indicators are executed is important. While this method is an imperfect substitute for using controls, the PEP often suggests that causality be explored through participatory discussions of findings with beneficiaries. For example, villagers are likely to be able to tell evaluators why recorded levels of water in local wells is changing. But in order to use this method, all the necessary data must be gathered and tabulated before any participatory discussions take place. This means that the data for *Soil Runoff, Ground Water, Height-for-age, School Attendance* must be collected and analysed before the participatory discussions can take place.

Finally, all the time estimates given here do not include the extra time that will be required to use control groups.Controls help specify the causal mechanisms of change (i.e.,"Is our programme responsible for these improvements?"). Controls are less important for indicators like *Durables, Enrolment, Use, Outsiders* and *Social Capital,* where people themselves can tell evaluators the reasons that there has or has not been change. But when dealing with phenomena like soil erosion, which are less immediate to people's lives, controls are essential. Evaluators must decide for themselves how heavily they wish to rely on controls. Itineraries must then be adjusted accordingly.

POSSIBLE TIMETABLE FOR FIELD VISITS —FOLLOW-UP

Indicator	Day 1	2	3	4	5	6	7	8	9	10	11	12	13	14
Soil Loss*														
Ground Water														
Consumer Durables														
Height-for-Age														
School Attendance														
Prepare Participatory Discussion														
Use														
Outsiders														
Social Captial														
Particapatory Discussions of Extractively Obtained Data														
	Get acquainted with partners	General tour of watershed	Consultation with partners											Wrapping up loose ends
	GEARING UP			FIELD VISITS							PARTICIPATORY SESSIONS			WRAP UP

*Data should be supplied by project engineer before going to the field.

VII

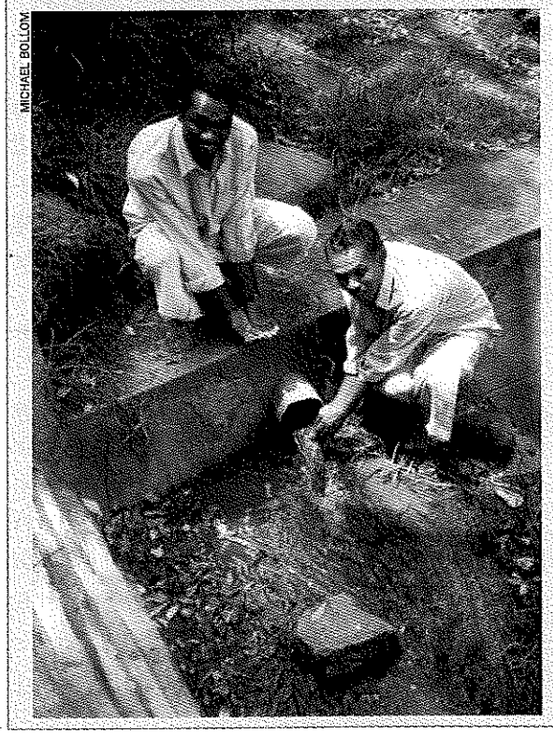
THE SELECTED INDICATOR SET

Nine indicators were chosen from the Survey of Indicators to create an indicator set for evaluating watershed management programmes. This chapter examines these nine indicators in detail. Each indicator is discussed in terms of the objectives towards which it measures progress and how it should be implemented in the field. Side boxes present the findings of the IGBP-sponsored evaluations that used these indicators.

THE FINDINGS: THE INDICATORS WORK!

In most cases, the evaluation team was able use the indicators to gather baseline data on the two watersheds. The findings generally show Kattery RWS to be more advanced than the Arki Watershed. In Kattery, the ground water levels were less erratic, the children here were taller and attended school longer. IGBP activities enjoyed generally higher levels of use and maintenance in Kattery, despite being less dependent on help from outsiders. In addition, institutions that can manage watershed issues are emerging in Kattery while they appear to have been stillborn in Arki.

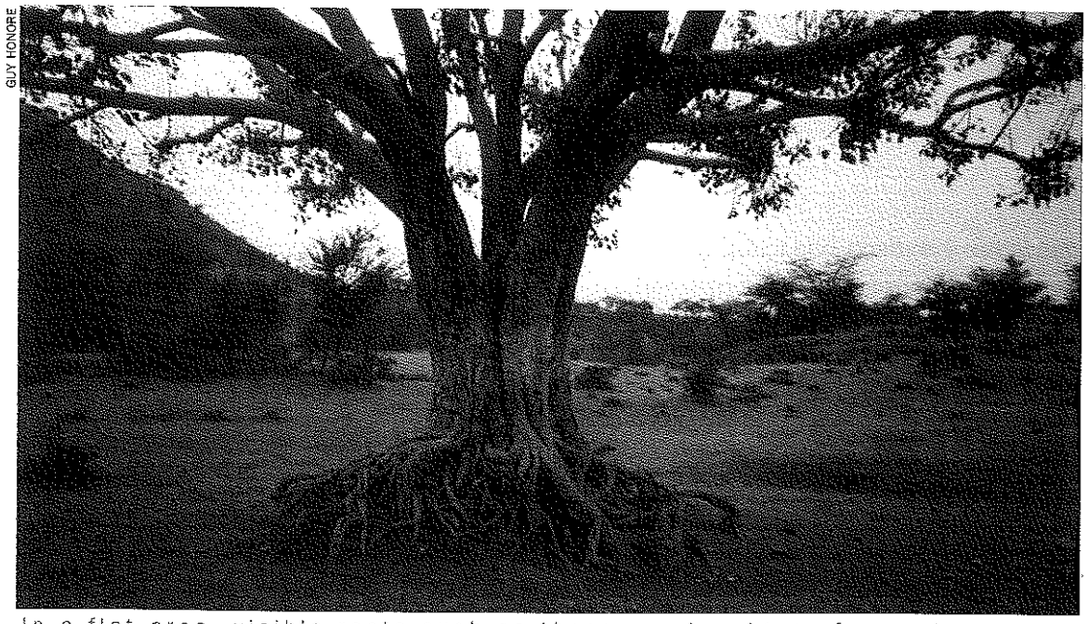
Findings with regard to the measurement of change are, not surprisingly, inconclusive. Most of the indicators in the protocol were not designed to measure change in a single site visit. Multiple evaluations over time are required. In order to look for conclusive evidence of change, another evaluation will have to be conducted several years hence.


MICHAEL BOLLOM

In a few cases, the evaluation team was able to gather data that tentatively document change, or the lack of it. For example, the team was able to obtain time series information on school attendance rates from school masters. This data actually demonstrates little change in school attendance rates over the last five years.

Even where actual changes were recorded, they generally could not be directly linked to IGBP activities. This is not surprising given that the RWS Programme has been in operation for less than two years. There are exceptions to this, however. In Kattery the increased wealth (more consumer durables) in one village was linked to MYRADA's efforts to develop a micro-finance activity. In Kattery there is also some evidence that the Watershed Federation (another MYRADA activity) has begun to serve as an institution which promotes and facilitates collective action *vis á vis* certain water-related issues.

GUY HONORE



In a flat area, visible roots such as these can be signs of an extreme erosion problem (Karkara, Bihar)

1. SOIL LOSS

While this indicator is resource intensive, both in terms of man-hours and equipment, it is recommended for continued use. This is due to the lack of a better alternative, and for the sake of continuity. (The IGBP has invested in the infrastructure to use this indicator and trained people to operate it. In addition, the Project has already accumulated large data sets.) This indicator seems impractical, however, for the replication stage of a programme when cost containment becomes more important.

Target Objectives

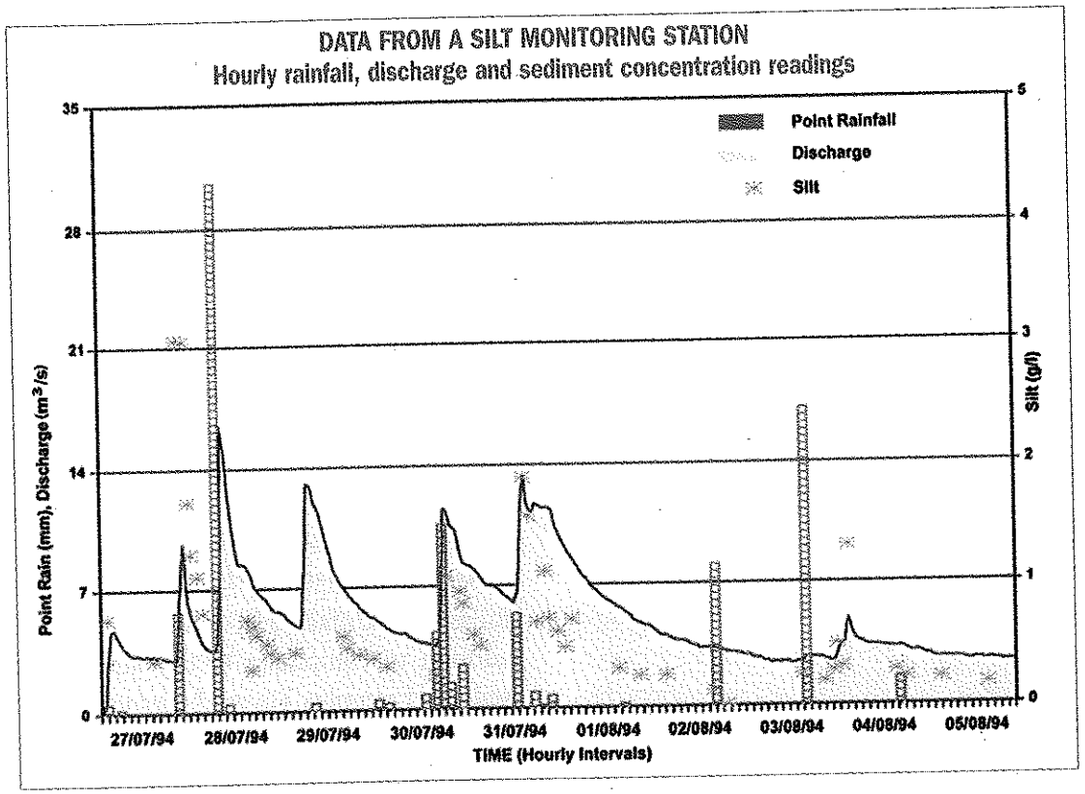
This indicator measures topsoil conservation. The assumption is that increased soil runoff in local streams indicates a higher rate of topsoil loss. In addition, the recharge of ground water resources can be inferred from this indicator—all else being equal, less topsoil being washed downstream implies that more rainwater is being absorbed into the ground, thus recharging the ground water supply. Soil runoff also indirectly measures the extent of vegetative cover—less topsoil runoff implies thicker vegetative cover (vegetative cover prevents runoff by reducing splash erosion and holding soil in place with roots).

