

ACTION RESEARCH ON CANAL IRRIGATION:
TRAPS, TACTICS AND A CODE

Robert Chambers and Roberto Lenton
The Ford Foundation
55 Lodi Estate
New Delhi 110 003

September 1981

Contents

Research and Action Research	1
Traps and Tactics	4
Trap One: Selecting Projects and Sites	4
Trap Two: Practitioners Versus Researchers	5
Trap Three: Choosing What to Do	7
Trap Four: Special Inputs and Multiple Causation	9
Trap Five: Tramlines	10
Trap Six: Measurement and Monitoring	11
Trap Seven: The Counterfactual	12
A Code	12
i. asking who gains and who loses	12
ii. involving affected people	13
iii. involving project staff	13
iv. considering replication	13
v. reporting the experience, warts and all	14
vi. reporting the inconclusive and negative	15
vii. making judgements	16

ACTION RESEARCH ON CANAL IRRIGATION: TRAPS, TACTICS AND A CODE

Research and Action Research

Research and action research form a continuum rather than two clearly separate categories. For the purposes of this paper, however, research on irrigation systems refers to studies of what has been and what is, while action research refers to linked interventions and studies designed to improve irrigation. The major difference is that with action research there are deliberate interventions in the irrigation system itself. Whereas in research one concentrates on appraisal, problem identification, and analysis, generally followed by identification of opportunities for improvement, in action research these are generally followed by implementation of promising interventions and monitoring and evaluation of results.

Action research on canal irrigation is quite recent. Examples which have been analysed and reported outside India are the work of IRRI and of the National Irrigation Administration in the Philippines on the Lower Talavera River Irrigation System (LTRIS) (Valera and Wickham 1976; Alagan et al 1979; Bhuiyan 1980), and on the Upper Pampanga River Integrated River System (Early 1980); by the Colorado State University (CSU) Water Management Project in Pakistan (Colorado State University 1980; Kemper et al 1980; Clyma et al 1977); and by the Cornell University and Agrarian Research and Training Institute, Colombo's project on Institutional Organisation for Water Management on the Gal Oya Project in Sri Lanka. Examples in India include experiences with the introduction of warabandi and integrated water management on the Shreeramasagar (Pochampad) Project in Andhra Pradesh (Ali and Hassan 1980; Hassan 1981); the work of the Tamil Nadu Agricultural University on the Lower Bhavani Project in Tamil Nadu (College of Agricultural Engineering, Tamil Nadu Agricultural University 1980); and the work of Water and Power Consultancy Services (India) (WAPCOS) on the Mahanadi Reservoir Project and Hasdeo Bango Project in Madhya Pradesh (Chadha 1980; WAPCOS 1980, 1981). Experience from these examples provides the basis for much of what follows.

Bottrall (1981) and Lenton (1980a, 1980b) have reviewed action research experience and approaches, and have discussed and made suggestions for handling some of the key problems - of action research management, of relationships between action teams and research teams, and of replication. Bottrall emphasises that the case for improving irrigation management can be considerably strengthened if planning decisions are based both on comprehensive evaluations of established irrigation schemes and on action research programmes to develop and test improved and replicable institutions and management procedures. Lenton uses case-study material available from two prominent action-research efforts carried out in South and South-East Asia to demonstrate that inter-disciplinary action research programmes undertaken in pilot areas of irrigation systems by research teams in collaboration with Government Agencies, can yield results capable of extension to larger areas by Government Agencies. He says that important characteristics which contributed to the effectiveness of these two projects were (1) a broad problem identification and analysis procedure; (2) an effective monitoring and evaluation programme; (3) interdisciplinary staffing based on problem characteristics; and (4) a training and communication programme directly linked to implementation. Lenton further suggests that procedures for research team/agency collaboration during the implementation phase would be of great utility, although these procedures were not developed in the two programmes studied.

