. Cyanide metabolises out of fish relatively

rapidly, and tests conducted at import destinations are likely to be negative for cyanide, regardless of whether the fish was caught with cyanide or not.

Community - Based Strategies

Without fishermen in the equation, there is simply no solution to the cyanide-fishing problem. There is no policy, law, or technology that can replace the need to work directly with cyanide-fishermen. Training, community organisation, income enhancement, and establishment of community-based coastal management systems in communities currently using cyanide - or vulnerable to its introduction as a live-fish trade is established in their area - is the core partnership necessary to end cyanide fishing.

Train fishermen in cyanide-free fishing technologies

When fishermen are presented with effective cyanide-free technologies for capturing live-food and aquarium fish - and given greater awareness about the legal, health, and ecological risks of cyanide fishing - many choose to convert to cyanide-free techniques.

In the Philippines, IMA has trained over 2000 cyanide-fishermen in cyanide-free live-fish capture techniques. A typical one-week local training programme targets 20-30 fishermen who are currently using cyanide to catch either live food or aquarium fish and have developed an interest, whether through IMA awareness activities or their own experiences, in learning cyanide-free techniques. Initially, three-day “classroom” sessions provide lectures and discussions concerning the arguments in favour of cyanide-free fishing, cyanide-free technologies, post-harvest management of catches, cooperative marketing and other strategies for adding fisheries production value, and safe diving techniques.

These sessions are specialised to address specific types of live-fish capture. Fishermen who primarily collect aquarium species are trained in the use of fine-mesh barrier nets. Fishermen, for whom food fish are the target species, are trained in hook-and-line techniques for capturing groupers and, importantly, simple techniques for decompressing the air bladders of captured fish to ensure their post-harvest survival and health. Because particular grouper species favour distinctive bait sizes and shapes, bait preparation is a key part of the hook-and-line training as well.

Following the “classroom” sessions, the fishermen and trainers carry out four days of in-water training in either net or hook-and-line techniques. The intensive one-week training is followed by a three-week follow-up period of monitoring by the trainers to ensure that trainees have mastered fishing techniques and proper post-harvest care. Other activities, such as organising local fishing associations and cooperatives and developing value-added livelihood activities - discussed below - take more time and involve periodic follow-up participation by the trainers over months or years.

Using this basic model, IMA in 1997 expanded training programmes to many new areas of the Philippines and now operates such programmes in five major cyanide-using regions. IMA has also initiated the first Indonesian training programme - for 60 fishermen - in North Sulawesi province, working with a local partner organisation.

Enhance local income from the live-fish trade and other sources

Fishermen’s incentives to forsake cyanide-fishing increase - and partnerships between fishing communities and outsiders such as IMA grow stronger - when local income from sustainable use of

marine and other local resources rises. Beyond training in cyanide-free fishing techniques, IMA therefore works with fishing communities to promote a variety of livelihood enhancement activities.

When fishermen can get more money for cyanide-free live fish, they are extremely enthusiastic about converting to cyanide-free techniques. As in most poor fishing communities in Southeast Asia, cyanide-fishermen receive only a small percentage of the value of their catch, with the lion's share of profits accrue to middlemen. By helping fishermen obtain post-harvest equipment and know-how and assisting them develop their own marketing cooperatives and outlets, the local share of the profits can be increased.

In the area of North Sulawesi, Indonesia where IMA initiated a training programme in July 1997, for example, the local partner organisation is the provincial cooperative of retired military veterans. By providing the fishermen with diving compressors (previously, the only one in the village was owned by a live-fish broker with a local monopoly on the trade) and offering higher prices for fish through the cooperative, the programme will break the power of the middleman and help the fishermen obtain higher prices for the cyanide-free aquarium fish they capture. The cooperative itself sees a good business opportunity, of course, but perhaps as important, the cooperative's director is also a dive-tour operator concerned about the effects of cyanide on the reefs which have made the province a premier dive destination.

Few fishing communities, however, subsist wholly from the live-fish trade. More typically, they pursue a "portfolio" economic strategy combining live fish, fresh and dried fish, agriculture, wage labour, and other activities. An effective livelihood enhancement strategy needs to target all of these activities, and introduce new ones, where an opportunity exists. Introduction of simple technologies can often add significant value to products that communities are already harvesting and selling.

In Philippine fishing communities, where the capture and sale of tiny dried fish (*dilis*) is a common activity, teaching simple techniques to spice the fish, can raise their value by 40 percent. Where raw oysters are collected, teaching oyster-sauce production methods adds considerable value to that product. In some communities, IMA training programmes promote non-fishery activities, such as soap making, tailoring, and handicrafts production.

In short, the IMA training and livelihood enhancement strategy seeks to assist a larger socio-economic transformation of poor fishing communities towards a better standard of living based on sustainable resource use and capturing a larger share of the local profits for local benefit.

Strengthen community-based management of local fisheries and reefs

Partnerships with fishing communities must go beyond training and income enhancement, important as these elements are. Sustainable coastal management requires the participation and support of the local communities that directly earn their living from the sea, in cooperation with government agencies - an arrangement often called "co-management". Cyanide fishing, blast fishing, coral mining, mangrove destruction, and many other sources of coastal degradation can only be slowed when the communities on the front line become central players in protection efforts and beneficiaries of sustainable management. This requires policy shifts by most governments, which have traditionally treated coastal zones and fisheries as the exclusive preserve of state power and policy.

In some areas of eastern Indonesia and the western Pacific, long-standing customary systems of marine tenure and management provide a sound institutional basis for community-based efforts. Where they exist, governments should recognise and support these customary systems and provide technical and financial inputs to assist traditional communities in adapting to rapid economic and technological changes.

Most coastal communities in Southeast Asia, however, do not possess functioning customary systems for managing and conserving coastal resources. Many are comprised of a heterogeneous mix of immigrants and natives, who lost such systems long ago. This loss does not mean that viable community management systems cannot be nurtured. The Philippines, where customary coastal management systems have vanished, has the most extensive and active community-based coastal resources management (CBCRM) initiatives in Southeast Asia.

A successful CBCRM program requires government commitment in policy and law, collaboration with like-minded donors and NGOs, and a “learning process” of drawing on the ideas and innovations of local communities to establish, refine, institutionalise, and measure the accomplishments of CBCRM initiatives.

Build the capacity of local communities to serve as front-line agents in anti-cyanide monitoring and enforcement

Building on training, community organisation, and livelihood enhancement initiatives, an effective cyanide-fishing reform programme needs to enlist local communities as partners in the specific tasks of monitoring and enforcement. Local fishermen are on the water far more regularly and know their areas better than government fisheries officers.

Box 8.2. Toward a Cyanide – Free Fishing Tradition on Canipo Island, Philippines

Canipo Island is located in the Calamianes group of islands in the north of Palawan province. The area has been a traditional fishing ground for the live grouper fish collection, especially the high-priced spotted coral trout (*Plectropomus leopardus*). For years, hundreds of fishermen used sodium cyanide to collect groupers. In 1993, however, a local businessman engaged in live grouper collection and dismayed at the impacts of cyanide on the reefs, started a cooperative called Kawil Amianam - Filipino for hook-and-line collecting. The group used the traditional hook and line but also developed a method for decompressing the air bladders of the captured fish using a plastic straw, which is necessary for the fish to survive when they are rapidly brought from 20-25 meters to the surface.

More than 400 fishermen in the area soon joined Kawil, due to pressure from the Cyanide Fishing Reform Program (which began operations in the area and opened a Cyanide Detection Test liaison office in 1994); to urging by their peers already in the group, and to the fact that Kawil’s decompression method blew up the longstanding myth: “you can’t catch live groupers with a hook and line”. In 1994, the Kawil fishermen began having samples of their catch tested by the CDT lab in Manila, with assistance from the CDT liaison office. Fish sampled by the liaison office were sent to Manila by air and tested. The results (in the form of a certification that the tested fish was cyanide-free) were returned to the Kawil members within 36 hours, so as not to unduly interfere with shipping of the catch.

In 1995, IMA started working with Kawil to train more fishermen in the area and to assist in modifying the bladder-decompression technique and tools, substituting less stressful large-gauge hypodermic needles for sharpened plastic straws. The Kawil hook-and-line and decompression technique is also being transferred to other areas of the country via training programmes. Sampling and testing of Kawil’s catch has continued for the past two years, and the test results indicate that virtually all members of the group are continuing to use the hook-and-line method and have not reverted to cyanide use.

Major reasons for the preliminary success of the cyanide reform effort in the Canipo area seem to be:

- 1) dedicated and persuasive leadership of the fishermen’s organisation;
- 2) the fact that fishermen receive a higher price for cyanide-free groupers;
- 3) the presence of CDT sampling and monitoring personnel in the area; and

4) the self-policing of its members carried out by Kawil.

With minimal training, which NGOs are often best equipped to provide, these groups can serve as an “early warning network”, letting officials know when cyanide-fishing operators appear in an area. In the Philippines, members of local fishermen’s organisations and cooperatives have been deputized as “fish wardens” to patrol and monitor their fishing grounds.

Although local community groups cannot be expected to directly confront well-organised - and often well armed - cyanide-fishing vessels, they can perform important norm-setting and self-policing activities within the community. After all, a “community” does not decide to renounce cyanide fishing. More often, one group of individuals within a community may make that decision, while others continue using cyanide. Peer pressure is thus important in spreading the cyanide-free tradition throughout the community.

Conclusions

Cyanide fishing is not the only threat to the coral reefs and other coastal ecosystems of the Indo-Pacific region. Other threats include rapid conversion of coastal habitats such as mangroves for aquaculture, charcoal, and building materials; over-fishing due to government-subsidised fleet over-capacity; dynamite fishing; haphazard coastal tourism development; runoff from industrial pollution, mining, urban wastes, and fertilisers and pesticides; and sedimentation arising from deforestation. But the training and community-organisation strategies essential to stopping cyanide fishing also provide an important catalyst for communities to address a broader range of threats to their local reef environment. And, four unique characteristics of cyanide fishing provide hope that it can be stopped or at least significantly reduced faster than some of the other threats to coral reefs:

- Cyanide fishing is generally focused on isolated reefs far from the effects of coastal habitat conversion and sedimentation. As a result, the problem is relatively localised and a discrete target for control efforts;
- First discovered in the late 1950's, cyanide is a relatively recent fishing technique and has only come into widespread use in the past three decades in the Philippines, much more recently in other countries. Outside of the Philippines, therefore, the practice is not yet deeply embedded in local cultures and economies;
- Cyanide fishing targets a very specific and "high-end" market - live food and aquarium fish - with some food species selling for as much as \$180 per kg and some aquarium species fetching \$350 per individual. The consumers and their suppliers are therefore an identifiable and fairly limited group; and
- As detailed above, there is a clear and not-too-complicated set of actions to address the problem if governments set the right incentives in place, and partnerships are developed among fishing communities, exporters and importers of live-fish, scientists, and NGOs.

The difficulties in stopping cyanide fishing should not be underestimated. It is important to note, though, that people have long captured and sold live fish without using cyanide, and they still do in many places such as in the Caribbean and Hawaii, where live aquarium fish have been collected with fine-mesh nets for decades. Nothing is intrinsically wrong with a cyanide-free live fish trade as long as it is practiced at sustainable levels, and protects the coral reef ecosystem that provides fish habitat. But cyanide fishing is fast becoming a deadly tradition in the Philippines, handed down from father to son. It will soon be just as firmly established in Indonesia and other countries throughout the Indo-Pacific. Our challenge is to eradicate the growing cyanide tradition and replace it with a cyanide-free fishing tradition.

Part III

Consolidating the Interface

There is no single “approach” that all countries can take to improve the interface between research and public policy making. Indeed, there are a great variety of approaches that can be taken. What is suitable hinges very much on the nature of the problem and the nature of the institutions involved. But, still, there are a number of interventions that can *enable* a better interface between research and policy making.

In Chapter 9, the use of “policy briefs” as a tool to bridge Kenya’s natural resource research findings and policy concerns is presented. The briefs were prepared as a means of presenting research results in a form that policy makers could better understand. The Kenyan experience suggests that all research does have policy content, and that what is needed is the willingness and ability to distill such findings into policy-actionable form.

Policy makers can also help attract input from scientists when decision-making processes are opened to popular participation. The wave of democratisation sweeping the world has helped stimulate demand for expert advice and opinion in the decision-making process. Chapter 10 presents the case of water-use management in Brazil, and shows how the opening-up of the policy making process has inspired widespread support for the use of scientific research to tackle water sustainability concerns in that country.