Measurement Procedures

This is a complex undertaking that has been well-documented in Indo-German Bilateral Project manuals[4]. A very brief summary of the hydrological procedures is nevertheless provided here. The ultimate goal of the hydrological monitoring undertaken here is to collect data demonstrating: how much water runs off in the stream that drains the watershed for a given amount of rainfall, how quickly this occurs after a rainfall, and how much sediment is carried away by the runoff. To do this, a crew of silt observers must work around the clock to gather data on rainfall in the watershed, depth of the stream at the drainage point, stream velocity and sediment concentrations in the stream. The IGBP has built Silt Monitoring Stations (SMS) in each RWS in order to house the equipment necessary to take these measurements.

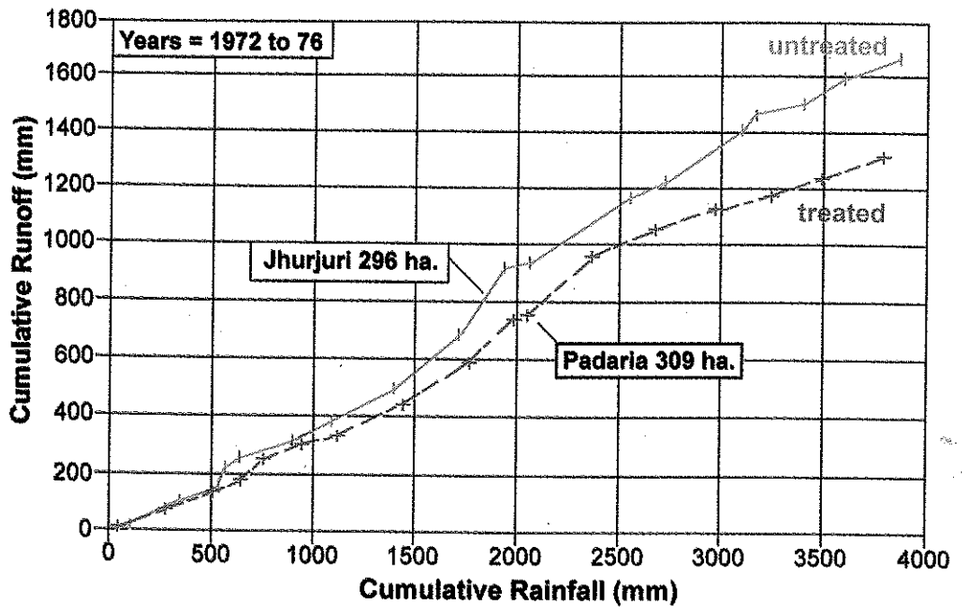
For an actual printout of some data that the IGBP collected from Kattery RWS, see the figure below. In this graph the spikes represent a period of rainfall, the continuous irregular curve represents discharge rate in the river, and the small stars represent silt concentrations in the river water. The area under the discharge curve represents the total discharge of water. Notice how discharge and increased silt loads follow periods of rainfall.

In order to demonstrate changing runoff rates, such data must be collected over very long periods of time (not less than ten years). Successful erosion control treatments will result in decreased levels of discharge (meaning more water soaks into the ground). If this is the case, then the discharge that does occur will be spread out over a longer period of time (i.e., the water drains more slowly). In addition, silt loads will be decreased.



[4] For technical details, see any of the following IGBP manuals: # 15/92: Collection and processing of automatically collected hydrological and sediment data - 'A' manual. • # 16/92: Collection and processing of manually collected hydrological and sediment data - 'M' manual. • # 17/92: Operation and Maintenance manual for sediment monitoring stations - 'O&M' manual. • # 06/92: Training manual for hydrological and sediment monitoring of small watersheds.

DOUBLE MASS PLOTS FOR TWO NEIGHBOURING WATERSHEDS



The figure above is a good example of time series data on two watersheds—one treated and the other untreated. This data, collected by the DVC near Karkara RWS long before the arrival of the IGBP, demonstrates that run off rates were reduced in the watershed that was treated.

Outlook and Recommendations

This indicator has many strengths. It produces valid, reliable data about soil (and water) conservation. It is also extremely responsive and sensitive — improved soil conservation will be evident in the fine-grained measurements taken during the very next rain. In its favour, very few (perhaps only one) monitoring stations are needed to take measurements for the area being treated. In addition, once the monitoring stations are in place, the measurements can be carried out by relatively unskilled labour. Finally, if meticulously carried out, monitoring this indicator can produce a very objective, and highly quantifiable database.

Unfortunately, this indicator is only suitable for evaluating pilot projects, not monitoring projects being implemented on a large scale. The indicator is very labour intensive. In an ideal situation, measurements must be taken every hour, twenty-four hours per day, three hundred and sixty five days per year. In order to carry measurements out properly, this indicator also requires the use of some expensive equipment — instruments to measure rainfall and stream flow in addtion to equipment to dry and weigh sediment samples. Given the remote, rural setting of most watershed programmes, maintenance of this equipment can be difficult. Poor maintenance and/or lax personnel will quickly corrupt databases. As with other scientifically measured indicators, this indicator also requires the use of controls.

Those desiring an indicator more suitable for monitoring might want to explore the use of remote sensing (i.e., satellite imagery). A series of satellite images taken over time can be compared to chart changing land-use patterns. Since satellite images (old and new) are often available (perhaps through the Remote Sensing Department of the local government) remote sensing would be fast and inexpensive. There may, however, be difficulties in obtaining such images if there are "national security" concerns involved. Such a method would also still require the creation of a computer model to interpret the images, and initial field visits to help create a key to the satellite images.

2. GROUND WATER

This indicator produced rich and graphic findings about ground water levels in and around the selected villages in each RWS. The local people who contributed to the results probably also benefited from the open discussions about their water resources. In addition, this indicator produces valid and reliable data. Nevertheless, it is doubtful whether this indicator, as executed, will be of use to many programmes attempting to measure changing ground water levels.

As executed, this indicator offers an insight into one of the limitations of par-

THE FINDINGS: SOIL LOSS

Unfortunately, the IGBP has been unable to collect the sort of data needed to demonstrate programme impacts. This is, in part due to the long time periods required to establish baseline data and post-treatment data. Most Silt Monitoring Stations (SMS) have been in operation for only five years.

Even when the SMSs have been in place for longer periods of time, data collection problems have undermined the integrity of the data sets. Collection problems have generally not been due to equipment failure, but because of labour problems. Every SMS is staffed locally, by literate farmers or school teachers. At times, the monitoring equipment used is too complex for these silt observers to handle, even after extensive and repeated training sessions.

More problematic, however, has been the lack of enthusiasm shown by the silt observers. For whatever reasons, data collection has not been carried out consistently, resulting in data gaps. Such gaps corrupt the data sets. (Hydrological data sets in India are particularly susceptible to corruption due to missing data points because the rains are generally short and intense, as are the runoff periods.) The result has been data sets that are too incomplete for meaningful time series analyses.

To compensate for these weaknesses, the IGBP has focused more of its energies on training of staff in hydrological monitoring. Unfortunately, while such training can build up the skills and knowledge of the hydrological assistants, it has little effect on motivation or professionalism.

GUY HONORE

ticipatory evaluation techniques—they are often not precise enough to measure the generally small levels of change that most programmes bring about. So, while this indicator is capable of measuring changing ground water levels, its metric is imprecise. If evaluators require that their measures be finely calibrated (in centimetres or millimetres, not metres) then this indicator needs to be executed in a totally different fashion.