In this paper we shall try not to repeat Bottrall and Lenton's main points, which are taken as read, but to look more closely at some of the other problems of methodology. The inherent difficulty of good action research can be underlined by comparing it with research. At the risk of exaggerating the contrast, some of the differences can be outlined as follows:

	<u>research</u>	<u>action research</u>
objective	knowledge	improvement
type of irrigation projects studied	"good" systems (to study reasons for success), as well as "poor" systems	primarily "poor" systems with opportunities for improvement
identification of research influenced by	research fashions; gaps in knowledge; methodology	methods and speed of diagnosis; problems and potentials

	<u>research</u>	<u>action research</u>
number of disciplines involved	fewer	more
interventions	nil, or strictly limited and controlled	central, and often multiple
relationship with subjects	observing, interviewing	collaborating
duration	more easily pre-determined	less easily pre-determined
criteria of success	methodological rigour; new knowledge (descriptive, or confirming or refuting a hypothesis)	improvements in performance; replication
interpretation of results	cause-effect relationships not always vital	judgements about causes and effects critical for replication

Research can be safer, tidier, more controllable, and entail less management and interdisciplinarity. Its results are in principle easier to interpret. Action research, in contrast, can be riskier, untidier, less controllable, and entail more management and interdisciplinarity. Its results can be harder to interpret.

The distinction and some of the problems can be illustrated by some recent pioneering work by the Water and Power Consultancy Services (WAPCOS) in outlet studies in Madhya Pradesh (Chadha 1980; WAPCOS 1980). Their activities can be separated into "research" and "action research". The research part was a study of yields by location on canal systems, and comprised 644 crop cutting exercises on 57 chaks. The methodology, as always, faced problems, such as how to define head, middle and tail on a canal, on a distributary, on a minor, and most of all within a chak. But by and large this was a straightforward fact-finding exercise involving well-known methods and leading to clear and extremely interesting and useful conclusions which raised policy questions, but which do not indicate how they might be answered.

WAPCOS also, in parallel, conducted investigations which can properly be described as action research. The hypotheses were based on three interventions to be carried out simultaneously: extending channels down to sub-chaks and about 8 ha each, installing controls and measuring devices at the new subchak outlets, and rotating the flow between the new subchaks. The aims included identifying whether these interventions would raise yields, reduce the time taken to water

a chak, reduce yield variability within a chak, and reduce water use. This was methodologically far, far more difficult than the research, involving as it did the measurement and timing of rainfall and irrigation water supply in relation to crop activities, the monitoring of agricultural activities and inputs such as HYV seeds and fertiliser, the measurement of yields, and finally inferring relationships between several possible causes and the effects observed. Given the complexities, and possible causes of higher yields on a trial chak such as favourable location, high use of HYVs, and high fertiliser use, it was difficult to derive clear conclusions. Much action research is likely to face similar problems; and one important lesson from the WAPCOS work is the importance of the full and frank reporting which they presented in their study.¹

TRAPS AND TACTICS

Trap One: Selecting Projects and Sites

Projects and sites may be selected very early on, even before clear criteria for selection have been specified or discussed. Some of the criteria, for better or for worse, which may operate are:

a special problem. Salinity, waterlogging, low intensities, sticky black soils difficult to cultivate during the monsoon, the cultivation of crops for which land was not localised, an absence of infrastructure like field channels, the past investments of a donor agency - these are examples of problems and factors which may influence choices of projects and of parts of projects on which to conduct action research. But a problem orientation may overlook opportunities, and may lead to the blind alley of brick-wallitis.² It may also divert attention from less obvious problems from solving which the gains may be greater.

¹ We are grateful to Mr. C.P. Chadha and Mr. B.K. Uppal of WAPCOS for useful and detailed discussions, and for making their reports available.

² Subject bangs his or her head against a brick wall which does not fall down. Diagnosis: subject is not banging hard enough. Prescription: bang harder.

accessibility. But accessible projects and sites, near urban centres and good roads, may be biased towards more prosperous farmers, better services from Block Headquarters or wherever, and unrepresentative on-going programmes of government departments or banks.

a reliable and adequate water supply. Without water, nothing can be done. (On Hasdeo Bango Project, in kharif 1980, there was so little water that some findings had to be rejected (WAPCCS 1980). On the other hand, the selection of sites which are well supplied (outlet at the head of a minor at the head of a distributary at the head of the canal, for example) may sidestep and fail to identify major problems and opportunities in main system management. The biggest problems may be precisely unreliable and inadequate water supplies in other parts of the system.

political or administrative pressures. There may be pressures to select a project or part of a project because it has already received special treatment, or because it is the base of an influential person. This may or may not matter, but it does carry with it the danger of further pressures to apply multiple interventions which may make learning lessons and subsequent replication more difficult.