Coalitions can be built to bridge the needs of the resource managers and the interests of policy makers. Presented in chapter 11 is the case of soil conservation in Mali where a strategic alliance was forged between research, the extension service, farmer groups and the cotton commodity board. Soil conservation policy was incrementally reformed once resource managers and the commodity marketing agency came to appreciate that scientific soil conservation interventions were technically appropriate, socially feasible and in the long-term economic interest of all parties.

Donors can play a valuable role as change agents. The European Union can do much more to support the development of a credible scientific infrastructure in many of the poorest developing countries. Chapter 12 argues that, without a credible local capacity to find scientific solutions to site-specific problems, many developing countries will simply exclude scientific considerations from the policy making process. The German Technical Assistance Agency, GTZ, has increasingly aimed its agricultural research support at interventions focused on policy-relevant natural resource management concerns. By helping to build research capacity, and to focus that capacity on critical resource management concerns, the GTZ hopes to create positive momentum and establish the institutional foundations for sustained collaboration between resource management science and policy makers. The GTZ case is presented in chapter 13.

Chapter 9

Building Institutional Links Between Research and Policy Change: Experiences and Lessons from the Kenya Agricultural Research Institute

Introduction

Even a brief inspection of the research output of the Kenya Agricultural Research Institute (KARI) reveals a large volume of results of potential policy significance (KARI, 1989, 1990a, 1990b, 1991, 1995, and 1997). Yet, at a time of deep and rapid change in Kenyan agriculture (PAM-KMDP, 1995a and 1995b), the public debate on strategic issues pertaining to agricultural administration and institutions seldom reflects KARI's accumulated knowledge. This enduring failure to project research findings on to policy discussions is not unique to KARI but also afflicts other public research institutions in Kenya, notably universities. A common explanation for the phenomenon links low policy impact to low policy analysis capacity. But gaps in analytical capacity may not be the only, or even the principal, impediments to the translation of research output into policy action. For even where policy research capacity is significant - as in some universities - policy impact remains meagre. Increased policy research capacity thus may not lead to greater impact if other impediments to improved links between research and policy are not identified nor addressed.

At issue in this paper, therefore, is the nature of these additional constraints on the translation of policy-relevant research results into policy action and the means through which they might be overridden. Specifically, the paper proposes that in the absence of explicit formal or informal channels linking agricultural researchers and agricultural policy makers, even strong policy research capacity is insufficient to achieve policy impact. To explore this hypothesis, the paper analyses the results of an experiment at KARI seeking to bridge the research-policy divide through a new publication—the KARI Agricultural Policy Brief.

Background

The subject matter area addressed in the KARI Policy Brief experiment covers a pressing natural resource management issue in Kenyan agriculture, namely soil fertility depletion, especially on small farms. Soil fertility depletion has been identified as one of the principal biophysical factors responsible for declining per capita food production in Kenya (ICRAF, 1997) and elsewhere in Africa (Sanchez et al., 1997). Regions with high agricultural potential - such as Kenya's highland areas with their fertile soils, adequate rainfall, and moderate temperatures - now have the highest population densities in the world. Soil fertility gradually has declined under successive crop harvest removals, leaching, and erosion induced by increasing land pressure. Nutrient offtakes and losses have exceeded additions from biological processes - e.g., nitrogen fixation - and applications of inorganic fertilisers.

A major component of soil fertility replenishment thus involves restoration of stocks of the most limiting nutrients - primarily nitrogen and phosphorus (Sanchez et al., 1997) - and development and dissemination of soil and water management practices that will help maintain replenished nutrient levels in the future. A pilot initiative along these lines is underway in western Kenya, involving large applications of phosphorus - "recapitalization" - and improved management of inorganic fertiliser and soil organic matter on small farms, with a view to expansion to other parts of the country, if successful (KARI, 1996). Prospects for the success of the programme hinge on the incentives facing impoverished small-scale farmers, who for years watched their crop yields fall due to declining soil fertility, yet did not apply the inorganic fertiliser and soil organic matter management techniques that would have reversed these effects.

The most important current source of changing production incentives in Kenyan agriculture is liberalisation of input and output markets (PAM-KMDP, 1995a, 1995b). As is the case in other countries, many of the pressures for market liberalisation in Kenya are based on conditions facing smallholders. Indeed, since Kenya gained independence in 1963, smallholders have featured prominently in the country's national development programme. Efforts to invigorate the agricultural sector through freer trade in goods and services thus identify the response of this segment of Kenya's farming community as key.

'Smallholders' responses to market reform will depend on how reform measures impact both their production and consumption opportunities. Embedded in these responses will be selections of soil fertility management technologies. This is a key recognition, because under liberalisation, inorganic fertiliser prices have risen sharply and prices for maize - the staple crop that dominates farming systems countrywide - have declined. These relative price shifts do not bode well for soil fertility maintenance and productivity growth on small farms through increased inorganic fertility application - a central component of soil fertility replenishment initiatives. Moreover, if factors such as poor access to credit and limited information about correct rates and timing of fertiliser applications continue to constrain production choices, farming practices using little if any fertilisers likely will persist, further depleting soil nutrients and lowering yields.

The four Briefs prepared as part of the experiment attempt to highlight the potential contradiction between farmers' preferred options for soil fertility management and their responses to changes in incentives associated with market liberalisation, on one hand, and the goal of soil fertility replenishment via increased use of inorganic fertiliser, on the other. This conflict has yet to find a voice in current discussions about agricultural policy under market reform. Indeed, it is not uncommon to hear the very policy makers who argue for increased liberalisation of agricultural input and output markets lamenting declining use of fertilisers by smallholders.

The Policy Brief Experiment

Policy research is one of the research thrusts of KARI's Socioeconomics Division. The Briefs fall within this thrust and are intended to serve two broad purposes. First, they are a vehicle through which KARI scientists - both biophysical and socio-economic - can interpret key research findings in light of pressing agricultural policy issues. Second, through the Briefs, KARI hopes to convey research results to relevant agricultural policy makers so as to better inform them of the potential impacts of their decisions on the welfare of KARI's diverse client base.

The Policy Briefs are one-sheet, two-page documents that identify the principal policy issues addressed in past or on-going research activities, highlight policy-relevant results, and interpret these results with respect to the identified policy issues. Deliberately, the Briefs do not undertake any new research. Rather, they aim to explore the extent to which policy-related results can be extracted from the wide range of research undertaken in KARI; research that in many cases has not been perceived or motivated as "policy research".

The first Brief, titled “Fertilizer Use in Smallholder Maize Production in Western Kenya,” identifies the fertilizer: maize price ratio as a key contributor to low fertilizer application rates in smallholder maize production; the higher the ratio - as is the case under market liberalization - the lower are application rates.

The second Brief - “Domestic Fertilizer Prices Under Market Liberalization” - presents results pointing to abuse of market power by large-scale fertilizer traders in a major agricultural region of the country, implying higher prices than would exist under more competitive conditions, especially at the lower levels of the marketing chain frequented by smallholders.

The third Brief is titled, “Fertilizer Use in Smallholder Potato Production in Kenya” and identifies credit constraints and poor information about fertilizer application rates as key impediments to productivity growth in smallholder food production.

Finally, the fourth Brief - “Smallholder Cash-Cropping in Kenya Under Market Reform” - demonstrates that the shifts in production incentives implied by market liberalization may be necessary for more specialized input-intensive production practices but they are not sufficient, and, moreover, that premature withdrawal of public support for smallholder agriculture militates against higher incomes through improved enterprise selection and management on small farm.

Using the KARI Director’s official mailing list, the Briefs and questionnaires were sent (in early September 1997) to over 100 individuals based in a wide range of public and private domestic and international research and development institutions, in addition to decision makers in key ministries of the Kenya Government. Accompanying the Briefs was a four-page questionnaire aimed at ascertaining the recipients’ views on the Briefs, with respect to overall quality, choice of subject matter, visual presentation, writing style, analytical soundness, and practical usefulness. The extent to which the proposition that good policy analysis is necessary but not sufficient to bridge the research-policy gap does or does not hold would be determined based on the recipients’ evaluations of the Briefs and, in particular, on those of policy makers.

Preliminary Results

Within KARI, the Briefs have been received very positively, by both scientists and administrators. One aim of the publication is to demonstrate that there is nothing special about policy research and, moreover, that policy research is not the preserve of socio-economists - i.e., policy interpretation can be performed by any scientist with a firm grasp of agricultural policy issues. However, the low rate of submissions by KARI scientists of draft Briefs for editing and publication suggests that this objective has been only partially met.

Most respondents to the questionnaire found the Briefs to be useful in their work (Table 9.1). On average, the Briefs were determined to be of good quality, and while two Briefs - Nos. 2 and 4 - were judged only “fair” by two different respondents, none were considered “poor” (Table 9.2).

Table 9.1: Assessments of the Usefulness of the Briefs

Brief No.	Percentage of respondents indicating that brief was useful
1	87.5
2	100
3	100
4	75

Table 9.2: Assessments of the Quality of the Briefs

Brief No.	Average Score	Highest Score	Lowest Score
1	0.5	1	0
2	0.25	2	-1
3	0.25	1	0
4	0.75	1	-1

Scale: Poor = -2; Fair = -1; Good = 0; Very Good = +1; Excellent = +2

Table 9.3: Assessments of the Overall Strengths of the Briefs According to Selected Criteria

Assessment Criterion	Percentage of Respondents Indicating that Briefs are Strong Based on this Criterion
Length	100
Subject Matter	100
Visual Presentation	62.5
Writing Style	75

Viewed together, the Briefs' lengths and subject matter areas were identified as major strengths by all respondents, but some respondents found fault with the visual presentation - insufficient use of graphics -, and writing style - at times too dense and academic (Table 9.3). With respect to the broad policy question under consideration - the potential contradiction between improved soil fertility management and farmer responses to market liberalisation - in all but one case, respondents identified farm-level impacts of market liberalisation and soil nutrient depletion as related policy concerns.

These preliminary results suggest that the Briefs contain sound policy analysis, and thus should be of use to policy makers, especially those in the Ministry of Agriculture and the Ministry of Planning and National Development. Yet, among the small number of recipients to respond to the survey thus far, not one is a policy maker, this despite the author's attempts to solicit responses from government officials. One donor representative, six scientists and managers in IARCs and domestic research institutions and one analyst in a private consulting firm comprise the eight recipients who readily responded to the request for feedback on the Briefs, in some cases adding extra comments and

reactions to completed questionnaires. One reason for the ready response from this group of recipients may be the long-standing relationships, either between KARI and their respective organisations, or between themselves and the author. In effect, Briefs and questionnaires had been sent to individuals with strong personal contacts with KARI and thus with strong incentives to maintain the relationship.

No such relationships are evident between KARI and policy units in key government ministries, perhaps because the communications from KARI could be ignored at little cost. In addition, a strategic error may have been made in the choice of government officials targeted in the initial mailing.

Because the covering letter originated in the KARI Director's office and bore his signature, the documents were sent to policy makers at his level of seniority or higher - i.e. Directors and Permanent Secretaries. While this choice followed the correct protocol, it appears to have been a mistake, because the work schedules of these officials likely do not allow them to read research reports carefully, let alone complete survey questionnaires, no matter how brief these may be. Most of these officials depend on advisors to identify the issues they should take into consideration in policy deliberations. The Briefs and questionnaires thus should have been sent to these advisors. Unfortunately, the identities of advisors with access to policy makers are difficult to establish *a priori*; job titles and rankings within public organisations are not always accurate signals of access. To address this limitation, a second, more focused survey is planned. But it is now clear that, without a formal institutional linkage between KARI's Socio-economics Division and e.g. the Planning Division of the Ministry of Agriculture, the transaction costs involved in identifying appropriate recipients of Briefs and soliciting responses to the survey will remain high.

Conclusions

The results lend tentative support for the hypothesis that, in the absence of a supportive institutional structure, even the best policy analysis may be unable to bridge the gap between researchers and policy makers. This is perhaps not surprising. But one insight emerging from the experiment points to a possible format for institutional linkages that reduce transaction costs met during efforts to connect research and policy making institutions.

Good policy research appears to be analogous to good extension work in that analysis must be followed by communication, implementation, evaluation, more analysis, more communication, and so on. The analogy is helpful because if, as is becoming increasingly evident, participation by farmers in all stages of the technology generation and dissemination cycle increases the relevance and likelihood of adoption of improved farming technologies, so, too, should participation by policy makers in all stages of policy analysis raise prospects for the translation of policy research results into policy action. Farmer participation in technology development typically occurs in on-farm trials of potential technology packages. By implication, successful "participatory policy research" hinges on the establishment of similar "test sites" within government policy units.