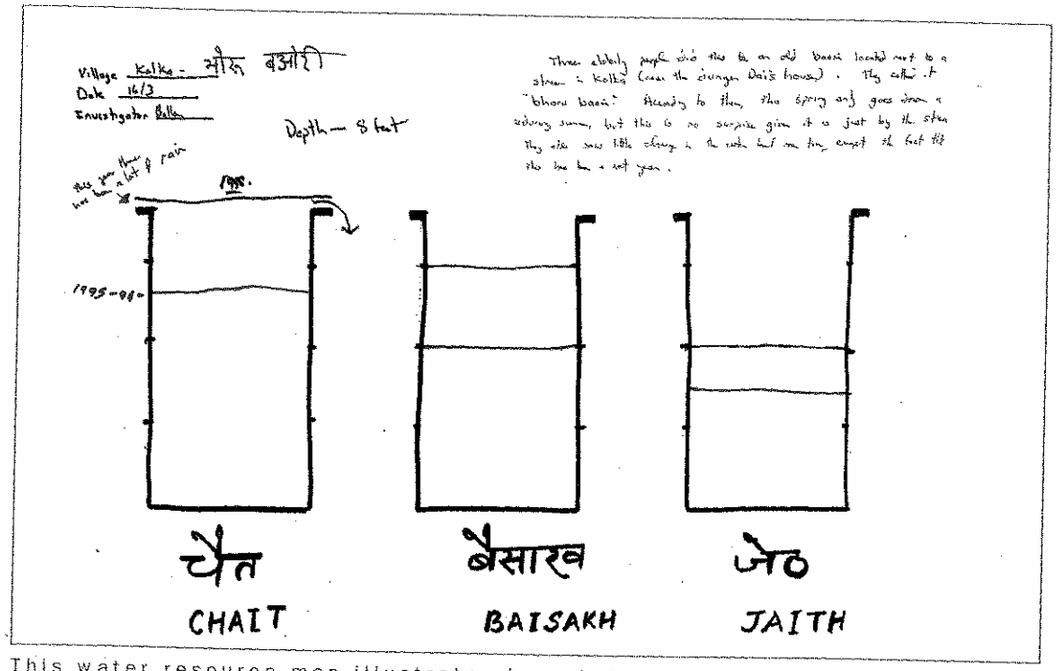
This section first discusses the indicator as the evaluation team executed it. It then concludes with a brief discussion of how this indicator could be altered to offer more finely calibrated results.

Target Objectives

This indicator measures ground water conservation. If ground water levels are maintained or augmented, then ground water resources are being sustainably utilised. In addition, this indicator indirectly measures topsoil conservation. All else being equal, a higher level of ground water is at least partially the result of less (or slower) water runoff. This, in turn, results in lower levels of topsoil erosion. Water table levels are also an indirect measure of vegetative cover. As previously stated, vegetative cover prevents runoff, thus recharging ground water, by checking splash erosion and by holding soil in place with roots. If ground water levels are being sustained, constant or increasing vegetative cover may be responsible.

Measurement Procedures

The preliminary PEP recommended that beneficiaries map out the changing water levels in a local well. The assumption is that the water level corresponds to the



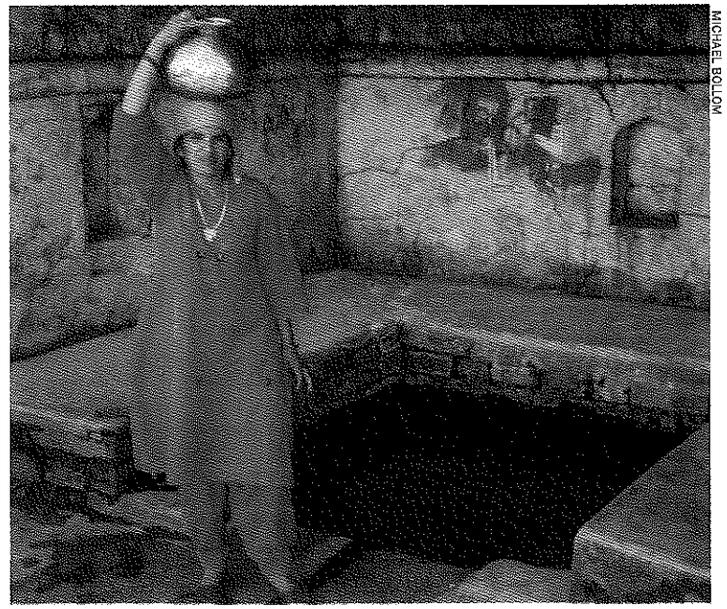
This water resource map illustrates how, between 1995-1998, ground water availability in a local well rose during the pre-monsoon months (Arki,H.P)

ground water level near by. The team proceeded to measure the water levels in selected wells through resource maps. The figure on the previous page is a copy of a resource map used in Arki. The open-ended rectangles represent the well in question, one for each month of the year. The hash marks along the sides of each "well" represent the one-quarter, one-half and three-quarter full points.

At the bottom of each "well" are the names of the months (first in the Devanagri Script, then in the Roman Script) as used by the local people. This map was developed with the help of SUTRA (*Chait* corresponds to the dates March 15 to April 14 on the Roman Calendar and the rest of the months follow in this sequence), in order to ensure that the team spoke in time terms understandable to local people. The same was done for the Kattery RWS with MYRADA.

Some of the effort to be sensitive to local cultures took an ironic turn in the latter watershed. In Kattery the team used the names of the Tamil months and wrote them in the Tamil script. But when these maps were used, many people developed confused expressions and began whispering amongst themselves. It turned out that many of them were not familiar with the Tamil names of these months, nor the Tamil dates. The team quickly modified the drawings to use the names from the Roman Calendar, which they understood! This underscores that many elements of the evaluation process have to be participatory—local people must be consulted during the process of formulating the indicators.

As recommended in the preliminary PEP, this indicator was supposed to be executed as part of the Participatory Sessions, after the Field Visits. Once in the field, the evaluation team realised that many people in the villages were totally unaware of the water situation in their local wells and springs. In Arki this was more so because the state government supplied piped water to many houses under a previous development activity. In Kattery, community wells were generally managed by a handful of people, who were responsible for pumping water from their community well to the community tank. The


MICHAEL BOLLOM

The water level in local wells can be used as an indicator of ground water resources (Arki, H.P.)

team's revised strategy was to speak with only those people who used the wells on a frequent basis. This took place during the Field Visit phase of the evaluation.

The selection of wells took place in a rather ad hoc manner. The team simply asked for the locations of wells that local people were using. The ones that could be found easily were chosen. These included large tube wells as well as tiny mountain springs. In the future, programme engineers should select the water sources to be monitored. Their decisions will be based on the knowledge of where programme impacts are expected.

In order to use the resource maps to their fullest potential, the team needed to gather a small group of people to fill them in. The process of gathering groups differed in each RWS. In Arki, the team waited near the selected wells in the morning and gathered groups of users (all women) for a resource mapping. In Kattery, the team sought out those people (all men) responsible for maintaining the well and pumping water.

The discussions began with questions about the well's depth, how long it had been there and how often the interviewees used it. When the team was certain that both the well and the group were appropriate, they then asked the people in these groups to draw coloured lines that represented the water level in their well during each month of the year. In the figure on page 52 this is represented by the upper (blue) line. Most of the groups spent several minutes deliberating amongst themselves before each line was drawn. By the time they had finished all twelve months, they generally appeared quite satisfied with what they had produced.

The preliminary PEP recommends that changing ground water levels should be measured through successive visits to the site, several years apart. The evaluation team nevertheless conducted an experiment to gauge whether change could be measured in a single site visit. The same groups of people were asked to draw a second (different coloured) line in each month to indicate what the water level used to be at some point in the past. Five years ago was suggested, but the team let them choose any time period that they could agree upon (so long as it preceded the IGBP's first investments under the RWS activity).

MICHAEL BOLLOM

Resource mapping is a participatory tool that can be used to measure ground water (Arki, H.P.)

THE FINDINGS: GROUND WATER

The resource maps document that the water levels in the Arki springs follow the pattern of the south-west monsoon. The water levels generally drop slowly in the months preceding the rains, although the spring in Thamogi begins to dry up by early winter. Every spring surveyed was dry in the month of *Jaith* (May 15 - June 14). The springs get replenished in the months of *Asar* (June 15 - July 14) and *Sawan* (July 15 - August 14).

All groups agreed that the water levels in their spring had dropped. In Senj, the water level had dropped from eighty percent full in *Baisakh* (April 15 - May 14) five years ago to about twenty-five percent today. Aside from this earlier drying of the spring, things have remained unchanged. In one of the Kolka springs, the water levels were less than half what they had been ten years back during the entire summer. After the rains, this spring continues to remain full. Water levels dropped by about a third in the other Kolka spring, but only during the three months preceding the rains. In Thamogi, the water levels only dropped during the winter months, from *Ashwin* (September 15 - October 14) until *Fagun* (February 15 - March 14). Current levels are about half of what they were ten years ago.

When asked to pinpoint the cause or causes of the falling water levels in their springs, most groups pointed to a drop in rainfall and loss of tree cover in the valley. No one mentioned any IGBP-funded activities.

In Kattery resource maps were collected from four villages—one map each from the sister villages of Salamoor and Dodanni and one from Thorajada. The team was not able to obtain a map in Mellodyarahatti because this village takes its water from an artesian well (which has no depth). Instead, the team did a mapping in Oranalli, where MYRADA has recently done some work. As in Arki, the resource maps in Kattery show local ground water levels following the pattern of the south-west monsoon. The ground water levels in Kattery fluctuate much less dramatically, however. Water levels drop slowly until June, after which they start rising and continue to do so until the rains end in September.

Only one of the four maps gave any indication that ground water levels had changed within common memory. The group in Oranalli drew lines showing that since ten years ago, the water in their well dropped from three-quarters to one-half full between mid-May until mid-August. Their explanation for this was a drop in the annual rainfall. There was no mention of programme investments in relation to the dropping water level.

