IMPACT INDICATORS

An Alternative Tool for the Evaluation of Watershed Management

MICHAEL W. BOL

भारत-जर्मन द्विपक्षीय परियोजना "जलग्रहण प्रबन्ध"
INDO-GERMAN BILATERAL PROJECT "WATERSHED MANAGEMENT"

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The boundaries shown in the map of India as illustrated in this book are merely indications of locations of areas.

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Cover photograph: An IGBP consultant uses participatory methods to evaluate water harvesting activities (Karkara, Bihar)

PREFACE

Traditionally watershed management has been associated exclusively with soil and water conservation. In recent years, the focus of watershed management has broadened, incorporating more holistic approaches that deal with the larger issues such as natural resource management and improving the livelihood of local people. Projects of this kind are becoming more common and are being implemented through different government departments as well as non-government organisations. Although most of these projects have been beneficial for natural resources and the people living within the watersheds, not enough attention has been given to the monitoring and evaluation of their environmental and social impacts.

The Indo-German Bilateral Project "Watershed Management" has now developed a tool kit to assist practitioners concerned with monitoring and evaluating watershed management projects. This book describes in detail a wide range of impact indicators. From these indicators a set of nine have been selected. This set was designed to evaluate program impacts and has been field tested by Dr. M.W. Bollom and his team. These indicators address the environmental and social impacts of watershed management projects, using a mix of extractive and participatory techniques. For each of these indicators a practical user friendly Project Evaluation Protocol (PEP) is enclosed.

It is my hope that the indicators and methodologies described in this book will be highly beneficial for any kind of development project concerned with evaluating the environmental and social impact of their activities.

G. Honore
German Project Coordinator

ACKNOWLEDGEMENTS

As is the case with many books, it is not really truthful to list my name as sole author. Many of the ideas and the data were given to me by other people. My most significant contribution has been to gather and organise these into a coherent whole. While it is not possible to list all of the people who have helped me, a few stand out. The Indo-German Bilateral Project "Watershed Management" funded this entire exercise. The original idea for this undertaking and much on-going inspiration was provided by Guy Honoré, the German Project Co-ordinator. Fellow professionals at the Indo-German Bilateral Project (E. Tideman, P.K. Das, S. Kumar and S. Yadav) guided my investigations, answered innumerable questions and corrected my many misconceptions. The Project staff (Lekha, Latha, and Arjun) provided me with much logistical support. Almost none of the field studies would have been possible without the work of my evaluation team members: Dr. K. Lavanya and Aparna Kanungo—they brought insightful eyes, analytical minds and local knowledge. During my field visits, the Project's partner NGOs (PRADAN in Bihar, SUTRA in Himachal Pradesh, and MYRADA in Tamil Nadu) gave generously of their time and answered many of my questions. In particular, S. Rajkumar of MYRADA offered me many insights into the reality of institution building. Thanks also to Dr. Kasturi Basu, whose savage red pen provided much needed editorial support. Finally, I must thank the people of the Karkara, Arki and Kattery watersheds. Without their generous inputs, I would not have been able to develop and test the indicator set described in this report. It is to them, and others like them all over the world, that I dedicate this book. I hope that the ideas contained in it will improve their lives, at least in some minor way.

CONTENTS

LIST OF ABBREVIATIONS

AED . . . . .Agricultural Engineering Department (Tamil Nadu)

Crore . . . .[Equal to Ten Million]

DVC . . . . .Damodar Valley Corporation

DM . . . . . .District Magistrate

FD . . . . . . .Forest Department (Himachal Pradesh)

GoI . . . . . .Government of India

IGBP . . . . .Indo-German Bilateral Project "Watershed Management"

Lakh . . . . .[Equal to One Hundred Thousand]

MYRADA .[An Indian NGO, based in Karnataka State]

NGO . . . . .Non-Governmental Organization

PEP . . . . . .Programme Evaluation Protocol

PI . . . . . . .Principle Investigator

PRA . . . . . .Participatory Rapid Appraisal

PRADAN . .[An Indian NGO, based in New Delhi, with offices in Hazaribagh, Bihar]

RVP/FPR . .River Valley Project / Flood Prone Regions

RWS . . . . .Representative Watershed

SUTRA . . .[An Indian NGO, based in Himachal Pradesh]

SMS . . . . . .Silt Monitoring Station

WTMS . . . .Water Table Monitoring Station

EXECUTIVE SUMMARY

Impact indicators can be used to evaluate watershed management programmes. After spending close to six weeks testing and refining the Programme Evaluation Protocol (PEP) under field conditions, it is quite clear that the nine selected indicators can be used to quickly, cheaply and easily measure a programme's physical and socio-economic impacts in rural watersheds.

- Exclusive of travel time, a team consisting of a principal investigator and two assistants was able to execute the preliminary PEP in two Representative Watersheds (RWSs) in less than three weeks.
- The indicator set requires very few tools, the most expensive of which was a small measuring stand. In addition, the research assistants required only three days of orientation before the actual field visit.
- It was important that at least one team member be a native speaker of each local language encountered. Other qualifications are a rural development or social science background and experience with participatory evaluations.
- Of the nine indicators in the set, four—*Height-for-Age, Consumer Durables, Use* and *Outsiders*—are highly recommended. Three more—*Soil Loss, Ground Water,* and *Replication*—are recommended with some reservations. This is because they do not meet all of the original selection criteria (i.e., that the indicators be fast, cheap and easy to use). Finally, it is recommended that *Attendance,* and *Social Capital* be further modified by practitioners due to reliability problems.
- The indicator set was tested in two Representative Watersheds of the Indo-German Bilateral Project (IGBP). The empirical findings generally show Kattery Watershed (Tamil Nadu) to be more socially and materially advanced than the Arki Watershed (Himachal Pradesh).
- The investments that have been made in Kattery are used more heavily. Investments in Kattery also appear to be more sustainable than those in Arki. This is partly due to the fact that the NGO in Kattery, MYRADA, has made significant advances towards building up the social institutions necessary to manage programme investments independent of IGBP support.
- Where change was recorded, it was directly linked to IGBP activities in only a few cases. Again, this is not surprising because the RWS Programme has been in operation for less than two years. Some activities have, however, already begun to demonstrate

their potential to bring about positive change. For example, the federation of self-help groups in Kattery have begun to address community watershed problems. In Arki the Forest Department's programme to plant sapling species in consultation with community groups and privatise grass cutting rights on government forest lands has improved the quality of both grass and the survival rate of saplings on that land.

1

INTRODUCTION

Natural resource management projects have traditionally been assessed through *benefit-cost ratios*. Calculating these ratios tends to be expensive, time consuming and difficult to implement. Computing these benefit-cost ratios requires that the total benefits of a project are divided by its total costs. If this ratio is greater than one, the project is considered a success. For example, if there is an investment of Rs. one lakh in an irrigation scheme and the benefits derived from it are worth Rs. two lakhs, then the benefit-cost ratio is two.