These "sites" might be specialised committees with membership drawn from relevant research organisations and government departments, meeting regularly to exchange information in demand-driven, iterative processes in which policy problems define analyses, the results of which redefine the problems and lead to additional more informed analysis, and so on. The initial failure of the Policy Brief experiment to connect KARI researchers with agricultural decision-makers suggests that in the absence of such arrangements, investments in increased policy research capacity within KARI and elsewhere in the Kenyan NARS are unlikely to contribute to policy change.

A Sample Brief



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Agricultural Policy Brief

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Smallholder Cash-Cropping in Kenya Under Market Reform*

Policy Issues

Small-scale farming is the most common occupation in Kenya. In addition to being numerous, smallholder farmers are a mixed group. Their heterogeneity stems in part from diverse agroecological conditions around the country. It also can be traced to circumstances and policies that affect the degree to which smallholder farming regions are integrated into national and international markets. Small-scale farming systems thus range from those based primarily on annual food-crops to systems in which permanent cash-crops are prominent. In some cases, production is subsistence-oriented, depending almost entirely on family labour, while in others, purchased inputs and hired labour allow for greater commercialisation and specialisation. Livestock may be peripheral or integral to farming systems. However, one feature that most smallholder farmers do have in common is that, in apparent disregard for opportunities foregone, they try to provide the bulk of their food requirements from their own output. Specifically, they often devote larger shares of land and other resources to low-yielding food-crops than they do to cash-crops that have higher market returns.

Two central goals of agricultural policy in Kenya are broad self-sufficiency in basic foodstuffs and expanded production of cash-crops, particularly by smallholders. The prominence of low-value food-crops on small farms thus takes on great policy significance in the context of the market-oriented agricultural reforms that the Kenya government recently has undertaken.

Under reform, protectionism in foreign trade, price controls in domestic trade, and exclusive franchises for parastatals are under assault. Often identified as the primary beneficiaries of changes that lead to freer trade arrangements that improve incentives to cash-cropping are smallholder farmers. However, given smallholders' apparent lack of interest in targeting their production choices toward profitable market opportunities, their responses to market-oriented reforms may not be those implicitly assumed. This *Brief* summarises the results of a study aimed at exploring the likely responses to on-going reform in cash-crop marketing among small-scale farmers residing in the southern divisions of Siaya District, a region with agroecological and socio-economic conditions representative of a significant portion of Kenya's smallholder farming community.

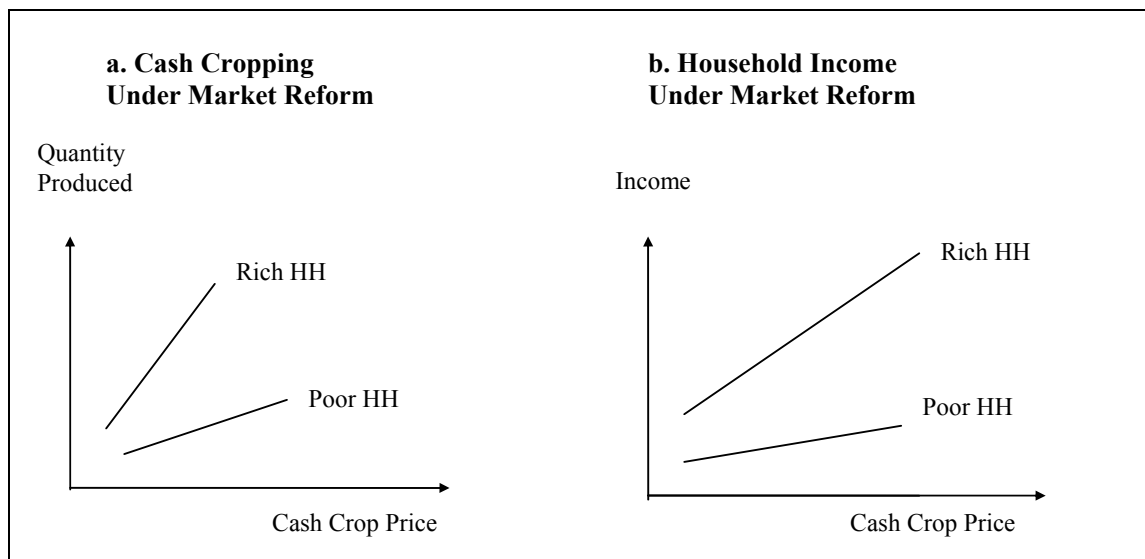
Method and Data

The study was designed to examine smallholder agricultural systems in southern Siaya using **mathematical programming techniques**. Inadequate time, financial resources and farmer census data precluded a fully randomised survey of households. The stratified sample—comprising 44 homesteads, each containing 3 or 4 households—was selected to reflect the maximum possible variation with a limited number of observations. An **integrated agricultural household model** was constructed based on primary and secondary data and used to simulate how optimal production, consumption, and income on representative “resource-rich” and “resource-poor” households are likely to be impacted by reforms that improve incentives to production of cotton, the principal cash-crop in the study region.

Results

Simulations with the model indicate that higher farm-gate prices for the cash-crop lead to increased production and thus higher farming incomes and expanded consumption opportunities for both household types (Figure). However, resource-rich households respond with greater vigour to the new market incentives than do poorer households—i.e., the richer households’ cash-crop supply response curves are steeper and wholly above those of poorer households. The associated increases in income under reform have similar relationships. Critically, the larger the improvements in production incentives, the greater is the income disparity between the two household types and, on aggregate, the less equal is the distribution of income and wealth in the region. Resource poor households, unable to adjust their practices in response to new incentives, persist in their subsistence-oriented practices.

The Impacts of Market Reform on Smallholder Cash-Cropping and Household Income



Implications for Policy

The importance of access to productive resources for cash-crop expansion under market reform reveals a policy quandary. Most smallholders face with severe resource constraints—some are land-poor, others are labor-poor, but, crucially, most are credit-poor. Historically, the statutory marketing boards targeted for privatization or dissolution under market reform channeled in-kind production credit to smallholders, often through cooperative societies. However, this service often was the most costly aspect of many Boards' operations and a key factor contributing to delayed payments to farmers, and thus a major impetus for reform.

A principal conclusion from this study is that attractive product prices may be necessary for successful expansion of cash-cropping but they are not sufficient. Past policies that used marketing boards and farmer cooperatives as vehicles to further broad development goals have produced marketing systems that at once penalize and support smallholder cash-crop production. The policy challenge under reform is to encourage the private sector to enter into key sectors and provide key services—such as seasonal credit—to smallholders.

The withdrawal of public bodies from Kenyan agriculture before privateers are prepared to assume these new responsibilities likely will lead to conditions that reinforce poorer farmers' motives to be self-sufficient in food supplies. Not only would this run counter to the goal of market reform to spur growth in small-scale agriculture, it would exacerbate existing disparities in wealth in Kenya's rural economy.

Source Document: *"Smallholder Agriculture Under Market Reform: The Case of Southern Siaya District, Kenya,"* by Steven Were Omamo (KARI/ISNAR).

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Chapter 10

Movement of Citizenship for the Waters

Paul Afonso Romano

A citizen is an individual capable of creating or transforming the social order, together with others, and to whom it behoves to obey and protect the laws which he helps to create (Bernardo Toro).

Throughout the world there are examples of governmental policies dictated by those in power at a given time and place, which thus have a transitory nature. The Brazilian experience regarding these cyclic policies is no different; often, they are worsened by the pyramidal hierarchy – rules and regulations are issued by the upper echelons with no participation of society. Since it is not consulted on issues which may affect its daily life, society avoids sharing in the mistakes and achievements, the rights and the duties inherent to every citizen. This is reflected in a lack of citizen's commitment towards the public assets, i.e. the required concern in the preservation of “what belongs to all” is lacking.

Natural resources also follow this rule, including notably the most important of them. Water has been treated as if it were infinite and inexhaustible and the result of this attitude is plain for all to see – polluted rivers and creeks, decreasing the amount and quality of this life-essential resource. However, for the first time in Brazilian history, a problem previously seen as “the government's responsibility” is mobilising society and institutions, both inside and outside the government.

Recognising that laws and regulations cannot solve the problems affecting water bodies throughout Brazil, the Secretariat for Water Resources of the Ministry of the Environment organised the Movement of Citizenship for the Waters, which is a partnership between government and society, uniting hearts and minds in a single objective, through activities aiming at recuperating / revitalising the river basins and their tributaries. And, since its does not depend on laws and regulations to take place and be absorbed by society, neither does it depend on “transitory power holders”.

Within this concept, any person, individually or in groups, may be a member of the Movement of Citizenship for the Waters, as long as he or she wishes to and does something for improving the water condition, granting water, its problems and their solutions, a place in his or her daily life, having a stance regarding water and acting accordingly. The sum of the mobilisations of all citizens makes up the social mobilisation process, which always has a beginning but never an end.

The Movement of Citizenship for Waters consists exactly in this process of social mobilisation which gathers together the will and the autonomy of citizens in order to prevent and to solve water problems through local activities. If the activity is undertaken at the community, the town, the property or the river level, solutions will be shared, with more positive results. If the problem is solved at the local level, each one doing his or her share, and other communities with similar problems follow this experience, solutions will be seen at the national level.

In order to increase the level of understanding of the philosophy of the Movement of Citizenship for the Waters, reference centers are being set up throughout the country. Acting as social mobilisers, the centers' debate with the community problems affecting local water bodies, involving the citizens in this everyman's crusade. But one doesn't need to wait for initiatives from these institutions – which may be part of governmental, environmental or professional agencies.

Any one can take up the role of mobilizer, beginning with initiatives which lead the community to grasp the importance of having clear and abundant water in order to keep or to improve its quality, since no one can enjoy such quality while rivers, creeks and lakes are degraded by pollution brought about by garbage and sewage indiscriminately dumped by these very communities.

To discuss and to act, because just pointing out and recognising the problem is not enough. If the river running through your town is polluted, what can one do to change this situation? Obviously an individual action will not solve the problem. Since we can establish that the actions of many agents were required in order to have reached this stage, its solution will also require the mobilisation of these polluting agents, because only those who degradate are able to recuperate. But the problems affecting water resources are not limited only to great or greater levels of degradation.

Together with the decreasing water quality, increased consumption also poses a threat to our water sources. In this case, how can the citizen participating in the Movement of Citizenship for the Waters act? Some points for thought: one can save 7 to 12 liters of water per minute simply by closing the faucet while brushing teeth, shaving or washing dishes. Using the maximum capacity of the water machine in each cycle means decreasing the total number of cycles, saving 170 to 190 liters per cycle not done. Quick baths save from 6 to 19 liters per minute, and not allowing dripping faucets can mean a saving of up to 300 liters per week.

If this information is absorbed and disseminated, certainly the users will think about each one's individual responsibility, because they are initiatives which do not depend on partnerships or collective commitments. Each one does his own share so that the results will benefit us all. It is important to know that the most optimistic forecast point water as the most important natural resource for the development of nations in the twenty-first Century, roughly equivalent to the role held by oil in the twentieth Century. Pessimists believe that conflicts between countries, including armed ones, over the rights to use water will rise very soon.

It is possible that this information is still too removed from our daily reality and so does not touch our awareness. But there is no cost in visualising this scenario in our daily life – and then how would our life be if this resource were unavailable? Undoubtedly we would think about actions to revert this situation. So, how about beginning to act now so that this futuristic scenario does not come about?

Whether or not one is a member of the Movement of Citizenship for the Waters, the most important thing is to act in defense of water. According to social mobiliser Bernardo Toro “participative mobilisation does not require people to be gathered in a single space or to know each other”. What is required is sharing the meaning and the interpretation, i.e. to have the collective certainty that “what I do is done and understood in the same way by many others in my category”.

Chapter 11

Natural resource management in the cotton zone of Southern Mali: Merging farmer participation, research, extension and policy

T.H. Schrader, B.H. Wennink, W.J. Veldkamp and T. Defoer

Introduction

In response to the problem of soil erosion and declining soil fertility, the *Compagnie Malienne pour le Développement des Textiles* (CMDT) has initiated a natural resource management programme that covers the southern cotton growing part of Mali. This programme started in the early eighties in response to farmers' demands. After an action-research and a pilot project phase, an erosion control programme has been conducted in hundreds of villages since 1990. Over the years, the erosion control measures have been embedded into the overall rural development programme of CMDT.