The groups were able to discuss changing water levels without much trouble, and the team had confidence in the general trends that they illustrated (e.g., a well that used to be half full in June is now one quarter full). The problem, of course, is that memories fade quickly and events can be confused or conflated. If a programme wants to measure change, the resource maps would be more accurate if separate "before" and "after" maps were produced, several years apart.

While "before" and "after" resource maps would be sufficient to document change, they would not be able to determine the cause of the changes. The PEP suggests discussing findings with beneficiaries—local people often have a very good understanding of the world around them. In a strict scientific sense, however this is not enough. *Ground water,* like all the other indicators except *Use* and *Outsiders,* needs a control group to help determine whether, and if so to what extent, IGBP-funded activities are responsible for change. The evaluation team did not use controls during this evaluation. The added expense did not seem necessary given that the primary task was to test whether the indicators function as planned. All subsequent evaluations

should, however, carry out the same steps discussed above, and also draw comparisons with water levels in wells that are far away from any programme investments. Depending upon how programme funds are to be allocated, this could be outside the watershed, or in areas of the watershed that have not been treated.

Outlook and Recommendations

While the evaluation team was able to use a participatory version of this valid, reliable, sensitive, responsive indicator to measure ground water levels in the watersheds, it may be an overly blunt instrument to document change. People's levels of perception are not accurate for small changes. For example, in a well that is four meters deep, it is hard to believe that regular users will perceive change in water level that is less than fifty centimetres. Only a very ambitious development programme would hope to change an area's ground water level by fifty or more centimetres in just five to ten years!

Programme engineers need to be clear at the outset of a programme about how significant an impact they hope to have on the local ground water level. If the expected impact is fairly large (meaning easily perceptible to the human eye), then the above method should be preferred as it is quick and cheap to execute. In addition, the data are probably as reliable as any produced through technical instruments. In fact, in the light the discussion regarding data collection problems at silt monitoring stations, (see "The Findings; Soil Loss") the above method is probably more reliable.

If the project's expected impacts are small relative to the capabilities of the human eye, then another method of measuring ground water levels should be used. One possible method is to use a water level sensor to measure the depths in village wells. Such a method could be accurate up to less than a centimetre. Measurements could be taken from local wells, or special monitoring wells could be dug. While the former is less expensive, it is less reliable. The problem with such a low-tech methodology is that local people disturb the level of water in wells by drawing water from them. This could be avoided by taking readings early in the morning, before the day's first water is drawn out. A single such reading, however, would be of little use. Water levels in a well fluctuate from day to day and month to month. Readings need to be taken frequently, for the duration of the programme, as is done in the Silt Monitoring Stations. And as with the other extractive indicators, controls must be used. Taking the required number of readings will be expensive in terms of labour and, as mentioned, reliability is a problem. Procedures for using both the participatory and the extractive method are documented in the PEP.

3. HEIGHT-FOR-AGE

Executing the "stunting" study was the most enjoyable but chaotic segment of the evaluations. In most cases, measuring the children quickly became a village-wide event. Children, from infants to youngsters in school, were everywhere. Most were either fidgeting in apprehension of what was to come or smiling in satisfaction with the sweet that they had earned by holding still for a few minutes. All the while, parents, teachers and older children looked on with curiosity and often tried to become involved in what at times teetered on the edge of anarchy.

Target Objectives

Anthropometric indicators are generally broken into three sub-indicators—height-for-age (otherwise known as stunting), height-for-weight (wasting), and upper arm circumference. *Height-for-age* is selected here as the single best anthropometric indicator for health (primarily nutrition) because it registers long-term health status. This is because growth cycles, which are missed due to periods of poor health, cannot be recovered. This growth is simply foregone forever. Children who have foregone growth cycles will register as significantly shorter than statistically established averages. Height-for-weight and arm circumference both give information about current nutritional status only.

Height-for-age is also an indicator of wealth for the very poor. The very poor often spend any increased wealth on food, which will register as increased height. Following the same logic, distributional analyses of *height-for-age* along gender and class lines are indicators of gender and economic equity. Finally, *height-for-age* is indirectly a measure of soil and water conservation—in a rural community, improved health is often linked to the raw materials of farming.

Measurement Procedures

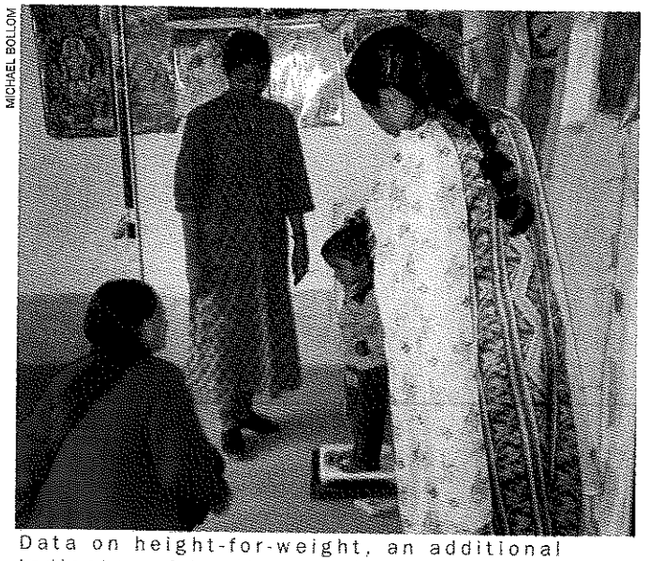
Children of known ages must be measured for height. Techniques for doing this are well documented and easily available, as are the international standardised tables that detail the distributions of height-for-age for children of different ages (for example, see the web page by Bender and Remancus, or the FAO manual listed in the Suggested Readings). A sample can be taken from several villages, randomly or in terms of representativeness. Children of particular age groups are measured and their heights noted. Since standardized tables of height-for-age measures are only applicable internationally up until

A small team can take precise height measurements quickly, easily and cheaply (Arki, H.P.)

puberty, younger children must be the ones measured.

The data collected is then analysed. Stunting is determined by counting the number of children who fall below two standard deviations of accepted norms. Gender parity is determined by analysing how the measurements for female children fare in comparison with males. Economic equity is determined by looking at the overall spread of the scores — if the standard deviation of the scores is high, equity is low.

When the evaluation team first arrived in the watersheds, they asked the partner NGO to schedule one day in each of the selected villages for the stunting studies.


MICHAEL BOLLOM

Data on height-for-weight, an additional indicator of health, can be gathered with a little extra effort (Arki, H.P.)

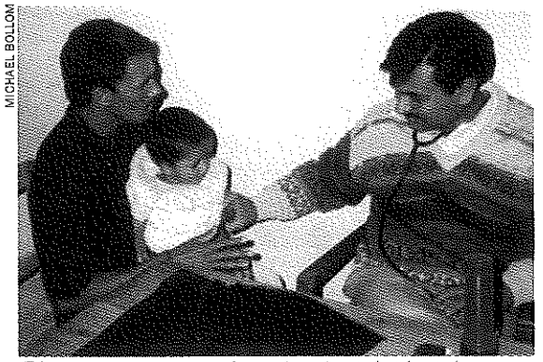
The team had to be careful to schedule visits when children were not in school, when mothers were not busy with their household chores, and when other, special activities were not taking place. On one occasion the team unknowingly scheduled the study on the day of a major festival in the village and before the study could even begin they were almost forced to join the village people in their raucous festivities! Generally, it worked best if the team arrived about mid-afternoon or on a Sunday. Three to four hours was enough time to process as many as fifty children.

While spreading the word about our forthcoming visit, the NGO informed parents that the team would need to know the ages of their children. While very few children in the watersheds had proper birth certificates, most parents did have vaccination cards that listed their children's date of birth. These cards were accepted as accurate since children begin their vaccination sequences within a few months after birth, when the date of birth is still fresh in the mother's memory. The team also accepted cases where the accompanying parent simply recited a birth date, if she or he seemed quite confident. In cases where the birth date seemed uncertain, the case was excluded from our database. [5]

[5] Our original plan was to calculate the children's ages using an ageing chart. Such a chart lists notable local events (whose exact dates are known) that occurred near the time that the children were born. A parent is then asked to specify how the birth of their child relates to these events. In this way the child's age can be estimated quite accurately. When the team was informed that the children in both watersheds had vaccination cards, this plan was abandoned. If birth records are not available, evaluators will need to devise a birth chart during the first few days of their stay in the watershed. This should be done with the help of local people and the NGO.

The preliminary PEP recommended that two-year-olds be measured. Given the small size of the villages being studied, the sample size would have been too small had this limitation been maintained. Instead, local people were told to bring children who were old enough to walk, up to five or six years old. In retrospect, it was a disaster to include children less than two years old. In the best cases they were unable to stand still; more often their shrieks of terror set off a chain reaction of crying which cascaded through to much older children who would have otherwise remained calm.

In order to encourage people to bring their children (and in the interest of giving something back to the community) the PI hired a local doctor to accompany the team on its site visits. The doctor's presence undoubtedly increased the level of participation in the study. The doctor was asked to bring the equipment and medicines that he thought was adequate to treat minor, childhood ailments. (The PI was also armed him with a large bag of sweets to put smiles on the little faces as they walked out of the chamber of horrors.) The doctor examined the children after the team had finished measuring them. In addition, he treated children too young for the study, whose parents had brought them because they knew a doctor was available. He treated older children and adults as well. Given the presence of the doctor, it seemed clear that almost every child between ages two and five was measured.[6]


MICHAEL BOLLOM

The presence of a doctor helped gaurantee a high rate of attendance at the stunting study (Kattery, T.N.)