Solutions

- i. careful specification of the objectives of the action research and of criteria for project and site selection.
- ii. full reconnaissance with time to look for alternatives, offsetting recognised biases towards unsuitable or unrepresentative projects or sites.

Trap Two: Practitioners Versus Researchers

This is a trap we have already fallen into. In writing this paper we have been thinking from the point of view of the researcher, not of the practitioner. Yet such action research is necessarily a collaborative effort between researchers and those who manage canal systems. If it is not or cannot be collaborative, it is likely to be confined, as the Pakistan work of CSU was, below the outlet.

The problems here may be serious and deep, and no purpose is served by ignoring them. Practitioners - those operating a canal project, or the relevant staff or other government departments - may understandably resent a body of outsiders - whether from government or from a research institution - who come and wish to introduce

changes. There is a widespread tension between doers and thinkers, aggravated when the thinkers think they can tell the doers what to do, and the doers think the thinkers do not know what they are talking about. The engineers in charge of a project may feel threatened - by research, by other disciplines, by what they may see as "investigations", and by intrusions into the realm of their authority. The word "evaluation" does not help, with its connotations of making judgements on performance; and even "monitoring" can have unfortunate nuances, as of being constantly watched. In a pathological form, suspicion and resentment on the part of practitioners could lead to obstructionism, prejudicing the action research or limiting it to areas outside the irrigation engineers' jurisdiction, as appears to have been the case with the CSU Project in Pakistan which was concentrated below the outlet and did not tackle the larger, and some would argue, greater problems and opportunities of management of the main systems.

Solutions

Much depends on personalities and on sequences of activity. Some suggestions are:

- i. consider the willingness of project staff to participate and collaborate in choosing a criterion on which project, or on which part of it, to work.
- ii. involve project staff in describing and analysing their project, and in planning the action research, right from the start. The team conducting a recent interdisciplinary training programme on the Mahi-Kadana Command in Gujarat began by giving a questionnaire to staff. This invited them to describe their work and problems and to present constructive ideas for improvements. If staff themselves collaborate in and contribute to the ideas of what action research should be carried out, they are more likely to be constructive and cooperative, and the action research itself will probably be better.
- iii. appraise the extra demands made on project staff. Action research may mean that project staff have to work longer hours, to work at weekends, to be in the field at unusual times, or to travel more. It may even involve them in unpopular activities which entail risks of transfer. It may not often be possible to pay an honorarium in compensation (like the 15 per cent on top of salary paid by the IRFI/NIA project on LTRIS in the Philippines in order to cover the overtime for Saturday and Sunday readings), but unless there is some compensation or incentive, an action research project may run into serious difficulties.

- iv. determine and agree the different roles of practitioners and researchers. The recommendation (Central Water Commission, 1981) of an action team and of a research team, has much to commend it. It is best to be clear about who is doing what.
- v. involve project and research staff in regular reviews of findings and open-ended discussions about priorities and the next stages.

Trap Three: Choosing What to Do

The deepest and most insidious trap is choosing what to do. With the planning and design of irrigation projects themselves, irreversible commitments occur very early on, often before they are recognised for what they are (Carruthers 1979). So too with action research. The temptation is to start with a clear idea of problems and of what to do, rather than with a sustained process of problem and opportunity identification.

It helps to recognise that there are many different problems and opportunities, and that all observers have their professional, disciplinary and other preconceptions - whether salinity, farmers' participation, control structures, warabandi, main system management, monitoring and evaluation, communications and transport, cropping systems, or whatever. Two separate teams could be recruited¹ to examine the same canal system and to recommend interventions for action research, and could, according to their composition, produce entirely different proposals, depending not least on their disciplinary composition.

Rapid appraisals and rapid identification of problems and opportunities may, however, be cost-effective². Their dangers include that quick visits are unlikely to involve farmers or take account of their wishes, insights and constraints, and that they are biased towards what is visible on such visits and at the particular time of the year. Moreover, what is done in one part of an irrigation system may affect the rest, so that the whole system needs to be appraised as well as some of its parts.