Four periods can be distinguished in the development of the natural resource management programme:

- Before 1986: Pre-project phase: action-research and on-farm trials
- 1986-1990: Pilot project phase: development of extension approach and technical guidelines for erosion control
- 1990-1994: Mature project phase: large scale extension, broadening and refinement of technical and methodological proposals
- After 1994: Institutionalisation and after-project phase

The interaction between the conducting agency (CMDT) and farming systems research represented by the *Institut d'Economie Rurale* (IER) and their respective roles are outlined in connection with two Dutch-financed projects.

Institutional Context

Extension

CMDT operates as a para-statal enterprise, responsible for all aspects of cotton production, collection, processing and marketing. Cotton attributes for 50 to 60 percent to the national export revenues. CMDT provides credits for agricultural inputs and equipment to farmers and supports them with technical advice. Disposing of a relatively dense extension network, CMDT has been charged by the Malian government to act as the rural development agency in southern Mali. The agricultural development activities, directly related to the cotton sub-sector, are financed by CMDT's cotton revenues. An additional budget for other agricultural and rural development activities is provided by the Malian government, often supported by donor agencies (Bingen et al., 1995).

The CMDT intervention zone in southern Mali is divided into five regions, each composed of several districts. At district level, the extension agents intervene in so-called rural development zones, made up of some 8 to 10 villages. Both at regional and district level, multidisciplinary teams of technical specialists support the extension workers in their daily work. CMDT has transferred some management

responsibilities of the cotton sub-sector to *Association Villageoise* (AV). These farmer groups take care of cotton collecting and marketing, the management of credits for agricultural inputs and equipment and the collecting of statistical data. The CMDT apparatus is in fact sponsored by the benefits from cotton growing; as such farmers indirectly pay for the extension services; this is not a transparent system and farmers are becoming more and more aware of this and are calling for more transparency.

The emergence of village associations and the improvement of their management skills is sustained by an important alphabetisation programme. The village associations manage village funds fuelled by membership dues and cotton marketing fees. These funds have encouraged community-based development and investments in village infrastructures (Bingen et al., 1995; Guindo et al., 1991; Hijkoop et al., 1991).

Farmers are also assisted by the regional livestock and forestry services; compared to the CMDT, these governmental services have a poorly developed extension network.

Recently, the NGO sector is developing increasingly; this is partly due to the fact that the CMDT has stopped their involvement in several sectors of rural development that were not directly related to cotton production;

For the same reason and due to a general privatisation wave, inspired by World Bank policy, the private sector is becoming more and more important in south Mali. As an example, the veterinary service has been privatised since 1994. The privatisation activity was however not well prepared; the privately operating veterinarians were not willing to assume the new role (equipment, delivery of quality products, transport facilities, knowledge of the rural areas, etc were some of the problems), which has resulted in a large number of animal deaths in some areas in South Mali.

Research

The IER conducts research programmes on agriculture, livestock and forestry production, as well as on farming systems research and natural resource management. Since 1992, the institute is organised in six regional centres for agricultural research, called: *Centre Régional de Recherche Agronomique* (CRRA; regional research centre). Research priorities are set in relation to the regional and national demands. Apart from commodity research, each regional centre has a research team working on farming systems research and natural resource management. These latter teams find their origin in the farming system research started in the Sikasso region about twenty years ago. The first farming research team, sponsored by the Netherlands Directorate General for International Co-operation (DGIS), developed a substantial research effort under the name of *Equipe Systèmes de Production et Gestion de Ressources Naturelles* (ESPGRN⁹³ or the farming systems and natural resource management research team), first located in Sikasso, later also in the other regions of Mali.

Since the beginning of the 1990's, the need was felt to widen the scope of ESPGRN from the farm level to the (inter) village level; research on natural resource management became the official mandate of ESPGRN. ESPGRN works in 12 research villages, representative for the agro-ecological and socio-economic diversity of south Mali. A field assistant is based in each of the research villages; ESPGRN is composed of technical and socio-economic discipline researchers.

⁹³ ESPGRN was formerly called DRSPR: Département de Recherche sur les Systèmes de Production Rurale

The IER has become an independent research organisation, partly funded by the state (through the Ministry of Rural Development) and sponsored by several donors; for the overall operation of the IER, the World Bank is partly responsible. In South Mali, ESPGRN remains Dutch sponsored; the forestry research programme is Swiss funded; the cotton and inland/rice research programmes are French funded and the dry cereals programme (especially sorghum, millet) is suffering from poor funding and as a consequence poorly developed. The Dutch Government co-sponsors the operation of the Regional Centre of South Mali.

Research-extension-community links

The Research-Extension-Community links are quite well established in South Mali. On a yearly basis, the regional research centre organises a number of planning-evaluation committees; these start with meetings of researchers of the different research programmes with the farmer/user commissions (representative farmers), in which the research results are presented and criticised by farmers. Farmers also may suggest new themes for research. A regional technical committee is organised by the regional research centre, with representatives of extension (such as CMDT) and other stakeholders, including representatives of the user commissions. At these meetings results are presented and extension expresses eventually interest for testing the results through a pre-extension activity and makes suggestions for new research themes.

These suggestions, together with those made by the farmers during the user commission meetings and based on on-farm research (especially for ESPGRN) are used to develop a research programme for the coming year. This regional programme is then channelled through national committees, who look at the consistency within the national research strategy/policy and possible overlaps with research of other regions and agree or not with the proposals. At the national level, again representatives of the extension services and of the farmer community (the national user commission intervenes).

Apart from collaboration in the regional and national setting, a number of collaborations happen in the field. First of all, ESPGRN works mainly in 12 research villages, where a field worker is based; farmer participatory action-research programmes call for multi-disciplinary and multi-institutional teams. For this reason, extension people from NGOs or CMDT participate in the field research of the ESPGRN; extension workers have generally more affinity with the farmer community, and thus deliver higher quality work. Moreover, the early implication of extension workers in research contributes to the possibility of producing technologies and methodologies that are adapted to extension conditions.

For research results that are of interest to the extension service, a pre-extension contract is made. The technologies are tested by the extension service in so-called 'diffusion villages' on a semi-large scale; the extension staff involved is trained by Research, and Extension is fully responsible for the field work; monitoring of the activity is done in collaboration with R&E.

Research, and especially the ESPGRN team, participates in working committees organised by the CMDT; the themes of the working committees are mainly on practical implications of new research results and especially on methodological aspects. For example, there are working committees on soil fertility management, pasture management etc; this involvement of research in extension working committees is very important.

It allows researchers to test the applicability of the methods and technologies developed and it allows them to constructively influence the future extension agenda; since these working committees must be seen as creative bodies (think tanks) of CMDT, with representatives of the different hierarchical layers in CMDT. On demand, research delivers tailor made training programmes for extension services; these include both technical and methodology training.

Research and Extension for Natural Resource Management

Origins of the erosion control programme

During the seventies, it became clear to CMDT that soil fertility was a main constraint for crop production. In one of the main cotton production regions, it started to promote manure collection in cattle pens. Stalling of cattle during part of the dry season and the improvement of manure quality by providing the pens with litter were promoted (Guindo et al., 1991).

In the early eighties, the monitoring programme of the Sikasso farming systems research team pointed out that water erosion was becoming a problem in some of their research village territories and was adversely affecting crop production. At the same time, farmers drew the attention of CMDT extension workers, that they were losing arable land by water run-off. As a result the ESPGRN team initiated a research programme on erosion control. The main goal of the programme was to propose a set of erosion control measures, that could be applied by the farmers themselves and to develop guidelines for an extension approach of erosion control to be used by the CMDT. Subsequently, erosion control became one of the major research subjects of the team. The main goal of the programme was to propose a set of erosion control measures that could be applied by the farmers themselves (Hijkoop et al., 1991; Schrader et al., 1996; Van Campen, 1994).

Before starting the field research, some basic assumptions were made which proved to be crucial in later years.

- Water erosion being the most important form of erosion in southern Mali, erosion control had to be based on the management of run-off water, for which two options were considered. The first concentrated on the evacuation of excess water. The second on breaking the devastating erosion force of run-off water, by spreading it and by improving its infiltration. This latter aspect was, of course, of importance in the context of rain-fed agriculture.
- To combat water erosion in the fields, having its origin uphill and its consequences downhill, efficient erosion control required an appropriate system of watershed management, going beyond individual field level. Therefore, erosion control measures were to be integrated in a larger village land management system.
- The proposal of new techniques should take into account farmers' experiences with traditional techniques, such as graded terraces (Hijkoop et al., 1991).

A first erosion control scheme was developed and tested in the southern part of the CMDT intervention zone near Sikasso. It proposed the evacuation of excess water by means of graded terraces and waterways. Diversion drains protected the fields downhill from incoming run-off water. Comments of the farmers, involved in the watershed management test, revealed that the installation and maintenance of the scheme was labour intensive and demanding a high level of technical skills. However, maintenance was essential, because collapse of earth bunds could cause great damage in the fields and the intended grassed waterways tended to transform to gullies. The graded earth bunds closely following the contour lines were also proven to be incompatible with current cultivation techniques along straight sow lines (Hijkoop et al., 1991).

A second scheme which focused on breaking the speed of run-off water and which improved water infiltration by permeable barriers, was tested in a village near Koutiala. Low permeable stone ridges uphill spreading the run-off water were combined with earth embankments along uphill limits of the fields evacuating excess water through an improved natural drainage canal. Live hedges perpendicular to the main slope and along the field limits also acted as permeable barriers. Permeable stone barrier thresholds, within the fields, were applied to tackle the problem of gully erosion. Farmers appreciated the

immediate effects of the works and also considered the live hedges around their fields as a way to secure their land rights. Again, they raised the problem of the labour intensity of the earth embankments and drainage canal application.

The researchers noted that the farmers were well aware of the problem of gully erosion, but paid little attention to sheet and rill erosion in their fields. Therefore, special attention had to be paid to use appropriate soil tillage techniques and organic fertilisers to improve the structure and infiltration capacity of the soil. The researchers also underlined the importance of the conservation of the uphill natural vegetation cover (Hijkoop et al., 1991). As a result of the action-research programme conducted in collaboration with CMDT, the ESPGRN team proposed a set of erosion control measures (stone ridges, live hedges and stone barriers in gullies) as part of an integrated land management scheme, including soil tillage techniques, organic fertilisation and conservation measures for natural pastures and forests. ESPGRN proposed that this scheme be used as a guideline by the extension workers and be introduced at the village level with the participation of village organisations.

Pilot phase: Develop the extension approach and the technical guidelines for erosion control

Building upon the ESPGRN action-research results, CMDT developed an erosion control approach, which would allow large-scale introduction of the erosion control techniques by its extension agents and by rapid adoption by the farmers. The so-called Lutte Anti Erosive (LAE) project was being financed by DGIS and received during all its phases technical assistance through KIT. The main objective of the programme was to slow and halt the degradation of the ecosystems in southern Mali, thereby creating more favourable conditions for the development of sustainable agricultural production systems.

The chosen erosion control techniques, concerning mainly the spreading of run-off water and the improvement of its infiltration, were compatible with common cultivation techniques and could be applied by farmers without technical or financial assistance from development agencies.

The CMDT uses a land management guide, which follows a sequential approach and works out a set of erosion control measures for each landscape unit of the typical topo-sequence of the region. According to the different landscape units, the following set of soil conservation measures was proposed:

- Plateaux: conservation of the vegetation cover through the introduction of fire-breaks and more rational exploitation of pastures and forests. The introduction of improved wood-stoves should diminish fuel-wood consumption.
- Steep slopes and escarpments: protection of the vegetation and permeable erosion control works (low stone ridges, live hedges) along contour lines.
- Cultivated area: permeable erosion control works (live hedges, grass strips) perpendicular to the overall slope and along the fields limits, stone barriers and branch barriers (“fascines”) in the gullies, appropriate land clearing techniques and tree planting. Appropriate soil tillage techniques and fertilisation with manure were advised to the farmers as important cultivation techniques to stabilise the soil structure and to improve soil fertility.
- Banks: full protection of natural vegetation on the banks of valleys and streams to avoid their degradation and the consequent silting up of these depressions (CMDT, 1995; Hijkoop et al., 1991).

The measures advised to farmers were taking into account the features of the village lands and the management capacity of the farmers and the village community (CMDT, 1995; Hijkoop et al., 1991). The land management scheme could be introduced step-wise through subdividing the village lands in

several sections and through the implementation of the measures over a period of time. However, it was emphasised that implementation of soil conservation measures should start uphill by the protection of the down hill fields from incoming run-off water. In the following years, measures on the field level were foreseen (Hijkoop et al., 1991).

The land management scheme was to be introduced at the village level with the participation of village organisations like the AV. This allowed all villagers to be informed and to participate in the implementation of the village soil conservation programme at different levels: on communal village land, farm and field level (Hijkoop et al., 1991; Schrader et al., 1996).