In order to save on personnel costs, the PEP recommends that assistants for the stunting study be hired locally. This worked quite well, but some time was required to train the entire crew to work together. Measuring the heights of children is easy (as is measuring the weight, which was also done), but these measurements must be taken with consistency and precision for the data to be useful. This concern for detail needed to be instilled in the local assistants, who otherwise tended to treat the measurement sessions as a game, especially in the light of the carnival-like atmosphere of the whole undertaking. The training was imparted through a very short (less than an hour) practice session.

Finally, future evaluations need to set aside control groups. It may be more difficult to convince people in untreated areas to bring their children for measuring (they will not even know the NGO or state department people). The presence of the doctor (and the bag of sweets!) may compensate for this.

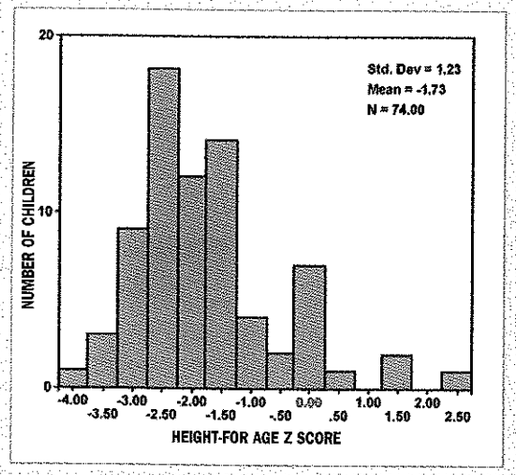
[6] This, of course, eliminates the possibility of any sampling error in the villages.

THE FINDINGS: HEIGHT-FOR-AGE

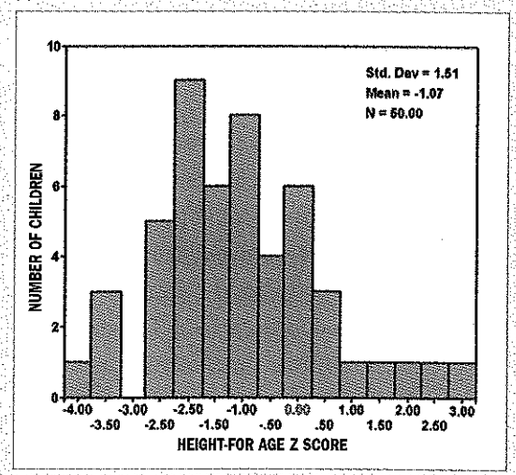
The findings were predictable in some respects and remarkable in others. Given the low levels of social development, especially in rural India, the assumption was that the children would, on an average, fall below international norms of height-for-age. The team's findings confirmed these expectations. In addition, most of the literature on social development in India maintains that there are stark inequalities along gender lines. This should register in measures of height-for-age—on an average, girls' heights should be farther below international norms than the boys'. The findings from this study do not support this.

The total sample size from both watersheds was 124, seventy-four of which were from Arki and the remaining fifty were from Kattery. Of the total, seventy-two were boys and fifty-two were girls. This is perhaps fifty fewer children than were actually measured. During the measuring process, certain cases were discarded. This was generally done for two reasons: when birth data information was uncertain and when the measuring process was not executed to the team's satisfaction.

Note that all the stunting data has been converted into "z-scores". (A child's height-for-age z-score tells us how tall a child is in terms of standard deviations above or below the international norm for his or her age.) This is to facilitate comparison across age groups and between the sexes. Conversion was done using growth reference curves developed by the American National Center for Health Statistics and the Center for Disease Control. (While the CDC is an American organisation, these growth curves are recommended by the World Health Organization for international use.) In all the following figures and tables, if a child's height-for-age z score is equal to zero, then his or her height is average by international norms. If the child's height-for-age is negative then the child's height is below average. A score of negative two or less means that the child is "stunted".



ARKI



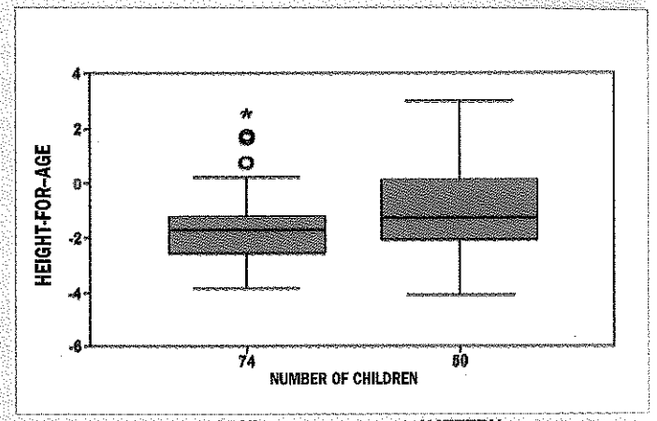
KATTERY

The above figures are histograms of the data sets for Arki and Kattery
These histograms show quite clearly that in both watersheds the children are far below international standards. In Arki, thirty-four children (forty-six percent) have scores of negative two or less. These children are stunted by international norms. In Kattery fourteen children (twenty-eight percent) are stunted.

COMPARING THE WATERSHEDS

A comparison of height-for-age in Kattery and Arki demonstrates that, on an average, Tamil children are healthier. The mean in Arki is -1.73, while in Kattery it is -1.07 (This difference is statistically significant (95% certainty). The Box-and-Whiskers plot on the facing page illustrates this point.

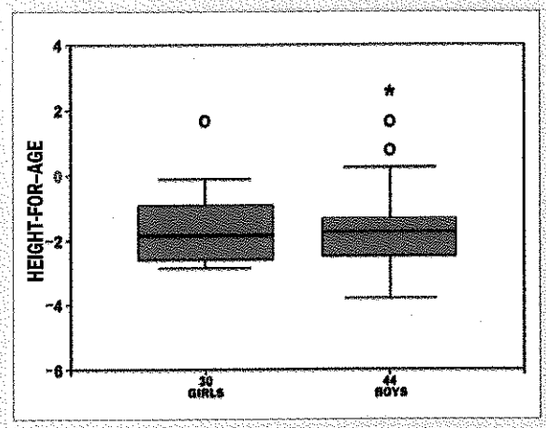
This difference between the watersheds is not surprising in the light of available information on the relatively higher levels of social development in Tamil Nadu.



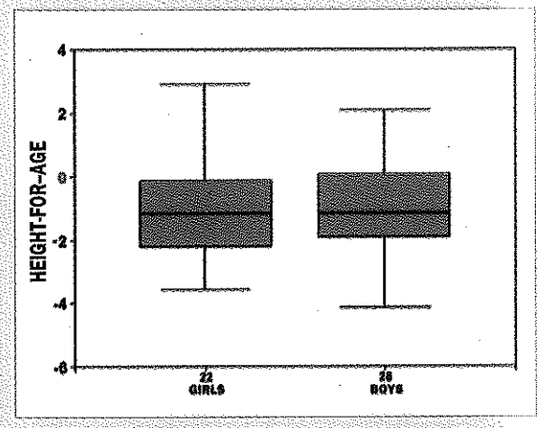
ARKI KATTERY

While the evidence is inconclusive, some of the data presented thus far indicates a higher degree of social inequality in Arki. While the Arki histogram is not two-peaked (which would be a very strong indication of social inequality), the box-and-whiskers plot for Arki (see right) contains four outliers at the high end of the distribution. These outlying points represent children who are much taller than the rest of the sample. These children could simply be genetic anomalies. Given the size of the sample (seventy-four children were measured in Arki), it is unlikely that the presence of a few unusually tall children was not balanced by a few unusually short children. It is more probable that these outliers are the children of local elites. Such children would have the sort of superior access to nutritional resources necessary for them to grow taller than others around them.

COMPARING THE HEIGHTS OF GIRLS AND BOYS



ARKI



KATTERY

When the data are segregated by sex there is a counterintuitive finding—the girls in both watersheds are, statistically speaking, the same height as the boys. (That girls in Arki are slightly taller than boys is not statistically significant.)

That there is gender parity (at least in terms of health) in the selected watersheds is not so strange if we examine Indian social development statistics on a state-by-state basis. While India has national gender parity ratings far below most other countries, certain states do fare much better than others. Both Himachal Pradesh and Tamil Nadu are amongst the top five.

Unfortunately, the data collect during this round of research can tell us nothing about changes in nutritional status in the watershed since the IGBP began its work. This baseline data only tells us about the current situation. In order to look for change, a similar study will need to be carried out in the same villages after a few years (no less than three). The data collected at that time can then be compared with the baseline.

Outlook and Recommendations

Of all the indicators tested, this one has the potential to be the most powerful, especially when considered in terms of resource constraints. For a relatively small investment in time and monetary resources, an evaluation team can gather a fine-grained database that is rich in information on nutrition, social equity and gender equity. (For almost no added costs, the team can also take measurements for wasting, which offers added information about the same issues.) Only a few pieces of equipment need to be purchased (costing less than Rs. 12,000), and the executing staff do not need to have any special skills. The study can be carried out quite quickly (half a day per village), while freely available software (EpiInfo6 from the Center for Disease Control) makes analysis quick and easy.

According to international organisations like the World Health Organization, this is a valid measure of nutritional status.[7] Distributions of nutritional status can be examined to gain information on gender and social equity too. Unless an evaluation team has sampling difficulties (and if they follow the procedure discussed above, they will not), this is also a reliable indicator. The stunting and wasting data have the added bonus of being objective, so it is less subject to criticism of bias.