Internal rates of return are benefit-cost ratios that have been discounted for time. Discounting is extremely important because project investments are often separated from payoffs by large periods of time. For example, Rs. one lakh invested in a forestry project today may, after a sufficiently long period of time, produce Rs. two lakhs of return (benefit-cost ratio of two). The problem, however, is that it is not meaningful to compare Rs. one lakh invested today with Rs. two lakhs recovered thirty years from now. In all likelihood, Rs. two lakhs thirty years from now

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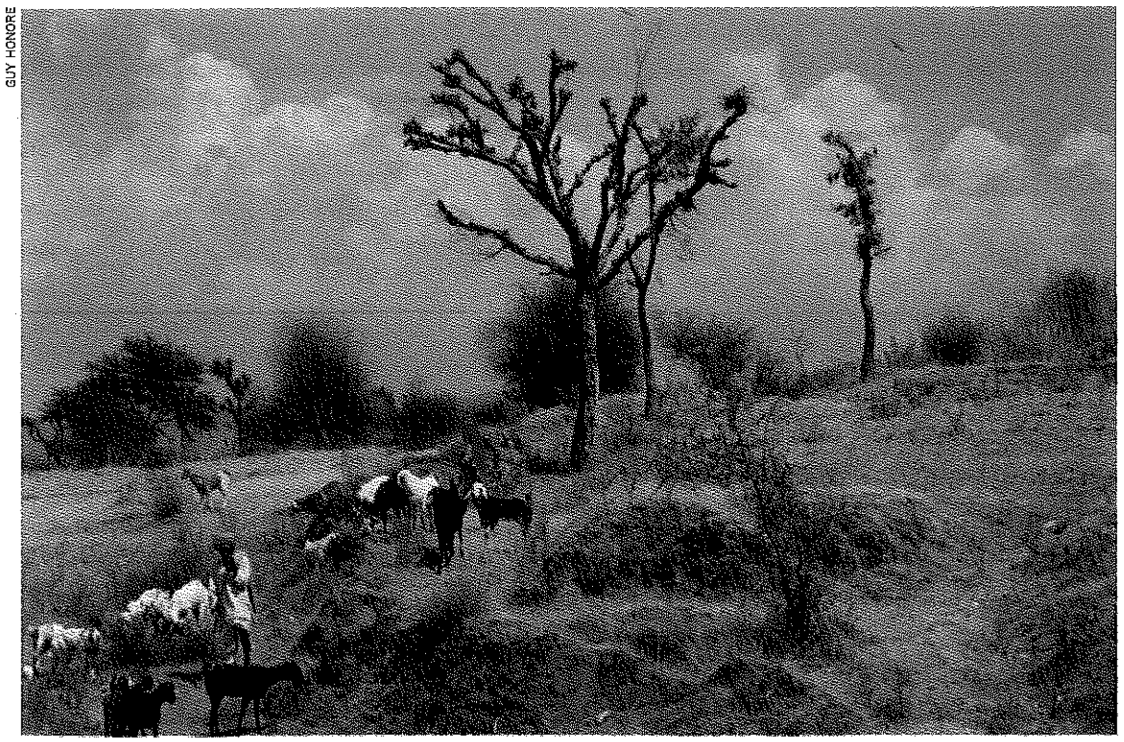


Degraded land (Burhapuran, Rajasthan)

will be worth less than what Rs. one lakh is today (i.e., a benefit-cost-ratio of less than one). For this reason, benefit-cost ratios are adjusted for time (or "discounted") producing internal rates of return.

Adjusting costs for time is in itself a difficult issue, but estimates can be made (often using long-term inflation or depreciation rates). It is more difficult to quantify project benefits (whether they are reaped today, or in three decades). The first difficulty lies in determining all project benefits. For example, what are all the benefits of an irrigation project? Would a list of benefits only include increased crop yields, or should it also include improvements in public health, lower migration rates, higher incidence of school attendance, changing gender relations, etc.? Even if all benefits are specified, taking exact measurements of these changes is often very resource intensive. In addition, there is the added problem that not all the benefits are easily quantifiable. How can the benefits of phenomena like changing gender relations be quantified? Yet benefit-cost ratios require quantification.

Indicators can be a fast, cheap and easy alternative to making the direct, quantified measures of project impacts needed for benefit-cost ratios and internal rates of return. Quite simply put, an indicator is a proxy measurement—one easily-measured phenomenon, which is closely related to a target phenomenon that is more difficult to measure. If some phenomenon can be measured directly, indicators are unnecessary. It is only when a direct measurement cannot be taken that an indicator needs to be employed. For example, one could directly measure the distribution of heights in a classroom of twenty co-operative children given the availability of an accurate metre stick. But what if the children will not co-operate or there is no metre stick available? Perhaps each child's height could be approximated relative to a chair in the classroom known to be exactly one metre high. Height in relation to the chair would then be an indicator of the children's actual heights.

P.K.DAS

Rehabilitation of degraded lands by Birhore tribals (Karkara, Bihar)

Indicators are also used to indirectly measure concepts that are abstract and/or complex. This is often the

case in the realm of natural resource management. For example, how does one directly measure bio-diversity? The concept itself is quite abstract, and even when precisely defined, its direct measurement would be a Herculean task. In this case, the presence and vitality of one particular species might be used as an indicator of the entire region's bio-diversity. For example, in the American Pacific Northwest, the spotted owl population has been used as an indicator of bio-diversity in coastal forests.

This book presents indicators as an alternative to traditional methods of evaluation such as benefit-cost ratios. It is in no way suggested here that indicators replace benefit-cost analysis, only that indicators can be an extremely useful evaluation tool for watershed management projects. This is especially true when time and monetary resources are in short supply.

Background of this Book

In mid-1997 the Indo-German Bilateral Project "Watershed Management" (IGBP) commissioned a study to design an indicator set that could be used to evaluate the impact of its watershed management programmes. The hope was that the IGBP could develop an inexpensive and less time consuming way to assess the impacts of its RWS Programme. The resulting report was informed by a literature review of existing Indian and international thinking on impact assessment. In addition, IGBP organised a one-day workshop on impact indicators. It was attended by about thirty Indian and international experts in the fields of rural development and natural resources management.[1] The recommendations of the workshop participants were incorporated into the final report.[2]

THE INDO-GERMAN BILATERAL PROJECT "WATERSHED MANAGEMENT"

The Indo-German Bilateral Project "Watershed Management" (IGBP) is an effort in technical co-operation between the Government of India (Ministry of Agriculture, Soil and Water Conservation Division) and the Government of Germany (Ministry of Economic Co-operation and Development). Established in 1989 with funding from the German Technical Co-operation (GTZ), the IGBP operates under the Government of India, Ministry of Agriculture's Flood Prone Regions / River Valley Projects (RVP/FPR) schemes. RODECO Consulting GmbH, a German consulting company, executes the project from its New Delhi office.