During the pilot phase, a village extension approach was conceived by a multidisciplinary project staff. The approach was basically an approach of "learning by doing and evaluation". It was intended to stimulate, through action, the individual and collective thinking on natural resource management on the farm and village level, in the hope to arrive at village decision making on natural resource use. The following sequence of information and training of villagers and of planning, implementation and evaluation of measures was applied:

1. Awareness building on the problems and causes of soil degradation and on the need for conservation by employing tools like the GRAAP method, slide shows and other tools during village meetings. For general awareness raising purposes, films and radio programmes were produced to inform farmers.
2. Training of a village erosion control technical team by CMDT extension workers. For this purpose, booklets on soil conservation were developed in the local language.
3. Prospecting of the village lands by the technical team, composed of villagers and extension workers, in order to locate and analyse soil erosion problems and to consider a land management scheme.
4. Submission of a proposal for a land management scheme to all villagers to establish a village soil conservation programme.
5. Implementation of the village programme with technical support from CMDT extension workers.
6. Annual evaluation of the works undertaken and decision-making on the next year programme.

After the introduction of the programme in the first year, most of the attention was given to the establishment of annual village action programmes and its execution and evaluation during the following years. The village technical team had an important role in the training of farmers, the extension of the activities on all village land sections and the co-ordination of the implementation of the village soil conservation programme (Hijkoop et al., 1991; Schrader et al., 1996).

In order to reach the maximum number of villages in southern Mali and to guarantee an institutional sustainability, the existing CMDT extension structure was used (Hijkoop et al., 1991). Extension on erosion control and soil conservation had to be incorporated in the existing work schedules and working habits of the extension service. The CMDT had a long tradition in the extension of improved cotton cultivation techniques and the agents were trained to give technical support at farm and field level. The applied erosion-control measures could be considered important technical innovations that demanded a more comprehensive understanding of land management. It was therefore decided by CMDT to recruit specialised land management and erosion control agents. These agents, based at district level, had to support the extension workers in the field.

At the same time, structures were created by the CMDT at the regional level (land management and erosion control sections), which should co-ordinate the implementation of the erosion control

programme. At the national level, the *Division Défense et Restauration des Sols* (DDRS) was to propose technical and extension approach innovations in collaboration with ESPGRN. The DDRS team was composed of technical experts (soil and water conservation, animal husbandry and agro-forestry) and training and extension experts. The project, with financial aid from the Dutch Directorate General for International Co-operation (DGIS) and technical assistance from the Royal Tropical Institute (KIT) for DDRS became an institutional support for these CMDT structures (Hijkoop et al., 1991; Schrader et al., 1996).

Large-scale extension and broadening of the erosion control programme

The second phase of the soil erosion control programme was characterised by its application in a fast growing number of villages. As a preliminary, a vast training programme was launched, that was, at first, mainly addressed to the extension workers in the field. These agents were trained by specialised agents at district level, who had received a vocational training programme on soil degradation, land management, soil conservation techniques, the step by step village extension approach and monitoring and evaluation. This specialised training programme, at that time non-existent in Mali, was developed and executed by the project staff and consisted of an alternation of one week class-room training and three week field work during one year (Guindo et al., 1991; Hijkoop et al., 1991).

The extension workers had two types of training sessions. During technical training sessions they got acquainted with the land management guide and learned the soil erosion control techniques. The methodological training sessions were structured according to the village extension approach (Schrader et al., 1996). The training sessions were directly linked to practice. During all training sessions, theoretical and practical learning techniques were combined. For all training sessions, booklets and other supports had been developed. The co-ordination of the training programmes was assured by the CMDT training sections at regional level.

The trained extension workers became the trainers of the village technical teams, who were training the individual farmers. Training supports were developed in the national language by the CMDT training service and as such the presence of alphabetised farmers in southern Mali was a major asset in implementing the programme (Schrader et al., 1996).

The implementation of erosion control measures was encouraged by a set of incentives. Where not available, the *Lutte Anti-Erosive* (LAE) project assured the distribution of cuttings and seeds for live hedges in the first year. It also created revolving funds for the realisation of cattle pens, tree nurseries, collective erosion control works and, in the poor San region, the acquisition of donkey carts. Annually, the project organised “erosion control days” in each district, during which experiences were exchanged, films were shown and the best performing villages were rewarded.

Also, from 1990 on, specialised structures for land management and erosion control, the Sections Aménagement des Terroirs (SAT), were created at regional level, which co-ordinate the implementation of the erosion control programme.

In 1992, the project staff structure was being upgraded to a division of the CMDT general direction, the *Division Défense et Restauration des Sols* (DDRS), which vocation was to propose, in collaboration with agricultural research, especially ESPGRN, technical and extension innovations for soil conservation. The DDRS team was composed of technical experts (soil and water conservation, agro-pastoralism and agro-forestry) and training and extension experts. The LAE project became an institutional support for the CMDT structures (Hijkoop et al., 1991; Schrader et al., 1996).

During the large-scale extension phase, the action-research programme continued. Research priorities were jointly set by farmers, the LAE project and IER. Technical innovations mainly concerned soil fertility management and the incorporation of livestock management, and agro-forestry within the

CMDT natural resource management programme. Methodological innovations included the participation of women and the use of aerial photographs by farmers.

ESPGRN reoriented its research priorities on environmental management and formulated an approach based on the development of improvements in the production systems, that should produce short-term gains for farmers, and at the same time contribute to a stabilisation and reduction of pressure on the natural resources. Therefore, ESPGRN collected basic data on environmental change in Southern Mali (for example, studies on carrying capacity of land for livestock) and started research, in collaboration with commodity research, on intensification of agriculture and livestock farming (Van Campen, 1994).

With the growing number of villages and field activities, the CMDT erosion control programme needed an efficient monitoring and evaluation system, which would permit CMDT to identify problems and bottlenecks at village level and to inform donor agencies about the results achieved. It was decided that statistical data collection had to be integrated into the existing CMDT monitoring system. The project itself, in collaboration with the CMDT natural resources management and data collection agents, conducted some twenty thematic evaluations.

On-Going Issues

Despite the successful collaboration between research (ESPGRN) and extension (CMDT), and their efforts to halt further degradation of natural resources, the sustainability of agriculture in southern Mali remains at risk. Degradation of forests due to over-exploitation of firewood, degradation of common pastures due to overgrazing, erosion and soil mining due to unsustainable farming practices are on-going features of southern Mali's agriculture.

Studies revealed that there were clear regional differences in the extension results of NRM. Moreover, although there is a clear effect of the extension the natural resource management, the measures applied by villagers are mainly concentrated in private fields and not on common natural pastures and forests.

The moderate adoption rates in the more intensively populated cotton zones, may be due to changes at household level as well as on village level. 'Generation conflicts' within farm households over the distribution of cotton revenues can diminish the household-heads ability to mobilize labour for additional tasks to improve soil fertility management, when these are not compensated for (Defoer et al., 1996). Moreover, intra-household conflicts can lead to the split-up of the large extended families in smaller units. These new farms are generally less endowed in equipment, labour and animals. They are also more likely to be confined to marginal lands and have less possibilities to invest in soil fertility management.

Further, several of the older AVs are confronted with internal conflicts, sometimes leading to their split-up. Under these circumstances, the village level approach is likely to become less effective, and mobilisation of labour for collective erosion control works is difficult to organize. The Koutiala region (cotton belt) has also been the centre of conflict between CMDT and AVs over cotton prices, in 1992. One of the results has been that CMDT agents decided to live in the city of Koutiala instead of in the villages. AVs have become more suspicious of the CMDT. These changes may also have influenced the quality of contact between extension workers and farmers.

Agricultural development did not only change the overall production system, but also increased differences between farming households. Access to productive resources such as labour, livestock, equipment, quality land and knowledge is becoming increasingly diverse. This results in a large variation of agricultural management practices and possibilities for change.

Intensive and extensive farming practices co-exist within the same village and even within the same farm

household. Kanté & Defoer (1994) showed that farmers' land management practices may differ between farm fields, according to the quality and topographical position of the land. Extension messages proposed as receipts for 'average' farmers and 'average' fields are likely to be inefficient in this context. Hence, there is a strong need for effective tools to analyse the diversity of farmers' management strategies, so that techniques can be better targeted. Farmers, being the resource managers, have to play a leading role in the analysis of their management practices and planning of improvements.

In one of the pilot zones, where the collaborative NRM programme started, farmers complained that their wood land protection works made no sense, as neighbouring villagers had free access to the bush and urban people were given permits to exploit the village forest. In fact, this brings back the problem of legislation; the villagers had no legal right to decide on use and management of their territory.

Responding to New Challenges

To respond to farmers' demand for assistance in legal aspects on their protected bush land, IER and CMDT, in collaboration with local state services (among them the state forestry service) and the administration, supported a process of development of local environmental legislation, initiated in six neighbouring villages, called SIWAA. Its main objective was to initiate the process of the establishment of a local convention by the villages for the sustainable use of common bush and fallow lands. This programme resulted in a proposal for local convention in 1994 and its final version has been signed recently.

This process served as grass root level experience for the ongoing discussions on new land tenure and forestry laws at the national level.

In order to address complex issues of NRM, both research and extension will have to take into account the diversity of the circumstances (as is shown above, not taking them into account leads to slow adoption). This calls for a socio-ecological and participatory process, with farmers not simply as end-users of technologies, but as an active partnership in development of approaches, methods and technologies.

Farmers will need to play greater roles in adapting technologies to their specific conditions and collaborative learning must become an essential element in enhancing this role. Researchers and extension workers should primarily act as catalysts and facilitators of farmer learning processes. Such an ecological learning process requires effective tools that assist farmers in analysing their own environment and management practices and enable them to discover, select and adapt alternatives for integrated NRM; a combination of available technologies which specifically pays attention to regeneration of resources and limitation of losses.

In this respect ESPGRN is actually, in collaboration with CMDT, developing and fine-tuning several participatory action-research processes, on livestock management, soil fertility management. A structured learning process of diagnosing actual strategies, and step-wise planning testing, adapting and evaluating alternative solutions is being developed based on visualisation, observation and exchange of experience among farmers.

Institutional Changes

After the successful pilot phase (1986-1989) and the consolidation phase (1990-1993) of the project, the integration of environmental management techniques and participatory extension methods in the core activities of CMDT was considered to be of utmost importance in order to secure the Malian cotton production. It was proposed that the project, which focused on soil and water conservation, should

develop a more general rural development approach. In this context cotton production was perceived as being part of sustainable rural production and livelihood systems, integrating staple and cash crops, cattle breeding and other economic activities of men and women. In 1995 and 1996, the DDRS team organised a series of workshops on the regional and national CMDT level to discuss these proposals, supported by basic data on environmental degradation collected by DRSPR and results of the natural resource management programme initiated by the LAE project.

As such, the LAE project contributed to the capitalisation of the technical and methodological project experiences, mainly by the implementation of general CMDT working methods, incorporating environmental and socio-economic concerns (CMDT, 1997):

- Integration of environmental management techniques in the overall set of development proposals of CMDT, that, until then, were particularly focused on short-term maximisation of cotton and cereal production (extension of cultivated area, introduction of animal traction).
- Development of a general participatory and gender-sensitive village extension approach (*démarche d'animation villageoise*), restructuring the wide range of CMDT extension methods, including those of the LAE project.
- Conception of a participatory rural appraisal method (*diagnostic global participatif*), in order to improve the CMDT-farmer interface and to concentrate counselling activities of extension workers on issues revealed by the villagers themselves.
- Proposition of a participatory monitoring system (*suivi-appui-conseil*), introducing new forms of collaboration and communication between the different levels of the CMDT organisation.
- Creation of interdisciplinary teams at district and regional levels, integrating specialists on environmental management, animal husbandry, gender, monitoring and evaluation and village organisation.
- Analysis of the actual work organisation within the CMDT rural development programme, which resulted in a renewed orientation on field work and counselling of village organisations. At the same time, more extension workers are now going to be appointed at village level, which will result in more frequent contact between agents and villagers.

Furthermore, the LAE project experiences in training and general awareness raising helped CMDT to define a more coherent training programme for its agents, to implement general guidelines for developing courses and training material and to produce radio programmes for the broadcasting of extension messages.

In 1996 the Dutch Ministry of Foreign Affairs decided that the LAE project would be dissolved in order to integrate it entirely into the CMDT structure. CMDT will still be supported by the Dutch Directorate General for International Co-operation (DGIS), but now through the so-called programme approach, with technical assistance through KIT. All management tasks have been entirely delegated to CMDT. This evolution can be seen as a rather rare example of successful institutional development.