This indicator does have some weaknesses, however. It is not a responsive indicator—changes in the level of community health will take several years to show up in anthropometric surveys. In addition, height-for-age will not be an useful indicator of health or wealth in those communities that are already relatively healthy and wealthy (since human height eventually approaches physical limits). Finally, like all extractively executed indicators, controls are necessary for the proper implementation of this indicator. Nevertheless, the continued use of this indicator is recommended without any reservations.

4. OWNERSHIP OF CONSUMER DURABLES

Target Objectives

This indicator measures the level of wealth in a watershed. The assumption is that as general levels of wealth increase, the local population will purchase more consumer durables. The ownership of various, highly visible consumer durables is used as an indicator for several reasons. First, consumption levels of non-durables (alcohol comes to mind as an example) are difficult to determine as people often do not monitor or remember their consumption rates.

The second reason why this particular indicator has been selected is because people often wish to conceal their personal income. Highly visible consumer durables, especially the larger ones such as farm animals or bicycles, are difficult to conceal so they can be easily counted. The distribution of consumer durables is then used to measure economic equity. Indirectly, this indicator is also a measure of soil and water conservation. The primary occupation in every IGBP RWS is farming. It follows that increased levels of wealth are likely a result of increased farm outputs. Sustained increases in farm outputs are less likely when soil and water resources are being degraded. Whether increased income is the result of improved soil and water conditions will need to be determined during the PRA sessions.

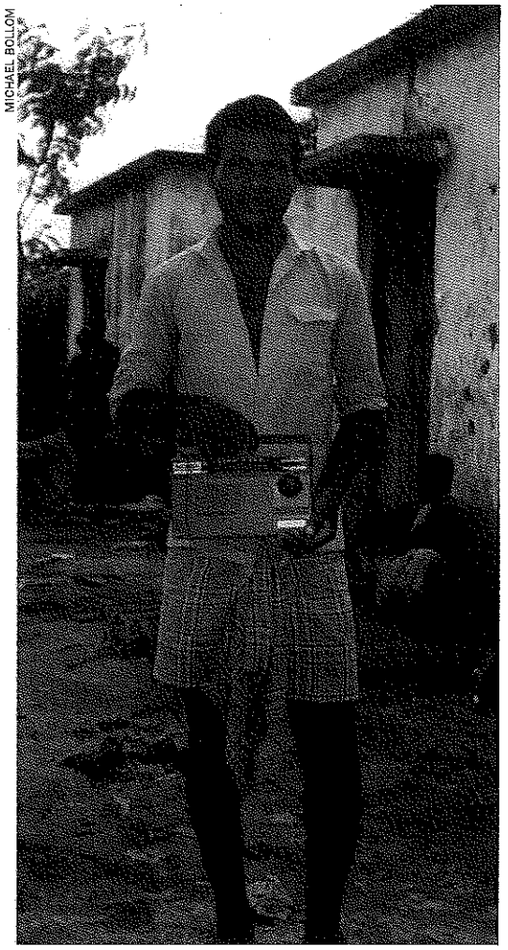
[7] Height-for-age as an indicator of health may face objections from people who do not believe that the heights of indigenous people can be compared to standardized tables constructed by the United Nations or the United States Department of Health. The basis of such an objection might be that local people are genetically shorter or taller than western people. According to research financed by the Food and Agricultural Organization of the United Nations this is not true (Bender and Remancus November 13, 1997). At least for the first ten years of life (through puberty) children throughout the world are the same height, all else being equal.

Measurement Procedures

Ownership of particular consumer items can be measured by a household survey or through a more participatory approach. The latter is recommended because it is faster, cheaper and more likely to uncover the truth. Obtaining figures of statistical significance does not require that the entire watershed be surveyed. Depending upon the number of villages, a sample of villages can be surveyed. If the villages in the watershed are very different in terms of socio-economic makeup, representative villages could be non-randomly selected. A skilled practitioner of participatory rapid appraisal techniques can assess the levels of ownership of various consumer durables in the village in a PRA session lasting no more than two hours.

The consumer goods surveyed need to be selected with local culture and levels of wealth in mind. Appropriate consumer goods to survey will be those that local people aspire to own, but are just out of their reach. For example, the number of snow shovels owned by Rajasthani villagers will probably not change even if their level of wealth increases dramatically. The goods surveyed must also be of the kind which others in the village would be readily aware of (e.g., a bicycle, more so than jewellery).

During the reconnaissance trips to the watersheds, the partner organisations were asked to help the PI assemble a list of consumer durables that a few people in


MICHAEL BOLLOM

People are generally willing to discuss their prized possesions (Karkara, Bihar)

the watershed possessed, but most aspired to own. The beneficiaries were told that when the evaluation team arrived, the team would survey these items in the selected villages.

Given the results of the evaluation team's survey, either the PI was not clear what he wanted, or the partners were not always in touch with the means and aspirations of the beneficiaries. In Arki, the list of durables included items such as a satellite dish! While a few people in Arki town may own such things, there was no evidence of them in the villages, and many people did not even know what a dish was. The list for Arki also included bicycles. Although bikes are within the financial reach of many villagers, they are of little use in Arki—most of the roads in the watershed are either too underdeveloped, too steep, or both.

In order to develop the best possible survey list of consumer durables, a group of local people must be consulted in the future. This should be done during the Gearing Up phase of the field visit. Evaluators must look for items that few own, but many would choose to own, given a modest increase in wealth. Such items will help evaluators measure change over time. If almost everyone in a village already owns an item, it is useless as a survey item. For example, if a village is already saturated with radios then it probably still will be when a second survey is executed several years hence. If this is the case, evaluators will not be able to register changing levels of wealth, even if they have occurred.

In one of the watersheds surveyed, a list of eleven durables was compiled, while in the other watershed the list contained eighteen items. In retrospect, the latter was a bit too lengthy to sustain the interest of the beneficiaries. Evaluators would be well served to survey between twelve and fifteen items. This number is still a bit large, but the original list needs to be longer. This is because some items may need to be withdrawn from the list during successive evaluations. For example, many people in Kattery presently want to own a mixie (blender). Five years from now, when a follow-up evaluation is being conducted, the mixie may have been superseded by a superior tool that does the work of a mixie and a grinder. If this were to happen, it would not make sense to continue surveying for mixies and the item would be omitted.

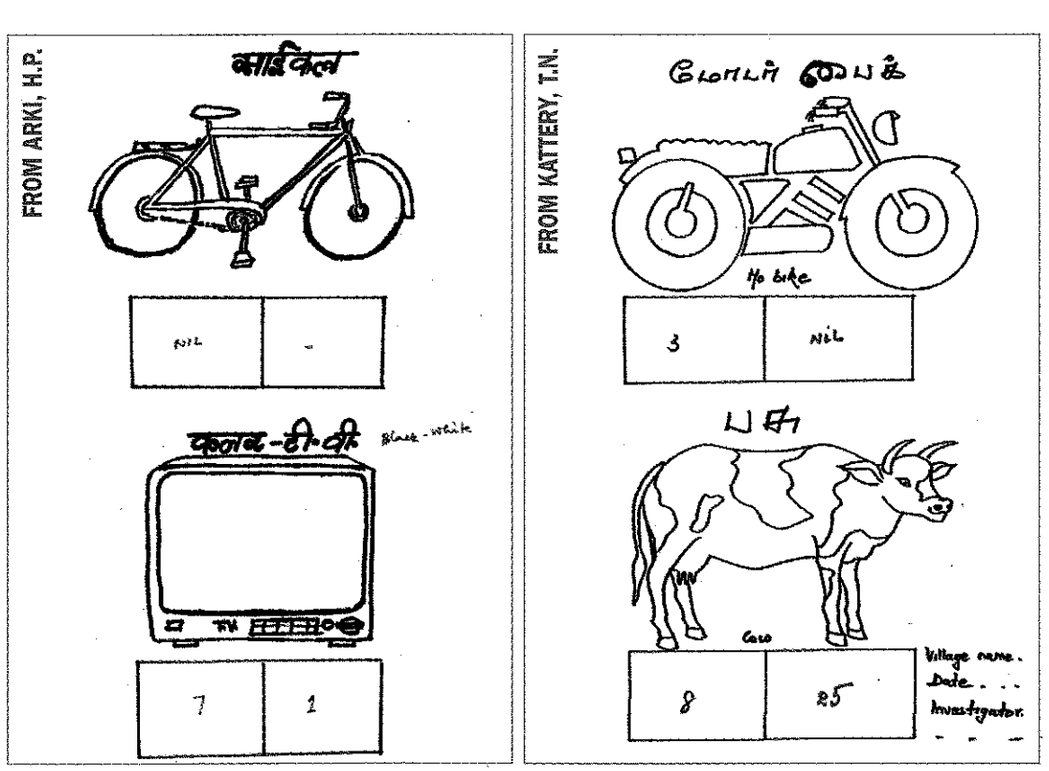
The lists of durables were then turned into pictorial surveys by an artist (no one on the evaluation team had the least bit of artistic inclination). The figure on the facing page shows a section from a survey done in Kattery and one from a survey done in Arki. Each item on the survey is represented by a separate picture. This is done both for illiterates as well as to stimulate discussion. In case the pictures were ambiguous, a caption was also included, in both the local language and in English. Since this book recommends that reconnaissance visits be dispensed with in the future, it is important that the evaluation team be prepared to construct these pictorial surveys in the field.