¹ It might be a revealing, though expensive, experiment to test this.

² For a longer treatment of these points, and a proposal, see Chambers 1981.

Solutions

- i. plan to delay decisions about the nature of the action research. Time must be allowed for adequate appraisal, and discussion. Preliminary fact-finding surveys, and analysis of existing information, are necessary. In the IRRI project, for example, the researchers did not automatically assume, as is often the case, that crop water supply problems were a result of faulty farm-level design or management. The approach was to start with a systematic problem-identification procedure which led the researchers to the conclusion that system-level rather than farm-level water allocation deficiencies were, in fact, the greatest constraint to increasing agricultural productivity in the pilot area. The programme then focussed on testing alternative system management techniques which led to important breakthroughs in performance. Had the researchers evaluated more conventional farm-level solutions without first conducting a broad enquiry into the nature of the water management problems of the area, it is probable that the large improvements in performance obtained as a result of the programme would not have been achieved.

- ii. ensure a range of disciplines in the appraisals. It could be as misleading for, say, an engineer and an agronomist to carry out an appraisal without a farming systems agricultural economist, as for, say, a sociologist and a management specialist to do it without an engineer. A possible list is:

irrigation engineer
agronomist/soil scientist
agricultural engineer
agricultural economist (farming systems)
sociologist/extensionist

as a minimum, with management science and more specialised scientists on an ad hoc basis.

- iii. at the time of appraisal, have a wide range of disciplines available, without any commitment that they will necessarily be involved in implementing the action research. For example, it may be important for an agricultural engineer to examine field channels and water distribution below the outlet to see whether that provides an opportunity; but that should not commit the action research necessarily to agricultural engineering below the outlet, or even necessarily to having an agricultural engineer on the final team.

- iv. in appraisal and identifying interventions, use a repertoire of methods for rapid investigation while recognising their limitations. In particular the techniques developed by Collinson (1981 forthcoming) and Hildebrand (1981 forthcoming) may be useful.

Trap Four: Special Inputs and Multiple Causation

This is a vexing problem. Action researchers, both practitioners and researchers engaged on action research, want to succeed. Success is liable to be defined in terms such as higher yields, or higher yield: water ratios, or satisfied farmers. The pilot project syndrome is familiar. The site is chosen. The interventions (a rotation, a structure, farmer organisation, field channels, land levelling, or whatever) are introduced. But at the same time:

- the main system supply is more adequate and more responsive than before. The engineers know the project is going on and cooperate or play safe, according to one's point of view, in taking pains over the water supply, if necessary denying others elsewhere. Indeed, if the supply to the study area is steady and predictable, this may be at the offsetting costs of less steadiness and less predictability than before elsewhere. Further, a larger area irrigated in the study area may be at the cost of tailends elsewhere (unmonitored, unseen, and unheard) which get less. A "success" on one major, distributary, minor, or outlet, may be a net loss for a system as a whole.
- various organisations make or are induced to make special efforts. Their help may be needed to provide benefits which will induce farmers to cooperate with the experiment in the first place. They are willing because they see the possibility of some reflected glory. A bank supplies credit; HYVs, fertiliser and pesticides follow. Extension visits are intensified. And as a result yields are indeed substantially higher than the year before, or than in other parts of the system. The temptation is then to attribute increased yields and farmer satisfaction to the trial intervention and not to the special inputs.

Solutions

The most effective solution would be to restrain other inputs in the trial area (unless they are easily replicable as part of the extension of the trial). However, this may often not be practical or feasible, in which case the following corrective measures are possible:

- i. monitor and record special inputs, including staff time.
- ii. assess the effects of the action research on other parts of the irrigation system. This implies, at a minimum, monitoring key control points on the boundaries of the area where interventions are made.
- iii. use statistical techniques and exercise judgement to disentangle from the mess of multiple causation what can legitimately be attributed to the action research proper. The use of statistical techniques such as tests of hypotheses, experimental design models, and multiple regression would appear to hold much promise, but they require implementing and evaluating multiple interventions with varying levels of other inputs at different locations in the action research area, monitoring and recording all special inputs in each case. The data collection needs could thus become prohibitive.