NRM can not be realised at the farm level only, but requires a favourable institutional environment. A decentralised decision-making structure is needed: although both IER and CMDT are working along decentralised lines, in practice this is not always obvious. Directives from the national levels often come on an ad hoc basis, trickling down to the field level; e.g. CMDT at national level, in collaboration with the Dutch Embassy, has decided on indicators for sustainable land use management; the actual collection of the data becomes the task of the field level extension worker. Similar national level decisions are made by the IER, without regional and local level consultation,

which may eventually result in new tasks of the field worker. While the institutes increasingly feel the need for their personnel to work in a participatory mode, the management often does not prove to have the same ability of working.

To make integrated and ecological approaches work, conditions have to be created at higher than the village level. At regional level, so-called human platforms have to be created involving a wide range of actors in the agricultural knowledge and information system. Platforms assume negotiation about demanding less from a common good or paying more for a public good. This has been done in relation to the aspects of making a local convention. Similar platforms have recently been created; for example a NRM platform is headed by research involving interesting stakeholders involved in NRM related projects.

In the same sense, a research/farmer organisation partnership has been created, called Users commission. The set-up was realised with assistance of local NGOs. The main idea is to formalise farmers involvement in the programme of research, planning, and evaluation at regional and national level; involving farmers not only at the on-farm level, but also at all levels of the decision making process.

A research user fund was made available for the user commission to contract research on topics of interest and which had not yet been researched, in order to increase the probability of success, if farmers have financial leverage and thus more power to influence the research agenda.

Strong Points

- The original research on erosion control has made some basic assumptions and choices, which proved to be crucial: a) the proposed techniques could be easily applied by farmers; b) they were compatible with common cultivation techniques; and c) they integrated the larger village land management schemes and were based on a village approach. Consequently, the farming systems research oriented itself more on NRM.
- Farmers and CMDT were involved in the test phase of both the techniques and approach. Research remained in a continuous debate with extension to test alternative technologies to be integrated in the packages of control measures.
- After evaluation of partial adoption techniques, research and extension continued to seek alternative approaches (more participatory and more towards facilitation of learning). For both the research and extension projects, an approach was developed, that was feasible within the institutional context and for which the existing structure could be used.
- The project was incorporated into work schedules and working habits; this favoured largely the creation of FS&NRM teams in each of the regions and of specialised CMDT structures for NRM.
- The field-work was supported by scientific studies on environmental degradation, based on data collected by both IER and CMDT (e.g. soil mining (Van der Pol, 1992) and other studies done for OECD). This created at the CMDT an awareness of the need and possibilities for NRM at the farm and village level (Van Campen, 1994). As such, NRM has now become one of the main elements of policy formulation and implementation of both CMDT and IER.
- The fruitful collaboration between IER (ESPGRN) and development (CMDT) resulted in concrete technical and methodological propositions for extension and this collaboration serves today as a model.

- The collaboration has been largely favoured by the fact that these two institutions in southern Mali were financially supported for more than ten years by the same donor, and as regards research, the support exceeds 20 years, and is continued, under the so-called programme approach. Also, the technical assistance for these two institutions, which was entirely integrated within the two structures, came through the same institute which facilitates the informal and formal contact between research and development.

Weak Points

- Despite the fact that NRM is completely integrated into the policy of both IER and CMDT, all activities remain mainly donor funded. This is partly understood in the case of research, which is not a profit making enterprise, but less easily accepted in the case of the CMDT.
- While CMDT completely funds the cotton research, this is not the case for research on NRM. This is partly due to the fact that part of the short term NRM research is Dutch funded, and thus not in need of additional funding.
- The capacity of the researchers and extension workers is not adequate to fulfil their new responsibilities with respect to facilitation of learning.
- The approach to cotton extension is largely organised along the lines of transfer of technology; this is quite incompatible with the new proposed way of working; being a facilitation of learning processes.
- Motivation of researchers is not very high.

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Chapter 12

Strengthening development research potential: A priority for the European Union

Gilles Fontaine

Introduction

“Past data and experience in STR cooperation with the developing countries are disastrous: on the one hand, the governments of the developing countries have never devoted either the attention or the resources necessary for STR activities; on the other, cooperation aid from the developed countries has favoured scientific and technological assistance rather than the creation of local research capacity, promoted technological transfers rather than local initiatives [...], and has rarely involved the civil society in decision-making or the planning of collaboration efforts”

Mr Franco Malerba

European Parliament
(17.10.97)

This rather harsh assessment has been formulated in the Draft opinion on the Communication of the Commission to the Council and the European Parliament on: “Scientific and Technological Research: a strategic part of the EU’s development cooperation with the D[eveloping] C[ountrie]s”⁹⁴.

Even if the international literature, including Conventions or Agreements, refers systematically to the strategic importance of STR for the developing countries, in practice the (financial) effort is extremely limited.

If we want to change this practice and to apply the Resolution of the Council⁹⁵, we have to analyse the underlying reasons for the continued implementation of such activities. Among them, the fact that researchers or research organisations are generally not represented in the financial decision making process of development policies, at any of the levels (planning, pledging or tendering). Why are they not part of these networks?

The communication problem - in term of language - seems to be of much importance. Researchers are using concepts and jargon which are not easily accessible and understandable by politicians, decision-makers and more generally by civil society. This lack of understanding, however, may cause a bias against results generated from such research.

On the one hand, decision-makers have to understand clearly what the results are, on the other hand, researchers have to understand what the needs are. Although both groups have their own jargon and language, if both groups would collaborate closer, there would be no reason for continued misunderstanding.

There is a need for policy analysts, who are able to communicate research results to policy makers and donors, in order to open a constructive dialogue with decision makers and donor agencies. This essential role of ‘facilitator’ has to be promoted in respect of scientific expertise: universities and

⁹⁴ COM(97)174 / 25 April 97

⁹⁵ of 5 June 97

research institutions in developing countries would be well placed to play such a role.

Challenges for Sustainable Development

If staple food requirements are to be met, sustainable production needs to increase by 3% a year for 30 years.⁹⁶ The widening divide between centres of production and consumption, due to the rapid urbanisation of the South, is changing food habits and diversifying needs. Current production and processing techniques will not keep pace with rising demand. Similarly, the consumption of energy and renewable resources can only be sustained at a high or even irreversible cost to the environment.

Health and health care also face pressing challenges. Urbanisation and population movements are creating new kinds of problem and are aggravating the effects of endemic illnesses such as Aids. Such developments require a new approach to health issues at a time when many systems are threatened by economic and budgetary hardship.

Meeting educational and cultural needs is a third important challenge and one which is growing with the development of globalised information and the increased technical complexity of production processes. In many countries undergoing structural adjustment, school attendance rates fell during the past ten years. These growing needs cannot be met simply by increasing supply: the way they are tackled also needs to change.

At the same time, developing countries must also adapt to and participate in the globalisation of trade in goods and services. Although some are faring better than others, they still have a lot of ground to make up and cannot yet finance their economic, social and cultural development. However, integration into the world economy will not come about without major investment in the means of production and manpower.

These challenges also concern developed countries, either directly in that they stem from global problems or indirectly from the effects that political and social instability in developing countries will have on them.

Some of the issues are now so acute in developing countries, such as Aids, problems linked to urbanisation (drugs, insecurity, social breakdown) or environmental problems (climate change, erosion of natural resources) also concern developed countries albeit in a different way. The answers to these issues must necessarily be global ones.

The Urgent Need for Know-How and Appropriate Technologies

Facing these challenges will require new forms of physical, biological, social and human knowledge. Such skills are necessary for the development of indispensable new technologies in both the productive and social sectors to kick-start sustainable development processes. The technologies created will have to be tailored to suit the different physical, social and cultural realities in each place.

⁹⁶ Conway, G. et al., 1994. Sustainable Agriculture for a Food Secure World. Washington D.C.: CGIAR

There is little chance of this being achieved, however, solely by increasing technical assistance for technological research and development for southern countries. The idea that, in order to catch up, developing countries need simply draw on the pool of knowledge and technology in industrialised countries⁹⁷ is now recognised as wrong.

No society can really tap into know-how and techniques it has had no part in developing, and it will be many years before most developing countries, especially the least developed, possess the research capacities needed to tackle all these issues on their own.

Consequently, the efforts of the scientific communities in the developing *and* developed worlds need to be mustered, each contributing according to their relative skills and interests and starting from objectives set in conjunction with the relevant political decision makers, businesses and social bodies.

Given the limits of scientific and technical assistance and of *Recherche et Développement Technologique* (RDT) potential in southern countries, an appropriate response would be to strengthen development research through scientific partnerships for development between research teams from north and south, which would deal with major programmes drawn up specifically to tackle these urgent and common challenges.

Fostering New Scientific Partnerships for Development: A Strategy to Renew Cooperation Between the EU and the Developing World

RDT has three different but complementary purposes:

- to develop and channel basic research know-how in partnership with higher education and training. Know-how is conveyed to students through knowledge and to working people through skills;
- to generate technologies and innovation in conjunction with business and industry, generally through close working relations between the major productive or social sectors. It does so through targeted research programmes which draw on public and private funding;
- to offer expertise and consultancy, often within the framework of business and social activities, in the form of "action research" or "development research" (although the two concepts are not fully synonymous).

In developing countries, RDT needs to be structured and strengthened if it is to meet development needs. This requires medium- and long-term action; consequently training, through basic and applied research, should not be overlooked. Scientific partnerships must draw in all three functions in order to bring about a real shift towards sustainable development.

Although the partnerships will be different at each level, they must all meet the need for overall consistency. This could be done by getting together with the developing countries to set out priority areas in, say, development-related economic and social sciences, agronomy and health.

A prerequisite for the development of these partnerships will be the firm political will of both European and developing countries to create a climate conducive to the creation of action programmes tailored to the variety of situations and to gather the necessary means.

⁹⁷ Gaillard, J. 1991. *Cahiers des Sciences Humaines de l'ORSTOM*, 26(3): 405-425

At the EU level, the initiative could concentrate on:

- directing policy towards development research on the basis of a North-South partnership;
- drawing up a plan with developing countries to strengthen their scientific and technical research capacities - a prerequisite for the development of these partnerships;
- introducing specific coordination at European level to put the new policy thrust into practice through joint cooperation programmes.

Directing policy towards development research

Enabling research to play a more active part in meeting development challenges means reversing current trends, which are unfavourable to development research.

In the North, interest in this issue is waning. The discussion and bargaining that preceded implementation of the "developing countries" section (Activity 2) of the fourth framework programme for research and development (FRDP) and the growing difficulties in financing agronomic research for development are proof enough.

In the South, the resources allocated to RDT both by the developing countries and, in the form of Overseas Development Assistance, by the developed countries for RDT in the third world is generally falling, although there are some noteworthy exceptions. Further, in countries where structural adjustment plans have been put into action, the RDT sector has rarely been specifically addressed and the potential for research has been much weakened.

Political dialogue with developing countries as a starting point

If RDT is to be better accommodated in development cooperation policies and scientific partnerships for development fostered, the EU and developing countries must start talking.

Such dialogue will come at a difficult political and financial juncture, which is why a structured framework must be erected to set the main objectives and work out the ways and means to achieve them.

The EU is well placed to support this strategic option of bolstering development research in its cooperation with developing countries through the promotion of scientific partnerships. It also has clear direct and indirect interests in doing so.

The European scientific community enjoys high standing and has experience of scientific cooperation, structured and developed through its string of RDT framework programmes. It also has specific experience of development research, particularly in life sciences. The creation or strengthening of scientific partnerships will nurture this expertise and may well consolidate the privileged links that Europe has with southern countries. This could in the long-term be a considerable advantage for it in competing for the potential market that developing countries represent.

Moreover, the implementation of a more effective development cooperation policy is in line with the general aims of the Maastricht Treaty on European Union. It presupposes a shift in the procedures and the operational areas that are given priority. The scientific community must take an active part in this debate and come up with innovative responses.

For this guiding principle of development cooperation in RDT to become a reality, political consultation between the EU and developing countries must be extended technically to translate the selected priorities into programmes, covering:

- the relevant operational areas: agriculture, health, education, communication, etc.;

- the planned activities: capacity building (training, infrastructure, scientific equipment), institutional support, joint research programmes;
- the nature of the partnerships.

However, implementation of these programmes will require stronger and more structured research capabilities in developing countries themselves.