The IGBP's central mission is natural resource management. Towards that end, it works with the Government of India (GoI) to improve its erosion control efforts in rural India. Since the IGBP commenced operations, it has implemented hydrological monitoring activities to assist the GoI's efforts to measure progress made by on-going erosion control activities. In addition, the IGBP trains local field-level staff in hydrological monitoring and conservation practices. The project is currently carrying out these activities at 32 selected Silt Monitoring Stations (SMS) in eleven Indian states: Rajasthan, Uttar Pradesh, Himachal Pradesh, Orissa, Madhya Pradesh, Bihar, Andhra Pradesh, Tamil Nadu, Gujarat, Bihar and Maharashtra.

In March and April of 1998 a team of three investigators (hereafter referred to

[1] "Workshop on Impact Indicators" sponsored by the IGBP (New Delhi, India), December 12, 1997.

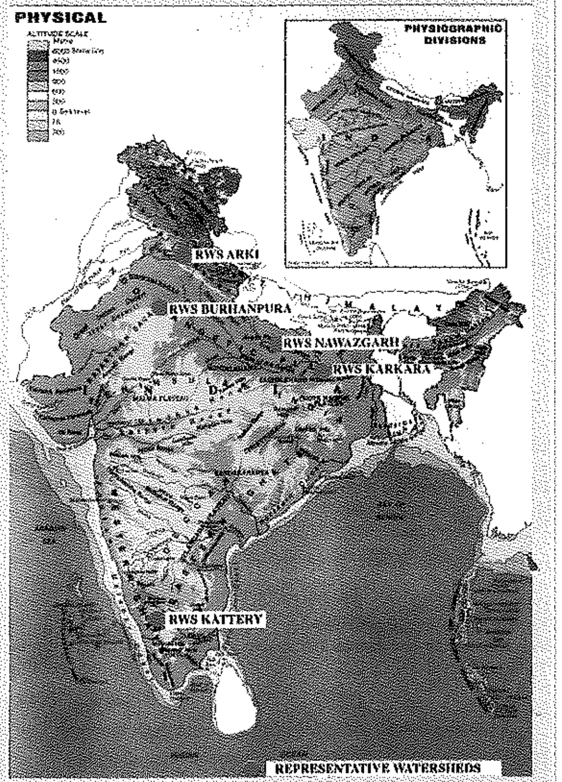
[2] Michael W. Bollom, "Impact Indicators: In Search of Fast, Cheap and Easy Indicators to Assess Physical, Social and Economic Change caused by Watershed Management Projects" (New Delhi: IGBP Technical Paper No. IGBP-WSM 86/98, 1998).

THE RWS PROGRAMME

In an effort to enhance the efficacy of soil conservation measures, the IGBP initiated a Representative Watersheds (RWS) Programme in 1992. Five watersheds were selected for this programme based on criteria that had been established by the All India Soil and Land Use Survey (AISLUS) by prioritising watersheds according to their severity of erosion. In each of the five Representative Watersheds, the IGBP has selected a partner NGO to work with towards the goal of building increased local awareness of natural resource issues and participation in IGBP activities.

The IGBP facilitates awareness and participation in watershed activities by creating a platform for co-operation and co-ordination between concerned State Government Departments and local NGOs. Together they should work to develop the watershed and protect its natural resources. The theory is that only through local participation can erosion control activities be effectively designed, implemented and sustained. RWS sites are located in Rajasthan (Burhanpura), Uttar Pradesh (Nawazgarh), Himachal Pradesh (Arki), Bihar (Karkara) and Tamil Nadu (Kattery). Four new RWSs will soon be included—one in Andhra Pradesh, one on Karnataka and two in Uttar Pradesh.

To date, all RWS activities are either in a pilot or demonstration phase—the Programme is experimenting with new techniques and/or demonstrating these techniques under new conditions. The long-term goal, however, is to create a sustainable and replicable programme. The techniques developed must be sustainable within the resource constraints faced by the Government of India and replicable in other watersheds for the programme to have long-term benefits. The IGBP's goal is to hand over a watershed management protocol that the GoI can replicate in other watersheds under its RVP/FPR schemes.



Map adapted from *An Atlas of India*

at the "evaluation team") tested a preliminary draft of the Programme Evaluation Protocol (PEP)—a manual offering detailed instructions for executing a set of nine indicators. The test evaluation was conducted in two IGBP watersheds, Arki in Himachal Pradesh and Kattery in Tamil Nadu. These evaluations were carried out with two goals in mind.

The first goal was to test whether the indicator set is able to function as intended. Informed by these field tests, the PEP has been modified. The PEP is presented in its entirety in Annex A of this book. It is intended to be a general, but detailed guide that can be followed by other programmes wishing to undertake a similar evaluation.

The second goal of the test evaluations was to gather data, which could be used to evaluate the RWS Programme and serve as a baseline for subsequent evaluations. Some of the more interesting findings are presented in the remaining chapters of this book, alongwith detailed discussions of the individual indicators.

II

WHAT MAKES A GOOD INDICATOR?

THE QUALITIES OF A GOOD INDICATOR

The difficulty with indicators lies not just in selecting ones that can be easily measured, but in selecting *valid* indicators—that is, indicators that are suitable proxies for the objectives ultimately being measured. Gauging the validity of an indicator can be difficult. For example, *The Economist* magazine has for several years used an indicator of foreign exchange rate volatility based on the local currency price of a Mcdonald's Big Mac® relative to the price in the United States. While *The Economist* itself presents arguments as to why this may not be a valid indicator (see box on following page), evidence suggests that the Big Mac® is a reasonably accurate predictor of exchange rate fluctuations.

Indicator selection is difficult in the realm of natural resource management because there is no universally agreed upon set of indicators. But, as a recent GTZ report (Heidrun Traeger 1997, 79) argues, the search for a universal indicator set leads to a "dead end" because the choice of indicators depends upon the objectives of the programme being assessed and the natural conditions under which the indicators are used.

This means that the indicators chosen need to be *programme-specific*. That indicators should only seek to measure change concerning project objectives is important. The point (which is very much linked to the issue of causality) is that if a programme does not seek to affect a particular phenomenon, one can hardly attribute changes in the phenomenon to that programme. For example, if a project aims to preserve biological diversity, it makes little sense to employ indicators that measure ground water quality. This may lead observers to believe that the project has been responsible for an increase in ground water levels that has occurred recently.

In addition, indicators by themselves (e.g., the number of spotted owls in a fixed geographical area) have little meaning. Indicators only have meaning in the light of *specified targets* and *threshold values*. For example, biologists might determine that bio-diversity is threatened when the number of spotted owl pairs in a one hundred square kilometre of forest falls below twenty. Targets and thresholds must be specified for all indicators.

Useful indicators must be *comparable* across time and space. In order to assess change in one case over time, a researcher must be able to ascertain whether current measurements show significant variance

THE HAMBURGER INDEX

For more than a decade, *The Economist*'s Big Mac index has provided a delectable guide to whether currencies are at their "correct" level. The Big Mac index is based upon the theory of purchasing -power parity (PPP)—the notion that a dollar should buy the same amount in all countries. In the long run, argue PPP fans, currencies should move towards the rate which equalizes the price of an identical basket of goods in each country. Our "basket" is a McDonald's Big Mac®, which is now produced in over 100 countries. The Big Mac PPP is the exchange rate that would leave hamburgers costing the same in America as abroad. Comparing actual exchange rate with PPP provides one indication of whether a currency is under or over-valued.