These surveys were used during the

Participatory Sessions. During the discussions themselves, it worked out best if the surveys are reserved until the end, when people were loosened up enough to talk about monetary issues. The team member leading the discussion asked the group to fill in the survey out together. They were asked to debate, one item at a time, how many of each are presently owned by the villagers. This number was then recorded, by one of the group members, in the left-hand box under each picture.

According to the PEP, time series data on changing ownership levels of consumer durables should be collected through periodic visits, several years apart. Despite this, the evaluation team made an effort to estimate changing levels of wealth by asking about past levels of ownership during the participatory sessions. After all items in our survey had been discussed once, the team asked the groups to go down memory lane and decide on how many of each item had been in the village a certain number of years earlier. While the team felt that the groups discussed the past with a great deal of confidence, the original approach is still recommended due to the frailty of human memory.

Given the uncertain nature of information gathered through group discussions, the team member leading the discussion was asked to rate her degree of confidence in the answers. She was asked to record on her own list if the group spoke with great certainty about the ownership rates of a



Pictures and labels help clarify the consumer durables being surveyed and stimulate group discussions

THE FINDINGS: CONSUMER DURABLES

The following table presents the findings for this indicator, broken down by watershed. While these are summary data, they are generally comparable (the data for each watershed is from the aggregation of results from three, similarly sized villages).

The data generally show Kattery to be more materially advanced than Arki. Where the same good was surveyed in both watersheds, there were almost always more of the same item in Kattery. There were two exceptions to this—telephones and black-and-white TVs. Of these, the latter is an inferior good to colour TVs, of which there are many more in Kattery.

Regarding change, only two items (cows and desi buffaloes) showed decreased ownership rates in both watersheds. Upon questioning, however, people in both Arki and Kattery related that they had not reduced their ownership of these animals due to monetary hardship. Instead, there has been a preference change in both watersheds, the result of which has made the ownership of these animals less desirable.

At the end of each participatory session the groups were asked to discuss what appeared to be their generally higher standard of living as compared to the earlier period surveyed. In Arki the answers generally related to changing employment opportunities with the state government (where most families earn their cash income). In Kattery, change was very closely related to the recent surge in the price of green leaf tea.

Only in one case did a group specifically link increased wealth to an IGBP-funded activity. In Salamoor Village (Kattery) the women's group spent a lot of time discussing their changing relationship with the local bank. As part of its empowerment programme, MYRADA has helped women's groups establish a client relationship with the local bank. Since the Salamoor group opened its account at the bank, the women have been able to supplement their own lending pool with a bank loan. They claim that this increased access to capital has allowed them to fund the purchase of some of their new durables. These funds have also helped fund agricultural improvements, which in turn led to increased incomes. This was mentioned by only one of the self-help groups in Kattery, but it was the last one that the team spoke with. Had they gone back to the other three groups and inquired about this phenomenon, it is likely that similar information would have been obtained, given that MYRADA had helped all the self-help groups obtain bank loans.

SURVEY OF CONSUMER DURABLES

Consumer good	Number of units: Present		Number of units: Past		Percentage change	
	Arki	Kattery	Arki[1]	Kattery[2]	Arki	Kattery
New or Tile Roof[3]	57	125	81	94	-30	63
Pukka House[4]	20	—	3	—	566	—
Cow[5]	41	42	14	80	192	-47
Desi Buffalo[6]	127	—	190	–	-33	—
Gas Connection	53	89	2	6	2500	1417
Bicycle[7]	5	—	4	—	25	—
TV (B&W)	49	30	10	6	390	400
TV (Colour)	2	38	0	10	NA	280
Cassette Stereo	51	98	6	25	750	292
Refrigerator	6	—	0	—	NA	—
Telephone	20	6	1	0	1900	NA

[1] Five years ago.
[2] Ten years ago.
[3] In Arki we asked about "tile" roofs; in Kattery the question was about "new" roofs.
[4] *Pukka* means finished, brick, or properly built, as opposed to a shack, or mud house.
[5] In Arki this item was specifically a Jersey cow; in Kattery it was not specified.
[6] The buffalo kept in Arki are mostly of a hill variety and are generally smaller. While *desi* means local, here it refers to the variety of buffalo from the plains.
[7] Includes motorcycles, scooters and mopeds.

particular item, or if their answers were tentative. For example, when one group of men got to the part of the survey that contained kitchen implements such as mixies and grinders, they openly admitted ignorance and told us to ask their wives. By rating the confidence in respondants' answers, we tried to control the reliability of the data—data deemed "too uncertain" by the interviewer were excluded from the final set.

When all the durables had been fully surveyed, the group was then asked to discuss the reasons for change. For example, why do fewer people own cows than they previously used to? How is it that there has been an explosion in the ownership rates of kitchen implements like grinders and mixers? If they answered that people have more money now, they were asked about the sources of the new-found wealth. Future evaluations may also want to use control groups to help pinpoint the mechanisms for changing levels of wealth.

Outlook and Recommendations

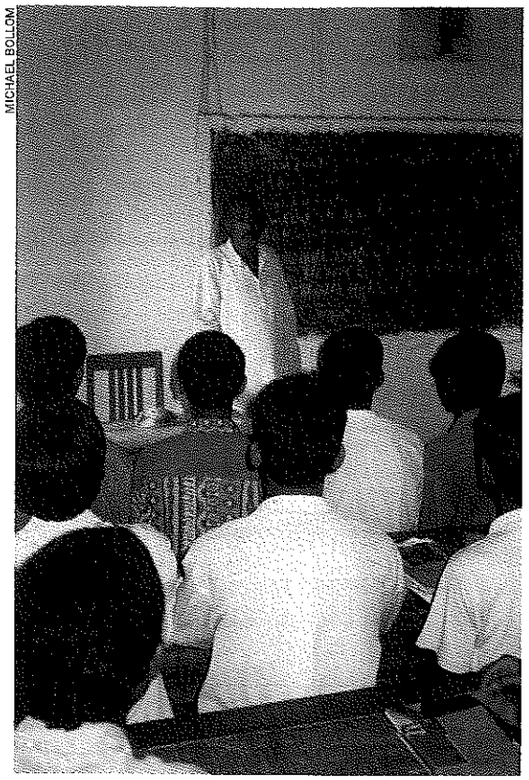
This indicator is highly recommended for future use. It allows evaluators to gather data on a very delicate issue (wealth). It is extremely inexpensive to implement, requiring only the purchase of poster paper and coloured pens. It also takes little time to implement—no more than an hour per village. The skills necessary to execute the indicator (the ability to lead a PRA in the local language) are somewhat sophisticated, but they are the same as the skills required for some of the other indicators in this set.

In addition, this indicator should be a valid measure of wealth for all but the poorest people. Given the nature of information obtained in group discussions, this data is also quite reliable. Reliability will, however, start to falter if the village is too large or the item surveyed for is too pervasive. For example, Mellodyarahatti in Kattery had almost seventy households. It was difficult for the groups to come up with accurate estimates of ownership for widely held items such as mixers.

To its detriment, this indicator is not very responsive—it takes time before beneficiaries transfer new-found agricultural wealth into consumer goods. In addition, this indicator will not measure changes in wealth at the very lowest rung of the economic ladder. Those most in need will first spend increased resources on food. After that, they will expend their resources on shelter and debt repayment. This problem is taken care of in part by using this indicator in conjunction with an anthropometric indicator (see the previous section). A survey of consumer goods also fails to register productive investment that come with increased wealth (e.g. the purchase of fertilisers).

5. SCHOOL ATTENDANCE

Due to unforeseen circumstances, the evaluation team was forced to collect the data for this indicator using a method other than the one that was proposed in the preliminary PEP. Then, obtaining data that could be compared between watersheds, across genders, and over time turned out to be much more difficult than expected. The reliability problem


MICHAEL BOLLOM

School attendance rates are an indicator of education (Karkara, Bihar)

leads to reservations about the utility of this indicator.

Target Objectives

This is a proxy measure for levels of education. In all but the worst cases, children become more educated the longer they attend school. Given that very poor people do not send their children to school, this is also an indicator of wealth—as the poor acquire more resources, they will send their children to school. The distribution of attendance data along gender lines also serves as an indicator of gender equity. Once again, this is an indirect indicator of soil and water conservation—in a rural community, the rising level of wealth necessary to attain higher levels of education is in most cases linked to the raw materials of farming.

Measurement Procedures

The original plan was to take a single day's attendance at all the schools that serve the selected villages. This would be accomplished by simply arriving (unannounced, if possible) at the schools in question, and requesting a head count. In the spirit of participation and sharing data, attendance figures should be discussed with the principal/director of the school at the time of collection. This person can offer an interpretation of the data.

Upon arriving in Arki and Kattery, the team was told that it would not be possible to take attendance at the local schools. In March, students all over India take their annual exams. The team's visits to both Arki and Kattery coincidentally overlapped with the local exam periods. An alternative plan was quickly developed. Instead of physically counting the students, team members asked to see the school's attendance registers for a recent date. It was decided that this date should be one prior to the exam period, because during exams attendance rates are unusually high (i.e., data needed to be collected for a "normal" day).