Draw up a plan to build developing countries' research capacities

Accommodating different situations

The developing world is not a uniform whole: The diversity of situations, created by differences in population and economic development levels, creates a range of scientific and technical cooperation needs. Cooperation programmes should take account of these differences, perhaps by grouping together regional blocks with similar features. Priority here could be given to the most backward countries and regions.

Despite the differences, common principles and priorities should nevertheless be identified in order to define a general operational framework.

The shortage and uneven spread of potential

A cursory glance at a few general indicators such as the percentage of GNP allotted to RDT or of scientific researchers and engineers in the population shows a wide gulf between the average potential of developing and developed countries (0.4% of GNP goes on RDT in developing countries compared with 2.1% in Europe; developing countries have less than 300 researchers and engineers per million inhabitants while Europe has 1 950).

Two sub-groups can be identified. The first is the Mediterranean, Latin America and Asia, with proven research potential in certain fields while the other is made up of the ACP countries, whose backwardness is more general and more marked. The amount of attention, and probably the type of operations, should be different for these two groups.

The wide range of scientific potential between countries in a single region militates in favour of a regionally-based strategy, drawing on synergies between national, regional and international programmes. This is in keeping with the priority the EU accords to regional integration in its development cooperation policy.

Scientific skills are not broad enough to analyse constraints

Nearly all developing countries, even the most advanced, have a very uneven spread of scientific skills, which are often concentrated in a restricted number of fields. Life sciences dealing with agriculture, natural resources and health are best covered although even here potential is still not enough to tackle existing problems.

Other sectors are very underdeveloped in much of the developing world. This is particularly true of applied economic and social sciences, in which a grasp of the realities of the economic, social, cultural and political context is vital. In Africa, there is also a notable weakness in engineering sciences.

Building on existing assets, including human resources

Research now is attracting more people at a time when the financing for RDT is stagnating or being reduced.

As a result, the means of scientific production are deteriorating, with an attendant drop in scientific productivity and, in many cases, a brain drain of the best scientists to other countries. This is true in nearly all countries, even the most technologically advanced.

The main task of any programme to boost scientific potential should be to put this right in a climate conducive to scientific work. New means of electronic communication (information highways and superhighways) and computerised data base system should be developed to strengthen networking (e.g. "laboratories without walls"), limiting the size of research facilities and their recurrent costs.

Research potential in developing countries cannot be bolstered without an institutional framework to take on the long-term administration of researchers' employment status, to build on and disseminate knowledge and to look after sectoral planning. Guaranteed financing of a sustained and appropriate nature is at the core of the political commitment required from both donors and developing countries themselves.

Developing coordination within the EU

Greater consistency between Community and Member State cooperation policies for science and for development is needed to achieve the overall goal and requires closer coordination in these sectors.

At the Commission level, coordination between the relevant departments must be strengthened. This is particularly true for Directorate-Generals I and VIII, dealing with external relations and cooperation with developing countries, and those responsible for implementing the Community RDT policy. The Commission has already taken, or is preparing, a number of research initiatives in agriculture and health for development, in which operational coordination has been introduced for the specific "developing countries" heading of Activity 2 of the fourth FRDP. Formal collaboration between DGs VIII and XII has also been developed to take better account of RDT in programming the 8th EDF.

These initiatives should be consolidated and expanded - more formally if necessary⁹⁸

However, improved coordination within the Commission would only have limited effects without closer coordination at the EU Member State level.

Article 130 h of the Union Treaty provides a legal basis for research coordination. For development cooperation, Article 130 x stipulates that "the Community and the Member States shall coordinate their policies on development cooperation and shall consult each other on their aid programmes, including in international organisations and during international conferences. They may undertake joint action ..."

⁹⁸ A Commission communication to the Council proposes expanding on the idea of a task force or interdepartmental group for cooperation with developing countries. Following a request from the Council, a coordination mechanism is being prepared for agronomic development research. Here too, mention is made of the value of an interdepartmental group to coordinate operations.

Such coordination could be developed in a number of ways:

- first, a mechanism should be developed providing two-way information on Member State and Commission operations;
- an operational framework should also be defined. This could take the form of "priority action plans" over broad regions, opening the way for harmonisation of current or planned activities;
- at a more integrated stage, some activities could gradually be harmonised. This could be tried out in set situations;
- consultation with international institutions should also be considered.

Chapter 13

Research Management as a Contribution to Bridging the Research - Policy Interface. The Experience of GTZ

G. Steinacker, R. Haep and A. Springer-Heinze

Introduction

The “*Deutsche Gesellschaft für Technische Zusammenarbeit*” (GTZ) is very often taken for a donor, yet it is not. GTZ is the principal development agency of the donor country Germany and it is commissioned for each project to implement the bilateral agreements between the German Ministry for Economic Co-operation and Development (BMZ) as the responsible government body and governments in partner countries.

The mandate of GTZ is change management to improve development. GTZ functions and objectives are discussed in public and performance is measured by multiple stakeholders according to the standards defined for each separate task commissioned under a specific contract.

GTZ is active in many fields. In this chapter the experience of the Agricultural Research Management Group will be presented. This group provides services according to demand in the area of agricultural research and tropical ecology research dealing with the whole chain of innovation development, implementation and dissemination of technologies and know-how. This includes subsectoral and ecological analyses in relation to development constraints and potentials and includes institutional and structural strengthening of the actors involved at different levels.

All actors involved in the innovation development process take decisions: the farmers, agricultural services institutions (including markets, irrigation, transport, processing), research institutions, the private sector and NGOs and, finally, government institutions and policy makers. During an innovation development process, decisions at one level usually have implications at the other levels of the agricultural system. This is not only true for the interaction between farmers and researchers but also with regard to the interaction between agricultural research and other members of society, e.g. consumers, which sometimes affect policies, while policy decisions determine the levels downstream. All these decisions together are the motor of development.

Dealing with natural resource management (NRM) is a challenge for the agricultural research system. NRM research tends to be of a public goods nature and thus depends on government decisions to utilize research results in public programmes and on appropriate policies providing incentives for the adoption of new technologies, especially if they aim at reducing negative externalities associated with agricultural production. At the same time, NRMR is needed to inform public policy formulation as to the potential resource and environmental costs and benefits associated with various policy options. This requires that NRMR maintains close linkages with policymakers. NRMR needs to be proactive in identifying and pushing policies that will have positive impacts on the environment and that will foster adoption of improved NRM technologies and practices.

For GTZ being a cooperating partner in the development process this means continuous learning and lesson-drawing to improve its interventions.

Experience of GTZ - Background and Learning Base

GTZ is currently engaged in institutional reforms of national research systems in Sri Lanka, Morocco, Ecuador, Ghana and Yemen. In cooperation with World Bank and INRAB we plan to implement the Agricultural Research Masterplan in Benin. In each case a participatory approach is taken to merge top-down policy with bottom-up planning with the goal to achieve an impact at different levels of the partner country's society and economy as outlined in table 13.1.

Table 13.1: GTZ Agricultural Research Group: Objectives and Project Performance Criteria

Objectives	Performance Criteria
Impact on resource use	• sustainability • efficiency
Institutional impact	• at international level (CGIAR, ESDAR) • at national levels (NARS, NGO, Farmer Organisations)
Impact for farmers and consumers	• food security • distribution • income
Impact on know how transfer	• new culture of business • aids for decision making • adapted technologies
Impact on policy	• investment policy (of donor and of partner country) • sustainability of investments • frame conditions

The learning process is oriented at performance criteria with regard to the contributions of all partners providing research, transferring results into development, and taking policy decisions.

In addition to implementing bilateral projects, the agricultural research management group of GTZ is linked with ISNAR; is a member of the ESDAR group at the World Bank and draws a lot of its experience from implementing German government contributions to the CGIAR System. The responsibility to advise on priority setting and the cooperation with International Agricultural Research Centres (IARCs) in agricultural research has led to concentrating on strategic issues. The combined experience of this international co-operation with bilateral institutional support to National Agricultural Research Systems (NARS) and activities relating to the Agenda 21 in rural development and forestry projects provides the background to the lessons presented here.

The learning bases are the GTZ interventions as outlined below. The different categories contribute specific experiences with bridging research and policy and vice versa: (the number of projects is given in brackets).

- Institutional strengthening of NARS or research institutions of partner countries (6),
- innovation services development with partners at production level, service institutions level and at policy level (4),

- methodology verification and of developing tools for process management, monitoring and evaluation, capacity building and translating research results into development activities including SINDA and TÖB (4), and
- IARC-projects (restricted core, about 40 in number) where GTZ is advising and administering the German contribution to the CGIAR.

As a change agent in rural and agricultural innovation, GTZ cooperates with two major players: the policy makers, who enable development by their decisions, and the researchers, who render services to the agricultural community and transmit information to policy makers who may need them. So GTZ was very interested to join forces with ECDPM and ISNAR, facilitating the analysis of the interface between policy and research. It helped to clarify its own role and of the mechanisms that may help to shape this interface in future. This is particularly valuable given GTZ's role as advisor of the German Ministry for Economic Co-operation and Development (BMZ) and Environment (BMU) in the area of agricultural research and NRMR with regard to developing countries.

However, experience from bilateral projects as cases is not sufficient. We also invest in our own research to improve the services we provide to German policy makers, and partner institutions. An example of this is the TÖB project.

The Tropical Ecology Support Programme

The Tropical Ecology Support Programme (TÖB) was planned to derive strategies and recommendations for the implementation of Agenda 21 and the Convention on Biological Diversity within development co-operation. TOEB develops practical instruments for an environmentally sound planning and implementation of bilateral development projects, and it supports the translation of know how in tropical ecology into practical concepts and by training of local experts.

TOEB provides major lessons about what research management can do. In this project, GTZ has adopted a strategy to put high management support into each activity in order to have an impact on development and policy. The rationale for this follows three hypotheses:

- clear and rigid applied funding conditions help to really focus on a 'development' research problem or policy issue,
- any input into research planning in terms of linking research to clients and stakeholders and its embedding into the development decision making process pays off through better and applicable results (scientific quality being assured by the scientific partner institutions of GTZ as GTZ is not a research institution itself),
- continuous interaction in terms of close monitoring and in terms of obligations for reporting (directed to specific groups) pays off in terms of a fast transfer of research results into application (different types of scientific, technical translated messages reports are contracted).

Two projects of TÖB provide where the research-policy gap has been bridged.

Mali: Flexible research on demand for improved management of a protected area

Mali is a land locked Sahel country confronted with instable and low agricultural production through variable rainfall, strong population growth and subsequent degradation of the natural resource base. The GTZ-supported project PREMA (Projet Régional de Manantali), works in south-western Mali, one of the poorest regions of the country.

In early 1997, PREMA in support of the national institution asked TÖB to conduct research on population dynamics of the most important species in the Réserve de Faune du Bafing, and to work out a concept for a sustainable use of wildlife with the local population. In addition to the requested researcher (wildlife biologist), TÖB sent a socio-economist familiar with wildlife issues in West Africa to allow for a more holistic approach. They formed a team, together with a national expert of PREMA's counterpart institution and a student from a local university. Terms of Reference were discussed with all stakeholders. The costs were shared between TÖB and PREMA who took the "ownership" for the research and provided all background information and linkages necessary.

The findings of the research, conducted from April to May 1997, were presented to all actors in Mali, the most important being:

- the need of a re-zonation and re-definition of the reserve in order to reconcile conservation needs legitimate development interests of the local people;
- the need for a participatory management plan for the reserve giving the local people a fair share of control over "their" resources and a strong role in the reserve management, including species monitoring and control of illegal hunting.

The results are not really a surprise for those familiar with the topic. What makes the success of the research is more the **acceptance** of the proposed policy decisions based on the results by both local people and government authorities who changed their earlier attitude from strictly refusing to touch the issue towards reconsidering the philosophy of their policy concerning protected areas.

This was due to the following factors:

- the research need was defined by PREMA and its counterpart organisation
- a "quick and dirty" approach was chosen since the urgency of the situation required rather "being vaguely right than precisely wrong"
- the planning logic of the research was linked to the log-frame project planning matrix of PREMA and took into account the necessity for an interdisciplinary approach, including quantitative and qualitative methods
- the research was planned and carried out jointly with international experts
- during all phases of the research, there was complete transparency between the actors involved
- results could be communicated to the policy level since the necessary links were established in advance.

Otters: advantage or constraint for swamp rice production in Indonesia?

The growing population of Java, Indonesia poses a special threat to the natural wetlands of the island. Wetland habitats including coastal mangroves and their biota are continuously converted into pond schemes and rice fields and subsequent fragmentation, contamination and even total loss occurs. Otter populations are steadily declining. In 1993, prohibited pesticides could be found in 98% of all rice fields.