Trap Five: Tramlines

A good action research project is not like a blueprint which is designed and then constructed, or a vehicle which is set on rails and then pushed along them. It is more like a boat launched into uncharted waters where skill in taking frequent soundings, in steering to avoid shoals, and a readiness even to change destinations, may be keys to success. It may be tempting to judge action research adversely if it sets out in one direction and then changes this to end up somewhere that was not foreseen. The question, though, is whether that place was better than the original destination. It may often be so.

But many forces impede flexibility. Patterns set early. The recruitment of staff is very committing, especially the choice of disciplines. A sociologist and an agricultural economist together might devise a very different action research programme from an agronomist and an engineer together. Any combination of staff, once working on a project, necessarily introduces an element of inflexibility.

Solutions

- i. regular open-minded reviews with a readiness to change course.
- ii. the use of ad hoc consultants for tasks which do not require a long-term input.
- iii. steering groups or committees which are prepared to learn, change their minds, and help action researchers to change direction, as necessary.

Trap Six: Measurement and Monitoring

The objective of action research is improvement in irrigation performance. This implies that criteria for measuring irrigation performance and improvements thereon must be defined, in order to enable action-researchers to make judgements on alternative interventions. Though several alternative criteria may be defined in terms of water delivery, productivity, equity, or other measures of performance (Lenton, 1981), what is most important is that researchers clearly define their criteria for evaluation of performance at the start of the project, and thereafter assess existing performance and effects of alternative interventions only in terms of these criteria.

This is seldom done. A common failure in action research projects is a lack of clarity in defining performance criteria, or a lack of a consistent monitoring and evaluation programme to determine changes in these levels as a result of interventions. Equally important are the traps of overcollection of data, inaccurate data, and measuring the wrong things. Water presents problems because of its elusive nature and its ability to change its form and location, not least inconveniently at night. Since more sparing use of water will often be a part of action research, measurement of flows has to be faced.

A further difficulty is restraining enthusiasm for "good" results. Crop cutting can be done in many ways. Staff may sense that their superiors will be better pleased if they report high yields than low. Bearers of bad news (low yields in the trial area) may be fearful. The problems are familiar enough.

Solutions

- i. limiting data collection to what is most likely to be relevant.
- ii. taking pains to measure carefully those factors which are critical for interpreting results.

- iii. supplementing and interpreting measurement through personal observation and judgements, including the observation and judgement of farmers.
- iv. impressing on investigators that the truth is what matters.
- v. separating the monitoring organisation from the operational organisation.

Trap Seven: The Counterfactual

The counterfactual is what would have happened without an intervention. It is possible, for example, to have a positive result which is attributed to the intervention, when without the intervention the result would have been even more positive because of other causes. The counterfactual problem is traditionally tackled through controls. It is a matter for debate how effective controls are on irrigation systems where every outlet, minor and distributary has its own character.

Solutions

- i. careful selection of very similar controls where controls are used.
- ii. in interpreting results, careful description on judgements of both trial area and controls, and of inputs (including rainfall, irrigation water, and staff inputs into, for example, farmer organisation).

A COLE

A simple, though exacting, point code can be suggested, on grounds which are both moral and practical:

- i. asking who gains and who loses.

The universal questions of political economy, which applies to all workers in all professions and disciplines, is easily overlooked in the rush and excitement of action and research. With action research, the question applies not just within the domain of an experimental site, but more widely at two levels. The first is in appraisal, design and steering of the project. Action research which involves small farmers in gaining equitable water supplies, or which redistributes water from heads to tails, may have different social effects to action research which, say, concentrates on the construction of field channels, or a change in irrigation intensity and cropping patterns. Moreover, if

action research leads to replication, then it can be asked at an early stage what sorts of people would benefit if such replication proved worthwhile and were implemented.

ii. involving affected people.

Teams of staff and specialists tend to talk to one another rather than listen to the affected people - farmers, the landless, women and others. They also tend to despise or overlook the knowledge and understanding that rural dwellers have. But the people affected are often good sources of practical ideas, mines of knowledge about their farming systems, and invaluable sounding boards to test for feasibility. Highly trained professionals are sometimes primitive in their inability, unwillingness, or lack of time, to tap and work with those ideas and that knowledge.