The first column in the table below shows local-currency prices of a Big Mac; the second converts them into US dollars. The average American price (including tax) is $2.42. China is the place for bargain hunters: a Beijing Big Mac cost only $1.16. At the other extreme, Big Mac fans pay a beefy $4.02 in Switzerland. In other words, the yuan is the most under-valued currency (by 52%), the Swiss franc the most overvalued (by 66%).The third column calculates Big Mac PPPs. For example, dividing the German price by the American once gives a dollar PPP of DM 2.02. The actual rate on April 7th was DM 1.71, implying that the Deutsche-Mark is 18% overvalued against the dollar. But over the past two years the dollar has risen nearer to its PPP against most currencies. The yen is now close to its PPP of Y121. Two years ago the Big Mac index suggested that it was 100% overvalued against the dollar.

Some critics find these conclusions hard to swallow. Yes, we admit it, the Big Mac is not a perfect measure. Price differences may be distorted by trade barriers on beef, sales taxes, or large variations in the cost of non-traded inputs such as rents. All the same, the index tends to come up with PPP estimates that are similar to those based on more sophisticated methods.Moreover, research by Robert Cumby, an economist at Georgetown University, suggests that a currency's deviation from Big Mac PPP can be a useful predictor of exchange rates. Over the past year, the Big Mac index has correctly predicted the direction of exchange-rate movements for eight of twelve currencies of large industrial economies. Of the seven currencies which changed by more than 10%, the Big Mac standard got the direction right in six cases. Better than some highly-paid currency forecasters. Investors who turned up their noses at the Big Mac index should now be feeling cheesed off.

THE HAMBURGER STANDARD	Big Mac Prices		Implied PPP* of the dollar	Actual $ exchange rate 7/4/97	Local currency under(-)/over(+) valuation, ** %
	In local currency	In dollars			
United States ***	**$2.42**	**2.42**	-	-	-
Australia	A$2.50	1.94	1.03	1.29	-20
Brazil	Real 2.97	2.81	1.23	1.06	+16
Britain	£1.81	2.95	++1.34	++1.63	+22
Canada	C$2.88	2.07	1.19	1.39	-14
China	Yuan9.70	1.16	4.01	8.33	-52
Germany	DM4.90	2.86	2.02	1.71	+18
Japan	Y294	2.34	121	126	-3
Malaysia	M$3.87	1.55	1.60	2.50	-36
Mexico	Peso14.9	1.89	6.16	7.90	-22
Russia	Rouble11000	1.92	4545	5739	-21
Singapore	S$3.00	2.08	1.24	1.44	-14
South Korea	Won2300	2.57	950	894	+6
Switzerland	SFr5.90	4.02	2.44	1.47	+66
Thailand	Baht46.	1.79	19.3	26.1	-26

* Purchasing-power parity; local price divided by price in the United States. ** Against US dollar
*** Average of New York, Chicago, San Fracisco and Atlanta. ++ Dollars per pound

This story has been adapted from *The Economist* April 12, 1997 (75).

from previous measurements. In order to assess variation across cases, the researcher must be able to show variance longitudinally. Both attempts to measure change require indicators that produce easily comparable data points. This is especially true as data sets grow larger.

In order to facilitate comparison, quantifiable indicators are often preferred. This preference is because quantifiable indicators are often thought to be more *reliable* (i.e., they will produce the same results no matter who undertakes the evaluation or the conditions under which it is undertaken) and *replicable* (i.e., deployable at different programme sites and in different settings). While reliability and replicability are of the utmost importance, they do not require quantification. Indicators need only to be *explicit* (used here to mean "clearly defined and specified").

Given explicit specifications, qualitative/descriptive indicators are not necessarily inferior to numerical indicators. In fact, there are many instances when only qualitative indicators can be used. For example, odour, taste and colour might be the quickest, cheapest and easiest indicators to assess the quality of local drinking water. Odour is not directly quantifiable, neither are taste or colour. While some qualitative descriptions of water odour might be totally incomparable in nature (e.g., poems about the aesthetic qualities of different water samples), this does not need to be the case for all qualitative descriptions. Instead, a research protocol can clearly define a

THE OBJECTIVES OF THE RWS PROGRAM

New approaches to natural resource management work from the assumption that purely technical approaches are incomplete. Thus inspired, the RWS Programme is experimenting with a more holistic approach. This Programme began with the hypothesis that the needs and desires of local people must be incorporated into conservation efforts if they are to be successful. The theory is that successful conservation programmes require local knowledge and co-operation. These can only be obtained when local people feel that programmes are serving their needs. So while the end goal is still soil and water conservation, socio-economic development is a means to this end.

NATURAL RESOURCE MANAGEMENT

As already mentioned, the primary objective of the RWS Programme is natural resource management. In resource-poor countries like India, natural resource management is more concerned with the sustainable use and

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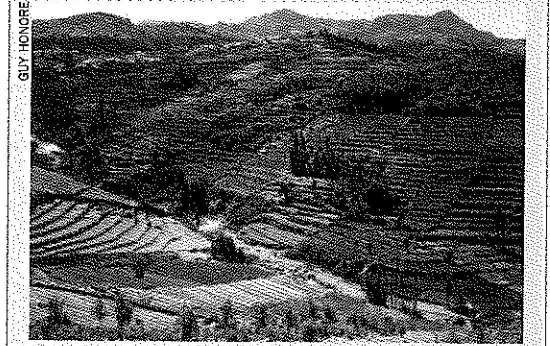

recharge of existing resources rather than with outright protection from use. Along with the interrelated goals of soil and water conservation, there is also a concern about the quality (e.g., salinity, productivity) of these resources. Another related issue is that of the local flora—tree cover in particular is important to soil and water conservation. Other issues of natural resource management (e.g., waste disposal, air quality, etc.), though accepted as important, are of secondary consideration.

POVERTY ALLEVIATION

In the socio-economic realm, the RWS Programme's main objective is poverty alleviation. As long as poverty per-

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THE OBJECTIVES (Cont.)

sists, natural resource management will remain a distant dream. Thus, poverty abatement is a means towards

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natural resource management, and an end in itself. This very broad objective has been divided into the following subheadings.

Wealth augmentation
Poverty has many definitions, the most basic of which is a shortage of wealth, either in cash or kind. Without wealth, people have few choices and are forced to subsist using whatever means they can find in their surroundings. Such desperation often leads to environmental degradation. For the sake of sustainability, watershed management programmes need to focus on the physical needs (food, fuel products, timber, fodder, water supply) of local people, as well as income generating activities.

Economic equity
Vast amounts of wealth do little to offset natural resource degradation if only a few people have access to it. Resources must be distributed such that even the poorest people have access to them. Seeking to help the poorest of the poor first, the RWS Programme considers the needs of the landless labourers a priority.