The Asian Wetland Bureau (AWB), today Wetlands International, is seeking solutions to protect wetland habitats and their species taking into account the difficult socio-economic situation of the local population. In cooperation with a German university and PHPA, the Indonesian Directorate for Conservation of the Ministry of Forestry, a research project was designed to clarify the role of two otter species in natural and anthropogenic habitats since otters were considered a threat to rice fields and fish ponds. The objective of this research funded by TOEB was to develop an integrated management concept allowing both food production and conservation.

The one year research revealed astonishing results:

- Otters heavily depend on crabs as a primary source of food. 95 % of rice fields are damaged by crabs since they feed on rice seedlings and tunnel rice-field dams.
- Crabs damage the roots and barks of mangrove reforestation schemes
- Otters do not invade and damage large scale brackish-water pond schemes with poor vegetation structure, but do significant damage to small scale fish ponds
- Pond-raiding can be avoided through traditional low cost methods, e.g. living fences of dense pineapple, thereby providing additional food or income
- Otters have an indicator function for the integrity of wetland ecosystems as well as for environmentally sound rice and fish production systems

The research findings were presented at an international workshop in Indonesia hosted by PHPA. As a result, the policy decision was taken to give legal protection status to all four endangered Indonesian otter species. Furthermore, the research results provided for the strategy and form an integral part of AWB's effort to protect wetland ecosystems, e.g. by public awareness campaigns. As a policy decision, Otters are now used as indicators for environmental impact assessments in Indonesia.

The following factors contributed to the impact of the research:

- the research need was defined by AWB and PHPA, thereby linking governmental and non-governmental organisations
- the interdisciplinary research itself was integrated into an overall strategy (research being only a part of the mosaic) which allowed for the immediate application of the results and a self-determined follow-up of the Indonesian counterpart organisations
- a dedicated work of all partners in the process applying innovative and cost-effective methods compensated financial constraints
- the research provided practical solutions for farmers based on traditional knowledge
- results could be communicated to the policy level since the necessary links were established in advance.

Critical Success Factors

Both cases are defined by similar elements: problem orientation of research, clear focus of research communication, and close follow-up action. Both examples verified the management input strategy. Obviously there were also other factors which contributed to the success. They have been of some importance as was research management in support of bridging research and policy into a development process. The lessons learnt of these two examples harmonise with the overall experience out of bilateral project implementation of GTZ.

Usually it takes a broad approach of a complete project design to achieve change at policy level, research is just one entrance or means to prepare the road.

As a summary of this experience some of these factors which are to be influenced or managed by the

researcher or his or her partners at different levels are presented in table 2.

Table 13.2: Bridging Research and Policy - Factors for Success

actors:	• alliances & partnerships at all levels • strong leading agency (NGO) • legitimacy at levels of interaction (grass-root, policy) • securing transparency and continuous interaction
funding agent:	• sufficient and flexible financing to cope with the process • selection criteria and timing of research funding • support in research management (instruments) • monitoring and validation of results
concepts/ approach:	• research embedded in development • pluralistic view, multi-institutional ownership • holistic view, spatial integration of systems • solid financing • participatory approach in planning & implementation
research:	• integrated planning and implementation simple and understandably in objectives and methodology • translate findings into management suggestions
Information strategy:	• scientific credibility (national, international symposium) • awareness building at local level (broad media use, TV, radio, print) (local education campaign) • administrative translation (documents for legislation process)

Any partner in the system might ask himself whether he is able to manage all of the above mentioned factors. It is clear from table 13.2 that closing the loop at the science policy interface is a process of many of decisions, interactions and partners. There are at each level decisions to be taken to emerge finally into a policy decision. The main keywords are:

- Ownership to address a problem or solution,
- Leadership to provide dynamic for the process,
- Partnership to divide activities according to specific abilities,
- Transparency achieved through a systematic information policy.

Annex – Tropical Ecology Support Programme

WHY TÖB?

Tropical ecosystems are the essential base of life for the majority of the earth's human population. Growing degradation of natural resources and the destruction of fragile ecosystems increasingly jeopardise efforts towards sustainable development and poverty alleviation.

International conventions like *Agenda 21* and the *Convention on Biological Diversity* are a challenge for development cooperation. For the implementation of these conventions in partner countries, projects of German development cooperation can take up an important pilot function.

WHAT IS TÖB?

The Tropical Ecology Support Program (TÖB) is a supra-regional service project which aims to contribute to the ecological sustainability of development cooperation. A flexible advisory and research service has been established, which supports projects of German development cooperation on demand. Research results are directly used by the respective project, and they serve TÖB to develop innovative instruments for ecologically sound project planning and management.

Complementary, TÖB funds environmental programs and pilot projects of non-governmental organisations which contribute to environmental conservation. They are financed by the Ministry for Environment (BMU) through surcharge stamp funds.

WHAT ARE TÖB'S SERVICES?

TÖB advises and supports development projects by providing the following services free of charge:

- identification, conception and funding of short and long term applied research / studies (on request)
- funding of and conceptional advice for environmental projects of NGOs
- mediation of contacts to experts in tropical ecology and to universities
- development of innovative instruments
- database, technical and literature inquiries
- evaluation and dissemination of results and experiences via publications and internet

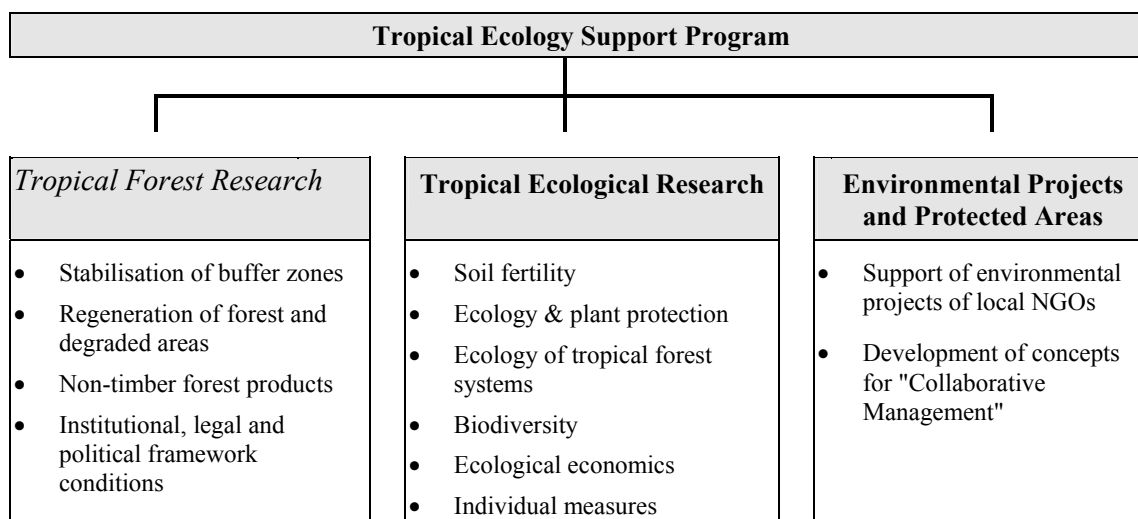
WHO ARE TÖB'S PARTNERS?

- development projects, technical, sectoral and regional departments of German development organisations, who want to conduct applied ecological research or support environmental projects of local NGOs
- local and German scientists, who conduct the flanking research as defined by the respective project and TÖB

- LOCAL AND GERMAN JUNIOR SCIENTISTS (HOLDERS OF BACHELOR AND MASTER DEGREES), WHO RECEIVE FURTHER VOCATIONAL/ EDUCATIONAL TRAINING
- Council for Tropical and Subtropical Research (ATSAF) and German Society for Tropical Ecology (GTÖ), who serve as advisors for TÖB.
- local and German NGOs jointly plan and implement environmental projects
- IUCN develops concepts for "Collaborative Management" on behalf of TÖB

WHAT ARE TÖB'S FIELDS OF ACTIVITY?

TÖB has an open program concept. It comprises projects with different priorities but similar objectives. The projects and their respective fields of activity are shown below.



WHICH CRITERIA ARE APPLIED TO THE FUNDING OF RESEARCH PROJECTS?

Criteria and guidelines for funding of environmental projects of NGOs are available directly from TÖB. For applied research flanking development projects, the advisory board has defined certain criteria. They help applicants to elaborate research proposals and serve as guidelines for independent reviewers. TÖB differentiates between the following groups of criteria:

Development policy:

- relevance in the context of development policy
- linkage to an existing development project of a German development organisation, e.g. KfW (Bank for Reconstruction and Development), DED (German Development Service), GTZ, CIM (Centre for International Migration)
- integration of relevant research institutions and consideration of research priorities in the respective partner country
- further educational/vocational training of local experts (e.g. as tandem: local and German scientist conduct the research together)

Contents of research:

- precise definition of applicability and utilization of expected results
- criteria of the respective field of research
- competent investigation of the actual state of knowledge and coordination with similar research projects
- application of appropriate methods

Organisational aspects of research:

- realistic and comprehensible research plan (objectives, time, finances)
- use of possible alternative/complementary financing opportunities

Aspects which lead to rejection:

- research which is not linked to a project of German development cooperation
- the research is an original task of the respective development project
- pure (not applied) research, excursions of students
- research areas covered by other grant programs

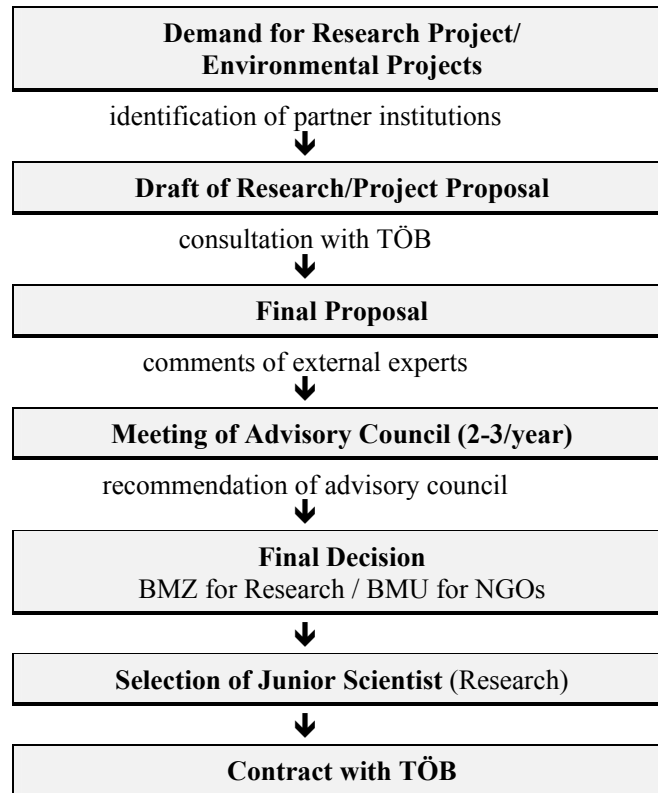
WHAT IS THE DECISION-MAKING- PROCESS FOR SUBMITTED PROPOSALS?

External, independent reviewers comment on the complete research proposals according to the above mentioned criteria. TÖB's advisory council (consisting of representatives from BMZ, GTÖ, ATSAF and GTZ) then gives a recommendation to BMZ who takes the final decision about funding. The advisory council meets twice a year. Proposals of lesser extent can be decided upon without formal meeting. Proposals for environmental projects are decided by a similar advisory council. It meets three times a year.

The time between the submission of the research proposal and the beginning of the research is usually between 3 to 9 months depending on the date of submission.

German junior scientists for long-term research projects who have little experience in development policy are obliged to participate in courses offered by the German Foundation for International Development (Deutsche Stiftung für Internationale Entwicklung, DSE) before they leave. These courses serve to prepare them for working in the complex interdisciplinary and intercultural field of development cooperation.

Process of Application and Decision-Making



WHAT CAN INTERESTED INDIVIDUALS AND INSTITUTIONS DO?

- **development projects, regional and sectoral departments** identify (possibly in cooperation with TÖB) their demand for advice or research and prepare a research proposal.
- **universities, their departments and institutes** get in contact with development projects or intensify existing cooperation.
- **local and German junior scientists** can contact professors or universities who already co-operate with German development organisations.
- **local and German NGOs** ask for more detailed information from TÖB or BMU and jointly prepare a proposal.

Since 1992 the Tropical Ecology Support Program has been funding more than 140 projects in some 40 partner countries of German Development Cooperation. Since 1994 activities have been extended to non-tropical developing countries also. TÖB is now able to contribute to the initiation of an ecologically sustainable development process and to the implementation of international conventions in these regions.

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