Too easily, farmer involvement can be an afterthought. No one is against it, but somehow it is low on the agenda. In practical terms, a more productive and equitable future for canal irrigation in India may necessarily lie with much stronger farmer organisation exercising pressures, demands from below, to secure their rightful share of water. If farmers are not involved in much action research, that may mean a heroic and unrealistic simplification, and a loss of opportunity. The experience with small communal systems in the Philippines (Alfonso 1980; Bagadion and Korten 1980; de los Reyes 1980; Korten 1980)¹ reinforces the view that it is both right and practical to involve farmers closely in programmes which affect them right from the start.

iii. involving project staff.

It is both right and practical that project staff should be full partners in diagnosis, prescription and implementation. Their commitment is vital and their knowledge and ideas a precious resource.

iv. considering replication.

Exceptional self-restraint may be called for in action research. The temptation to introduce treatments which cannot be replicated can be strong. This means that self-discipline is needed in deciding what to do, and being prepared to do less, with less dramatic results in yields or hectares irrigated, in

¹ These references are taken from ODI 1980, which summarises them and others. They have not been directly consulted.

order to achieve greater replicability. This applies especially to the water supply, if water is short in some parts of the system, and to the supply of fertiliser and other inputs. It may be difficult to prevent a bank, or extension organisation, from oversupplying inputs and credit to an experimental area, but such prevention may also, ironically, be a condition for success in identifying a replicable approach. On the other hand, subsidies may sometimes be necessary to encourage farmers to take part. The rule is repeatedly to ask whether and how an approach which is being developed could be spread much more widely.

v. reporting the experience, warts and all.

Social anthropologists are adept at telling stories against themselves¹. As a result, their findings gain in credibility. Similarly, those who report on action research will carry conviction to the extent that they are frank and comprehensive in describing what they did, what happened, the mistakes that were made, and the limitations of the methods used and the data that resulted. This requires something like the keeping of a diary, what has been called "process documentation". It is unfortunately not very common to find a thorough and critical self-evaluation of what happened and of research methods, or for data to be rejected. One difficulty is that members of a multi-disciplinary team, as we have found ourselves, may be inhibited from criticising the team's work or exposing its weaknesses because of the implied disloyalty to colleagues. Yet unless shortcomings are described, warts and all, and allowed for, then "findings" may be invested with a dangerously misleading authority.

Detailed and critical reporting is also needed to enable the jump from factual findings to policy conclusions. A major problem here is multiple or alternative causation. The WAPCOS (1980) report on experimental work in Madhya Pradesh is an example of more comprehensive reporting than usual, including water supplies, rainfall, the position of experimental outlets on the system (head, middle or tail of minor, distributary, branch canal and main canal), inputs such as fertiliser, and so forth. Analysis of this information underlines the difficulties of drawing inferences when there are multiple interventions, the difficulties of using controls, and the importance of judgement. All these contribute to an understanding of methodological problems in a way that would not have been possible had WAPCOS not monitored special inputs, and not presented such a range of data.

¹ See for example Beteille and Madan 1975.

vi. reporting the inconclusive and negative.

To report results which are negative can be a difficult challenge, or quite natural and easy, depending on the attitudes of the action researchers and the orientation of their sponsors. At one extreme, there can be a preconceived commitment to a solution and a blueprint approach where those taking part feel they have to achieve their targets. This is a disaster course which can lead to false conclusions. At another extreme, those taking part can be very detached, almost indifferent to the results, concerned only with obtaining some results, whatever they may be. Detachment may be preferred, but too much of it can also be had if it means a failure to engage in the continuous struggle to find good, replicable interventions.

The early work of IKRI in the Philippines illustrates the point. In 1974, an experiment was conducted on the Upper Pampanga River Project in which equal amounts of water were supplied to two 50 ha blocks. The water to one block was rotated; the water to the other was applied continuously over the whole 50 ha area. The researchers found that the rotation involved substantial costs and did not lead to a significant increase in yields (Bhuiyan 1980:141). This negative finding must have contributed to the search for other approaches, and the subsequent work on main system management which achieved quite dramatic increases in yields (Valera and Wickham 1976; Early 1980) and which have influenced thinking throughout South and Southeast Asia. Had the results of the first experiments been judged in some way to show higher yields where water was rotated, there might have been a long delay in recognising the importance of main system management.