Health
Improved physical health is a fundamental component of

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limited number of descriptive terms which would be employed to describe each water sample (e.g., sulphuric, brackish, etc.). Such a set of terms could be used to specify and compare the smell of water samples across space and time. If desired, such clearly specified qualitative indicators can, in the end, be numerically coded and used in a statistical analysis.

Indicators also need to be *precise* (i.e., finely calibrated) measures in order to be useful. An indicator may be a valid measure of some phenomenon, but if it fails to register anything except very large changes it is of little value. For example, the number of tractors owned in a village is an indicator of growing wealth among farmers, but such an indicator would fail to register small or even modest increases in income.

Even if an indicator is precise, it also needs to be *responsive*. That is, the indicator must register change soon after it has occurred. For example, the ratio of child height-for-age is an excellent measure of malnutrition, but the effects of malnutrition one season do not show up immediately in stunted growth—investigators will obtain such information only after several years.

Some authors argue that only "widely accepted" indicators should be used. The logic behind this argument is that if the consumers of an evaluation do not believe that the indicator is valid, or if they do not understand it, they will not accept the results of the study. This is a

good point, but it does not really support the argument that indicators need to be widely accepted. If the evaluation undertaken is only for the consumption of a select audience, only that audience needs to understand the indicators and accept them as valid. Care only needs to be taken to select indicators that the target audience will accept as valid. Regardless of how widely accepted the indicators are they should be devised with *ease of comprehension* in mind. Highly complex or abstract indicators will cease to have meaning, especially when the results are shared with lay audiences.

COMPOSITE VERSUS INDIVIDUAL INDICATORS

In a quest for extreme parsimony many composite indicators have been developed. Composite indicators amalgamate a wide range of information on different (but generally related) subjects into one index. A good example of this is the UNDP's Human Development Index (HDI), which combines information on rates of literacy, life expectancy and real per capita GDP to produce a single quantitative indicator of socio-economic development. While composite indicators are extremely easy to digest and compare, developing and computing them can be complex and time consuming. In addition, such indicators can be quite confusing and deceptive, given the manner in which the components of the index are combined.

The alternative is to use sets of individual indicators. Since one indicator by

THE OBJECTIVES (Cont.)

human development. Without health, human life is short and unpleasant. With good health, people are able to pursue improvements in their own lives and in their surrounding environment.

Education
Education improves the quality of a human life. It dispels ignorance and facilitates communication. Education

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is also a tool for self-improvement. Through education, people are better able to understand the long-term goals of natural resource management and work towards them.

Gender parity
Countless studies have shown that when women benefit from a programme (in terms of improved environment, nutrition, education, capital availability, etc.) overall levels of socio-economic development increase. Informed by this knowledge, IGBP Principles state that, "Development of Self-Help Groups amongst women is expected to be a main activity of the NGOs".

SELF-HELP AND PARTICIPATION
The current thinking in the development field is that projects are most successful when they help people help

IGBP

themselves. Once self-help is facilitated, aid is no longer necessary. The importance of local knowledge is ano-

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THE OBJECTIVES (Cont.)

ther reason why self-help and participation are so important—without participation at the planning stage, projects cannot be properly designed to suit local needs and desires. Finally, as a component of self-government and democracy, participation is an end in itself.

SUSTAINABILITY
Programmes that continue to operate after withdrawal of project monetary and/or technical supports are sustainable. To be sustainable, **projects cannot rely on subsidies.** Local people **must make contributions to projects that benefit them and they should** be able to carry out all programme tasks (hence, the need for participation in the earliest stages). In addition, projects must have access to some mechanism through which changing external environment and internal disputes can be resolved.

REPLICABILITY
The RWS Programme is a pilot programme. The ultimate goal, is to give the GoI a programme which can be implemented on a large scale. For this to happen, the programme must be replicable. Replicability is the capacity to duplicate programme processes and benefits in a new setting. This goes beyond sustainability towards issues of new capital investment and transferability of agency strategies.

itself is generally not enough to assess impact across all project objectives, especially when the project has broad goals, practitioners must use indicator sets. The set must be assembled such that it contains indicators that measure change in regard to all relevant objectives. These sets must strike a delicate balance between offering the maximum amount of information without overwhelming the consumer with too much data or exhausting project resources. The indicator sets need to strive for a state of what is termed "optimal ignorance", that is presenting the information necessary to evaluate impact, and nothing more.

LOCAL VERSUS NATIONAL INDICATORS

It is important to note that there are certain types of very familiar indicators, which are not appropriate for this undertaking. Watershed management programmes are generally located in micro-watersheds—sections of watersheds, which by themselves are relatively small. Many of the development indicators commonly mentioned in media reports and popular discussions of natural resource management are designed to measure impact at a national level. The HDI example discussed earlier is in this catagory. Such indicators are often calculated from estimates and projections based on national surveys and in the light of past trends. The indicator set developed here is concerned with change at the programme level. For this reason, national level indicators were not used here.

THE DIFFICULT ISSUE OF CAUSALITY

Employing a well-designed indicator set, investigators will be able to measure various aspects of change at programme sites. Often, however, it is difficult to determine whether the changes measured should be attributed to programme activities, or not. The physical and social phenomena being dealt with in natural resource management and the conditions under which they are being measured are far too complex to isolate causality using only indicators. In fact, using indicators alone, it is likely that investigators will draw misleading conclusions. This is because non-programme factors (e.g., large-scale economic, social and environmental fac-

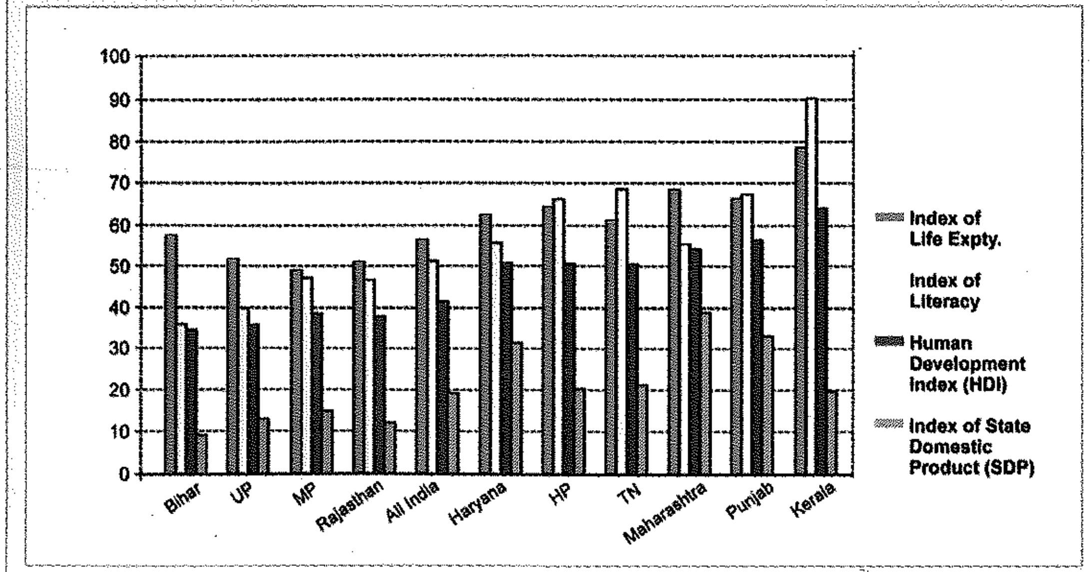
THE HUMAN DEVELOPMENT INDEX AND INDIA'S STATES