In many situations researchers face what appear to be inconclusive results. In these circumstances it is important for them to review first whether they have gone far enough in extracting useful information from the action research programme. In some cases the results can be made more conclusive by redesigning the experiments and/or using statistical techniques for data analysis. Frequently, however, particularly when faced with time or budget constraints, these programme modifications will not be possible, and in these cases, as with negative results, it is important to report honestly on the research so that false conclusions are not drawn.

Researchers should be recognised and rewarded for reporting the full truth, whatever it may be. To fail to report the inconclusive or negative is to mislead. In contrast, to point to the negative or inconclusive as in the Philippine example, is to enable action research to change direction, to steer to avoid shipwreck, and perhaps even to point closer towards the promised land,

vii. making judgements.

Finally, action research, involving as it does choices, steering and adjustments, requires many good judgements for which there are no rules. Such judgements require not just science, but also an openness to evidence and ideas, fair-mindedness, and flair. They involve seeing opportunities as well as problems. They involve deciding when an approach should be stopped or modified. Let it also be said in conclusion, that they involve optimising, and this may mean selectively ignoring advice (like some of that in this paper) that it would be too difficult, expensive or time-consuming to take.

REFERENCES

- Alfonso, F. forthcoming "Assistant farmer controlled development in communal irrigation systems", in D. C. Korten and F. Alfonso eds., "Bureaucracy and the Poor: closing the gap", McGraw Hill.
- Ali, Syed Hashim and Syed Turabul Hassan 1980 "Management of Canal Irrigation Systems and Warabandi", in K. K. Singh ed., Warabandi for Irrigation Agriculture in India, Central Board of Irrigation and Power Publication No. 146, Central Board of Irrigation & Power, Off Malcha Marg, Chanakyapuri, New Delhi, pp. 32-37.
- Bagadion, Benjamin V. "People's participation: a learning process", NIA Digest, (National Irrigation Administration, Manila, Philippines), 9, 2, pp. 2-14.
- Bagadion, Benjamin V. and Frances F. Korten 1980 "Developing Viable Irrigators' Associations: lessons from small scale irrigation development in the Philippines", Agricultural Administration 7, 4, November, pp. 273-287.
- Bagadion, Benjamin, Frances Korten, David Korten and others 1980 "Promoting Participatory Management on Small Irrigation Schemes: An Experiment from the Philippines", CDI Irrigation Management Network Paper 2/80/2, based on articles by Benjamin Bagadion, Frances Korten, David Korten and others, Overseas Development Institute, 10 Percy Street, London W1P CJB.
- Beteille, Andre and T. N. Madan 1975 Encounter and Experience: Personal Accounts of Fieldwork, The University Press of Hawaii, Honolulu.
- Bhuiyan, Sadiqul I. 1980 "Water Allocation, Distribution and Use Criteria for Irrigation System Design and Management: Selected Research Findings", in IRRI 1980, pp. 139-157.
- Bottrall, Anthony 1981a "Improving Canal Management: the Role of Evaluation and Action Research", Water Supply and Management, Vol. 5, pp. 67-69.
- Bottrall, Anthony 1981b "Issues in Main System Management", paper to Workshop on Investment Decisions to Further Develop and Make Use of Southeast Asia's Irrigation Resources, Kasetsart University, Bangkok, 17-21 August.

- Carruthers, Ian 1979 "Too Late to Change: Trap the Reality of Multi-disciplinary Planning in Irrigation", paper to the Conference on Rapid Rural Appraisal, Institute of Development Studies, University of Sussex, Brighton, UK, 4-7 December.
- CADD, AP 1981 Final Report on Irrigated Water Management in Vantivelagala Distributory of Revanur Branch Channel of Kurnool - Cuddapah Canal During Kharif Season of 1980 in Allagadda Taluk - Kurnool District, Command Area Development Department, Andhra Pradesh, 1981.
- CAE, TNAU 1980 "Agenda and Notes, Advisory Committee for Water Use Efficiency Increase in Lower Bhavani Project Command Area", Department of Soil and Water Conservation Engineering, College of Agricultural Engineering, Tamil Nadu Agricultural University, Coimbatore.
- Central Water Commission 1981 "A Proposal for an Action Research Program in Selected Irrigation Projects", Unpublished Document, June.
- Chadha, C. P. 1980 "Consultancy Services in Water Resources Development", Irrigation and Power Journal, (Journal of the Central Board of Irrigation and Power, Off Malcha Marg, Chanakyapuri, New Delhi), 37, 4 October pp. 387-389.
- Chambers, Robert 1981a "Appraising and Improving Canal Irrigation" (draft for comments), The Ford Foundation, 55 Lodi Estate, New Delhi, April.
- Chambers, Robert 1981b "A Note on Outlet Studies Conducted by WAPCOS in Madhya Pradesh in Kharif 1979", The Ford Foundation, 55 Lodi Estate, New Delhi.
- Clyma, Wayne, Max Lowdermilk, and Gilbert L. Corey "A Research - Development Process for On-Farm Water Management", Technical Report No. 47, Water Management Research Project, Colorado State University. (Report available from Publication Office, Engineering Research Center, Colorado State University, Fort Collins 80523).
- Collinson, Michael 1981 forthcoming "A Low Cost Approach to Understanding Small Farmers", Agricultural Administration.

- Colorado State University 1980 Executive Summary, Water Management Technical Report No. 65-A, prepared by Gaylord Skogerboe, Max K. Lowdermilk, Edward W. Sparling, Jacob E. Hautaluoma, Water Management Research Project, Engineering Research Center, Colorado State University, Fort Collins, USA, May. (Over 60 water management technical reports have been published by the Water Management Research Project. Reports are available from the Publications Office, Engineering Research Center, Colorado State University, Fort Collins, Co.80523, USA).
- de los Reyes, Romana 1980 'Managing Communal Gravity Systems: Farmers' Approaches and Implications for Program Planning, Institute of Philippines Culture, Ateneo de Manila University, Quezon City, Philippines.
- Early, Alan C. 1980 "An Approach to solving irrigation system management problems", in IRRI 1980, pp. 83-113.
- Hassan, Syed Turabul 1981 "Evaluation Study of Warabandi (Rotational Water Supply System) under Shreeramasagar Project Command Area", Shreeramasagar Project (Pochampad), Jagtial, Andhra Pradesh.
- Hildebrand, Peter 1981 forthcoming "Combining Disciplines in Rapid Appraisal: the Sondeo Approach", Agricultural Administration.
- IRRI, 1980 Report of a Planning Workshop on Irrigation Water Management, International Rice Research Institute, P.O. Box 933, Manila.
- Kemper W. Loral, Wayne Clyma, Gaylord V. Skogerboe, and Thomas J. Trout "Water Course Improvement Research in Pakistan", Water Management Technical Report No. 6, Water Management Research Project, Colorado State University, Fort Collins, Colorado, January. (Report available from Publications Office, Engineering Research Center, Colorado State University, Fort Collins 80523).
- Korten, David C. 1980 "Community Organisation and rural development: a learning process approach", Public Administration Review, 40, 5 September/October, pp. 480-511.
- Lenton, Roberto L. 1980b "Water Resources Management: Some Thoughts on Interdisciplinary Research", IHD Endowment Lecture, Centre for Water Resources, Perarignar Anna University of Technology, Madras.

- Lenton, Roberto L. 1981 "A Note on Alternative Forms of Performance Evaluation in Irrigation Systems", Unpublished Memorandum, The Ford Foundation, 55 Lodi Estate, New Delhi, May.
- Lenton, Roberto L. 1981a "Field Experimentation and Generalization in Irrigation Development and Management", paper presented at the XVII Annual Convention of the Indian Society of Agricultural Engineers, Indian Agricultural Research Institute, New Delhi, February 6-8.
- Valera, A. and T. Wickham 1976 "Management of Traditional and Improved Irrigation Systems: Some Findings from the Philippines", paper presented to the Choices in Irrigation Management Workshop, sponsored by the Overseas Development Institute, 10 Percy Street, London W1P 0JB, held at the University of Kent, Canterbury, September 27-October 1.
- WAPCOS 1980 "M.P. Composite Project Outlet Studies - Summary Report", Water and Power Consultancy Services (India) Ltd., "Kailash", 26 Kasturba Gandhi Marg, New Delhi.