The United Nations Development Programme (UNDP) has developed and advocated the Human Development Index (HDI) as a tool to measure a country's achievements in the enhancement of human capabilities development. The HDI is constructed from three indicators: life expectancy at birth, to measure health status and longevity; educational attainment, to represent the level of knowledge and skills; and an appropriately adjusted real GDP per capita (in purchasing power parity dollars), to serve as a surrogate for command over resources. The Human Development Report (HDR) categorically identifies the above three parameters as essential, though not exhaustive, for choices at all levels of development. Many other opportunities remain inaccessible in their absence. While the HDI is the measure of overall levels of human development in society, it does not register distributional problems. For example gender disparities that exist, in education as well as life expectancy, cannot be determined from an HDI score. These issues are dealt with by other indicators, such as the Gender-related Health Index.

In the table below the HDI has been computed for some of the major states of India and the country as a whole, (on a composite index ranging from 0 to 100). The index gives equal weightage to three component indexes computed from the most recent data on 1) the expectation of life at birth during 1989-93; 2) the educational attainment of the population based on a combined measure of adult literacy levels in 1991 and the enrolment ratio in middle schools in 1993; and 3) the purchasing power parity price adjusted per capita net state domestic product for 1993, measured in dollar terms.

The HDI for India as a whole by this modification turned out to be 42.8. With an HDI value of 42.8, India ranks quite low in the comity of nations, 135 among the 174 countries studied by the UNDP. There is a good deal of variation in the HDI values across states. Kerala, with an HDI value of 62.8, ranks highest among the states. In the international scene, its HDI rank would place it at 105, above China (with an HDI of 60.9) and Egypt (61.1). The lowest HDI values were observed in Bihar (with an HDI of 34.1) and Uttar Pradesh (35.5). These low values are comparable to the HDI value of Nepal (33.2) as given in the 1996 HDR. These states would be ranked 150 and 151 at the international level. The states with an HDI score of more than 50 are Haryana, Himachal Pradesh, Kerala, Maharastra, Punjab, and Tamil Nadu. The states having scores below 40 are Assam and Orissa and the large Hindi-speaking states of the north: Bihar, Madhya Pradesh, Rajasthan, and Uttar Pradesh.

This section has been adapted from the United Nations publication *India: Towards Population and Development Goals.*



tors) are often responsible for the observed changes.

According to a noted expert in the field of impact assessment, Krishna Kumar, one approach to the causality problem is to measure "net impact". This entails subtracting all impacts that are caused by external forces from any measured changes. However, Kumar counters that, "Experience shows that the two methodological strategies for measuring net impact—quasi-experimental design and statistical controls . . . have not proven practical for use in agricultural and rural development projects. Both strategies pose major conceptual and methodological problems that are difficult to resolve satisfactorily. Moreover, they require massive and expensive data collection efforts which must be conducted over extensive periods of time" (Kumar 1989, 6).

Kumar's solution to this problem is to supplement the data provided by indicators with qualitative studies. The indicators themselves provide information regarding the magnitude and direction of change. Qualitative studies can then determine whether these changes are attributable to project activities. Kumar (Ibid., 7) recommends essentially three different methods for carrying out such studies: 1) in-depth, unstructured interviews with key informants such as government officials, project management staff, beneficiaries, and local leaders; 2) community meetings and focus-group discussions with the same people; and 3) direct observation by experts. Such participatory methods rely on the premise that local people understand their own environment. While these techniques are not foolproof, they can help establish a resonable degree of certainty as to whether programmes are responsible for observed changes or not.

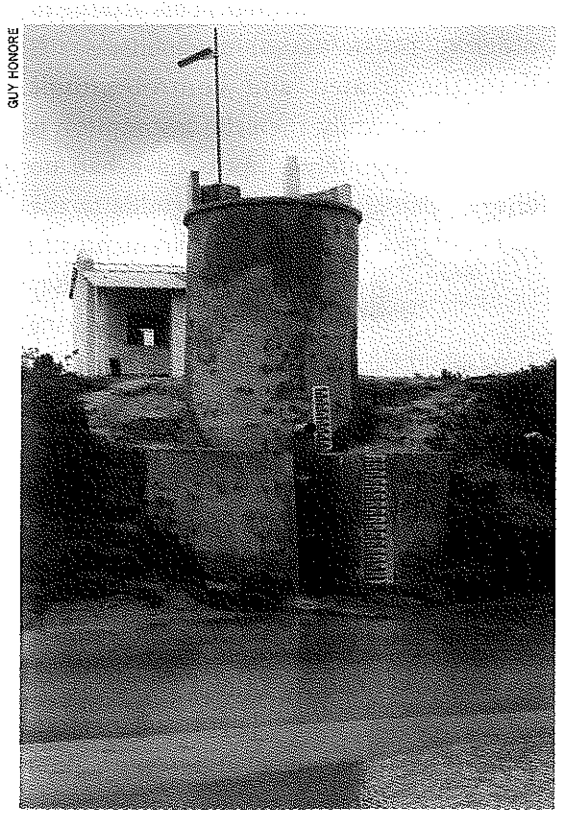
Whenever possible, this book supports Kumar's recommendations. When that is not possible (especially *vis-á-vis* phenomena that lay people do not readily observe, like erosion), the use of controls is necessary. Controls are often, however, expensive to use because they increase (often double) the number of measurements that must be taken. In addition, controls are often unable to filter out the effects of larger socio-economic trends.

III

METHODS OF DATA COLLECTION

The literature on monitoring and evaluation often assumes a dichotomy between so-called scientific or objective (quantitative) and subjective (qualitative) methods of data collection. This distinction should be rejected. There is no reason why qualitative observations cannot be objective and even quantifiable (nor is it inconceivable that quantitative measure could be subjective). To return to an earlier example, an investigator could objectively rate the odour, taste and colour of water against a well-specified qualitative scale. Such ratings could, if desired, be quantified in order to conduct statistical analyses. With this in mind, this book has chosen to divide research methods into "extractive" and "participatory" categories and argues that these methods can be used in a complementary fashion.

GUY HONORE



Silt Monitoring Station
(Karkara, Bihar)

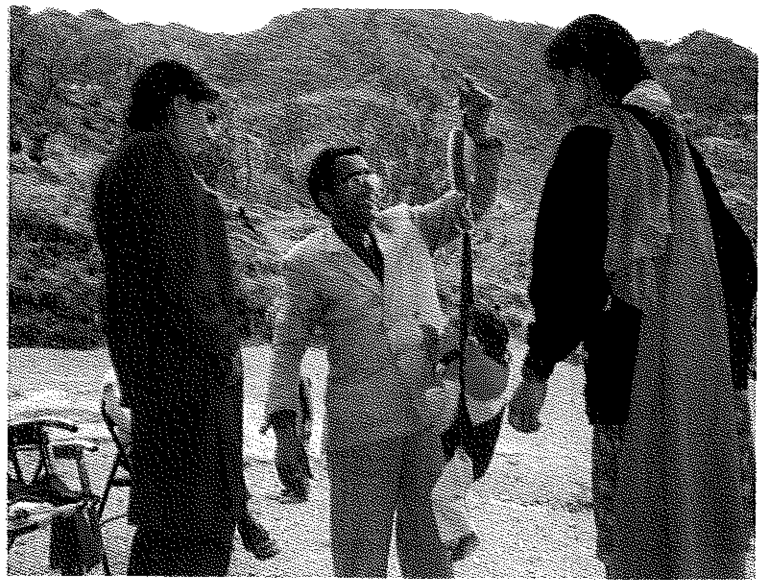
EXTRACTIVE METHODS

Often referred to as "scientific" methods of data collection, these methods strive to maintain a distance between the investigator and the subject under investigation. The investigator's main role is that of an outsider, extracting information regarding some local phenomenon. This information collected by extractive methods is for the benefit of a distant consumer (a state department or a development agency), not the local people. The extractive researcher strives to maintain objectivity—a distance from the subjects in order to lessen bias. To these ends, extractive research methods favour quantifiable data. Quantification is also done to facilitate analysis across cases.

Strengths of extractive methods

Unlike much of the current thinking in the area of impact assessment, this book agrees that extractive methods tend to be less prone towards bias. Investigators measuring precisely defined, often quantifiable phenomena are less able to introduce biases into their observations. Extractive methods are also less likely to be affected by local informants seeking to skew the results of the evaluation in some direction. This is because extractive indicators seek to measure concrete phenomena, not collect opinions in an open-ended, participatory fashion.

The quantified results of extractive research methods are also much easier to analyse and compare across cases. Purely descriptive case reports are nearly impossible to analyse in terms of variation across cases. Quantified results are also much easier for consumers to digest and more difficult to creatively interpret. A single, relatively simple table can display the quantitative data for large numbers of data points, all of which are very easy to compare with one another. With qualitative data, readers pressed for time may not find the time to read descriptive case studies or the descriptive comparisons.


MICHAEL BOLLOM

Weight-for-age is an extractive (and very quantifiable) indicator of health (Arki, Himachal Pradesh)

Weaknesses of extractive methods

Extractive methods can be very expensive and time consuming. Scientific studies require highly-skilled consultants to design and carry out. These studies may require the use of expensive tools, such as technical measuring devices, surveys, and computers. In order to scientifically measure change, studies need to be carried out over long periods, often requiring multiple visits to the same field sites.

Extractive, scientific methods also require the use of control groups. Control groups are populations (be they individuals, villages, rice fields), which are similar to the sample, but that are not treated by programme inputs. The scientific method requires that both sample and control populations are measured. This is done in order to isolate causal mechanisms. If both the treated and control groups behave identically, then the assumption is that the programme inputs have had no effect. Using control groups adds to the cost of measurement and may be difficult as they often require establishing relationships and setting up infrastructure in additional locations.

The most important criticism of extractive methods, at least from the perspective of this book, is that they encourage researchers to collect, analyse and report their data without reference to the context from which it was gathered. Without local context, even the most precisely measured and analysed data may be grossly misinterpreted. For example, a researcher may be measuring male-to-female school enrolment ratios as an indicator of local prosperity. The logic of such an indicator might be that, as families prosper, they will send their girls to school for longer periods, thus bringing the ratio closer to one. If the ratio drops (and there are fewer girls to boys in school), observers will conclude that prosperity has decreased. The local reality may be quite different. If, in a particular culture, farming is considered women's work, families may be pulling their girls out from school to work more hours if fields are increasingly bountiful. The observer simply relying on extractive observations would not be able to know that he had totally misinterpreted the findings.

PARTICIPATORY METHODS

Participatory methods of project evaluation grew out of a dissatisfaction with more extractive methods. Participatory methods, attempted to circumvent the large time and resource requirements of scientific methods by relying more upon the knowledge that local people have of their own situations. For example, participatory researchers have shown that it is not necessary to return every year for years to examine trends in rice yields when local farmers can very quickly give fairly accurate estimates of these figures in a single morning!

Advocates of this approach argue that, in addition to being less temporally demanding, the methods require few fancy tools, aside perhaps a chalkboard or paper for diagramming. They maintain that, in addition, this methodology is not neces-

PARTICIPATORY APPROACHES

Rapid Rural Appraisal (RRA)

The RRA is a social science methodology that emerged in the early 1980s for applications in development co-operation. In it, a multidisciplinary team makes use of simple, non-standard methods and the knowledge of local people to quickly elicit, analyse and evaluate information and hypotheses about rural life and rural resources that are of relevance for taking action. RRA techniques are an attractive alternative to conventional survey methods when the aim is not to systematically capture precise figures through a typically time-consuming and cost-intensive undertaking, but rather speedy and action-oriented assessment of local knowledge, needs and potentials with an aim to elaborating strategies to resolve conflicts or investigate specific problems. They are also suitable for shifting the focus of conventional surveys onto essential aspects.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Participatory Rural Appraisal (PRA)

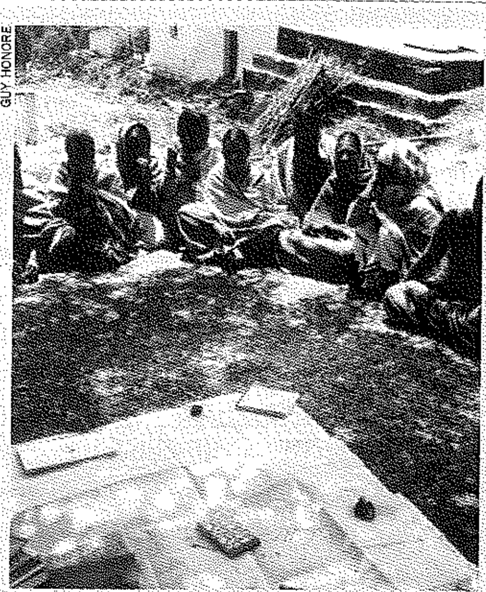
The PRA is a further evolutionary stage of the RRA approach. In it, emphasis is placed on empowering local people to assume an active role in analysing problems and drawing up plans, with outsiders mainly acting as "facilitators". Here it is no longer the external experts but rather the local people themselves who "own" the results of the study. This enables them to assume responsibility for implementing the activities based on them.

Adapted from Schonhuth and Kievelitz 1994, IX.

PARTICIPATORY TECHNIQUES

1. Review the secondary sources
2. Direct observation
3. Semi-structured interviews
   * Key individuals
   * Focus groups
   * Chain of interviews
4. Ranking and scoring of preferences, intensities, availabilities etc.
5. Construction and analysis of maps, models and diagrams
   * Social and resource maps
   * Topic and theme maps
   * Census maps and models
   * Transects (cross-sectional diagramming of land forms)
6. Diagramming
   * Causal, linkage flow diagramming
   * Time lines, trend analysis
   * Seasonal diagrams
   * Activity profiles and daily routines
   * Venn (or *chapati*) diagrams
7. Case studies and stories
8. Drama, games and role plays
9. Possible future and scenario workshops
10. Triangulation of data
11. Continuous analysis and reporting
12. Participatory planning, budgeting, monitoring, evaluation and self-surveys
13. Do-it-yourself (Outsiders being taught by insiders)

Adapted from Mikkelsen 1995, 71.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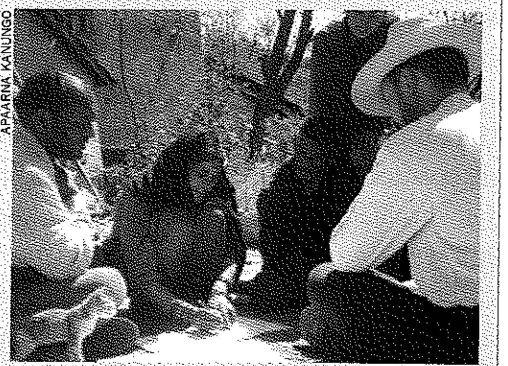
APARNA KANUNGO

sarily inaccurate and subjective—information gathered in such a fashion is actually quite valid and reliable.

Participatory methods have also been advocated by those who believe that development work should be more democratic. Chambers (1994, 1983) and others argue that development workers have an ethical obligation to include beneficiaries at every stage of the aid process-planning, implementation and evaluation.

Strengths of participatory methods

There is no doubt that participatory methods offer investigators with tools to evaluate impacts very quickly. This is especially true when trying to examine change. Scientific methods, even when they are very quickly executed, usually require that multiple measures be taken over time and that controls are used. Participatory methods can be used to measure change in a single site visit, without the use of controls. They are also very Spartan in terms of the amount of equipment required.

Participatory methods solve the problem of decontextualized data as well. The data gathered using participatory methods are inherently contextualized. In

addition, the activist nature of participatory methods is quite appealing from the standpoint of many organizations concerned with development—the goal of most development agencies and NGOs is not just to measure change, but to effect it. Allowing people to become involved in measuring and interpreting the programmes that affect them increases local understanding and involvement with programme activities.

Weaknesses of participatory methods

Despite the current love affair with participatory methods, they have many weaknesses. They are subject to biases of various sorts and are less reliable as a result. First, there is the issue of active manipulation. Beneficiaries, whether they are good-willed or wily manipulators, can turn group discussions to their own ends. Investigators themselves may have conscious or unconscious agendas that affect what they see, how they ask questions, and how they write their report.

Second, participatory methods at times face obstacles to participation. Local people may simply not want to participate—they could be suspicious or just too busy. Those who do participate may not represent a true sample of the local population—the old, the young and the unemployed are often over represented. Local power relationships may dictate that important issues are never discussed, or that those who would discuss them never attend a meeting. Local cultural considerations may also preclude women from talking or even ensure that only positive things are said in public to visiting *sahibs*.

Third, the results generated by participatory assessments tend to be less comparable because they are often ad hoc—when beneficiaries control the evaluation agenda, there is no telling what issues they will want to pursue. The bulky, qualitative reports produced by this method are often more difficult to consume than the tables and graphs produced through quantitative analysis.

Fourth, some phenomena are simply less easy to study using participatory methods. This is especially the case with very abstract issues, or issues of no immediate, tangible relevance to local people. For example, how reliable an estimate can local people give about the mineral content of their soils?

Finally, participatory methods may not be as inexpensive as originally argued. Just like traditional researchers, practitioners of participatory methods need to be highly educated and specially trained. Such experts are well paid. In addition, while participatory methods do not need to be carried out over multiple visits, the one necessary visit is still labour and time intensive.

THE CASE FOR USING MULTIPLE METHODS

In order to compensate for the weaknesses of both extractive and participatory methods, the complementary use of both is advocated here. Where possible, extractive, indicators should be used. Data from these sources can be easily aggregated, analysed and communicated to experts and lay readers. It is not enough, however, to simply measure the programme impacts. Local participation is necessary to interpret the results of impact assessments. Local interpretations can verify extractively collected data and help locate causal mechanisms.

In addition and in the spirit of participatory development, extractive data should be combined with community-based reassessment of local problems. Effective natural resource management programmes must work closely with local people to be successful (i.e., only with local knowledge and participation can programmes be a success). Since local problems and preferences change over time, impact assessments should be used as an opportunities to re-establish contact with beneficiaries, asking them to give suggestions as to how programmes could be fine-tuned to accommodate mutating problems arising from changing perceptions.

Local interpretation of assessment findings can be done through PRAs or informal interviews with key informants. Both should be carried out with several different sorts of key informants (selected on the basis of wealth, status, gender and location) so that their responses can be triangulated. In addition, final reports should be shared with beneficiaries at large. This can be done through women's self-help groups, farmers groups etc. During these discussions the investigators should assess how local people interpret findings and how programmes could be modified to improve outputs.

IV

RATING INDICATORS

Given that there could be an almost infinite number of potential indicators to measure the impact of watershed management programmes, evaluators have the luxury of choosing ones that suit their unique needs. Most watershed management programmes, however, face resource constraints. For example, the current level of investment in the IGBP's RWS programme is approximately Rs5000/hectare (about DM229/hectare at the current rate of exchange). As such, the programme must be executable under tight resource constraints.

The following subsections are to be used in conjunction with the Survey of Indicators presented in Chapter V. Each subsection begins with a brief discussion of a particular resource constraint. A scale is then presented with which potential indicators can be scaled *vis á vis* this constraint. This is done so that various indicators can be compared in terms of resource demands.

EQUIPMENT COSTS

Equipment costs can vary greatly from indicator to indicator. An indicator whose use entails only observations or oral surveys requires no tools (apart from writing utensils). A silt monitoring station, on the other hand, requires expensive equipment that is also costly to maintain.

The table below, presents a scale for rating perspective indicators as to their potential equipment costs. These costs are rated against the total programme budget for a particular programme site.

RATING INDICATORS—EQUIPMENT COSTS

Rating	Conditions
++	No special tools required to use the indicator.
+	Tools with minimal costs (< .5% of total programme budget, or < Rs 25/ha). This is less than Rs 50,000 for a 2000 hectare watershed.
-	Tools with high costs (.5% to 3% of budget, or Rs 25/ha to Rs 150/ha). Rs 50,000 - Rs3,00,000 for a 2000-hectare watershed.
- - -	Tools with prohibitive cost (> 3% of budget, or > Rs 150/ha). This is greater than Rs 3,00,000 for a 2000 hectare watershed.