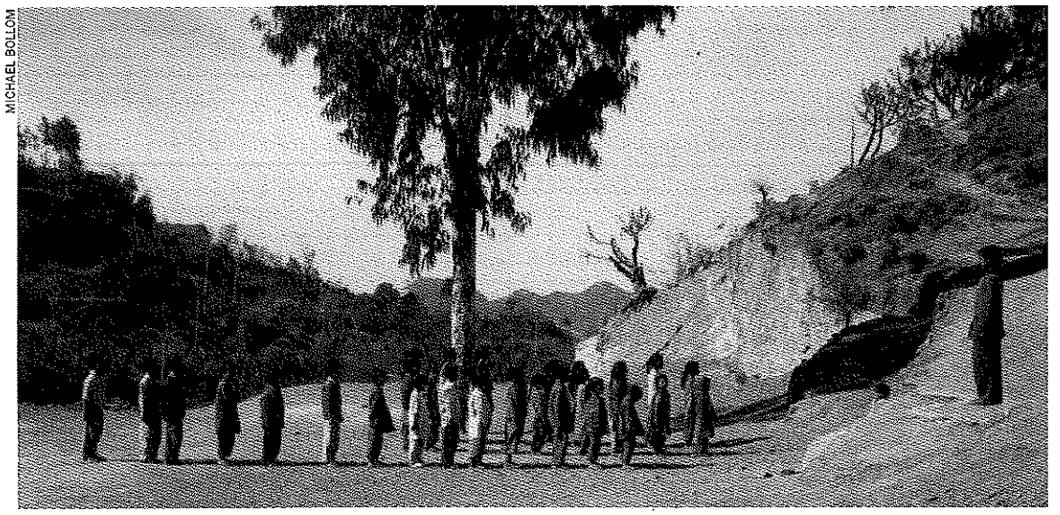
Almost all of the principals with whom team members spoke were quite helpful. After asking about the nature of the evaluation, many simply opened their attendance registers and let the team collect the needed information. Others went to their record keeping area and supplied the information to the team. This latter method of operation highlights the weakness of our alternative method—data supplied to the evaluation team by school administrators may be subject to tampering. (The same is true, probably even more so, of enrolment figures. This was the reason why attendance figures were preferred over enrolment records in the first place. [8])

Although the evaluation team did not actually carry out the head count method, visiting schools in Arki and Kattery gave rise to a concern about the invasive nature of the of the head count method. This problem was not evident when this method was first developed by the PI after his visit to Karkara RWS, Bihar. In Karkara the schools were fairly small and informal, as one might imagine village schools in a poor rural area to be. The secondary schools visited in Arki and Kattery were, however, much larger and more formally run. Had team members asked, the headmasters of these schools may have bristled at the idea of disrupting their classes to count the number of students, especially when the attendance had been already taken in the morning.

So both the methods of collecting attendance data have shortcomings. Head counts are invasive and official records can be falsified. If the local schools are small and informal, the head count method is recommended. If not, evaluators can attempt to be present during the normal morning attendance session (to do a parallel count). If neither of these options work, evaluators should use the daily attendance records that are available at the school.

Evaluators should attempt to mini-

[8] After collecting some enrolment figures in both Arki and Kattery, the original reluctance to use them was justified. One school in Kattery had offical absentee rates (enrolment minus attendance) of between twenty and forty percent. That this many students are missing for just the day is unlikely. It is more probable that many of these "absentees" are simply on the enrolment roster, but they do not really attend school.


MICHAEL BOLLOM

Morning is a good time to quickly determine the day's attendance at school (Arki, Himachal Pradesh)

THE FINDINGS: SCHOOL ATTENDANCE

The PEP recommends that changing enrolment rates be determined through periodic visits to the watershed. The evaluation team nevertheless attempted to gather some data on change. They asked school administrators to furnish attendance data for a date in the past, which could be compared with the present figures. This did not work very well. First, some of the schools did not have old attendance records. Those schools that did furnish old attendance figures did not give figures for the same dates. (In Arki, the old attendance figures were from three totally separate school years, none of which were from the same year supplied by the administrators in Kattery.) This made the figures incomparable. The decision was made to exclude these figures from the findings.

Below are school attendance data from the two watersheds for the given dates. The data appear to indicate that the attendance ratio of girls to boys is better in Kattery. This ratio is generally greater than one in Kattery and always less than one in Arki. The greater gender equity in Kattery is in keeping with the high social development ranking of Tamil Nadu.

Due to data collection problems, however, the PI is reluctant to claim that the data is valid or reliable. The evaluation team had intended to collect school attendance data that could be compared, from grade to grade and across genders. In retrospect, this was not probably done properly. This is because the local school systems are highly fractured. Children from the same village (even the same family) often go to different schools, which can be located in widely dispersed locations. This geographic dispersion of schools makes it difficult to use attendance figures from local schools as a proxy for the number of children from that village going to school.

An example, can be cited from Michael's Colony (Kattery). In addition to the government school, there is also a Catholic school in Michaelis Colony. This Catholic school serves only girls, from first through tenth standard. The school attracts children from many other villages besides Michael's Colony (the only village which was surveyed in that part of the watershed). There is no comparable school for boys in Michael's Colony so only local boys go to the local school. The fact that the Catholic school brought in a sizeable number of girls from neighbouring villages skewed our attendance data in Kattery. Thus, a false picture emerged that more girls attend ninth and tenth standards in Kattery.

Such problems made it difficult to make accurate surveys of attendance rates for the watershed. In the future an evaluation team should collect attendance data from all schools in a watershed that serve the grade levels of interest (in this case the ninth through twelfth standard). This should ensure the most complete count. Yet, even this may not be enough as some children may commute outside of the watershed, as was the case in Kattery.

The team was under the impression that they had taken a full survey of schools serving the ninth through twelfth standards in both Arki and Kattery, yet the attendance figures collected are so erratic that they are hard to believe. According to the data there are 521 eleventh and twelfth grade students in Arki, as opposed to 239 in Kattery. But Kattery has a larger overall population so there should be more children in school! It is also disheartening to note how steeply enrolment rates appear to drop off in Kattery. These figures cannot be correct, since most people in the Tamil Nadu watershed agreed that almost all students in Kattery finish tenth standard and over two thirds of those finish twelfth. Perhaps the team overlooked some schools in the watershed.

School Attendance Rates

Grade	Arki (16/2/98)		Kattery (2/12/97)	
	Boys	Girls	Boys	Girls
9	139	110	163	214
10	124	113	102	167
11 (10+1)*	165	88	85	65
12 (10+2)*	141	127	41	48

*The school system in Arki is such that the 11th and 12th grades are referred to as "10+1" and "10+2"

mise their counting work whereever possible. For example, in Arki the team began by visiting all the schools that served the selected villages, first through twelfth standard. After several informal discussions with both villagers and an elementary school principal, it became apparent that all this work was not necessary. Informed people told the team that, apart from exceptional cases, all students in Arki go to school until tenth grade. After this, attendance rates begin to decline, more so for girls. Hearing this, and confirming it at several elementary schools, plans to visit the remaining primary schools were cancelled, and efforts were focused on secondary schools. In retrospect, the decision to investigate only the grade levels from which attendance begins to fall below one hundred percent was a great time saver.

Outlook and Recommendations

This indicator can still be a useful tool. Given the data collection problems discussed above, however, only a guarded recommendation is offered. Attendance is certainly a valid measure of schooling (although whether it is a measure of literacy or education is an issue which we will not attempt to address here). School attendance is also a fast, cheap and easy indicator for measuring education. It requires very little time, no special equipment and can be carried out with low levels of training.

This indicator is not, however, particularly reliable. Attendance on any one day is subject to many factors, including the weather, festivals and cropping patterns. As such, attendance figures gathered even on two successive days might be quite different. For this reason, it is still recommend that the data gathered be discussed with an administrator—he or she will know if the attendance on a particular day is unusual or not. (If a high degree of reliability is required, then enrolment figures should be used instead.) Another weakness of this indicator is that it requires the use of controls.

Given the host of problems discussed above, (and in the box on the facing page) it might be quicker, less expensive and easier to skip the head counting and simply gather information on school attendance rates as part of the Participatory Sessions. The evaluation team collected more information about school attendance rates during the PRAs than while collecting the attendance data, and the latter took five or six times as much effort as the former!

6. USE AND MAINTENANCE

This indicator (referred to in the rest of the text as *"Use"*) is very closely associated with the indicator *Outsiders*. For this reason, many of the comments made here will also apply to *Outsiders*. The text will make clear which statements apply to both.

Use and *Outsiders* are the process indicators in this set. They do not attempt to measure the impact that a programme's activities have had. Instead, they give some idea of how successfully the activities themselves are functioning. With such information, evaluators can better

Activity	Level of Use	Level of Maintenance
Forest Department		
Nursery	Heavy (past) Disuse (present)	High
Plantation	N.A. (The plantations will not be ready to bear fodder or fuel for many years.)	Moderate
Live Fencing[1]	Moderate.	Moderate
Lantana Clearing[2]	N.A.	Poor
Check Dam[3]	Moderate	Poor
Village Development Committees[4]	Disuse	N.A.
SUTRA		
Smokeless stove	Heavy	High
Stove Technician (Mistry)	Moderate	N.A.
Solar Cooker	Disuse	Poor
Para-vet (Dunger Dai)		N.A.
Nursery—Napier Grass	Unknown	Unknown
Napier Grass Plantations	N.A.—The grass must first fully establish itself	N.A.—The grass is being left to fend for itself.
Nursery—Sapling	Light	High
Compost pit	Light	High
Women's Groups[5]	Light	Low
Watershed Federation[6]	Light	N.A.

[1] Rows of cactus-like plants that surrounding some piece of generally agricultural land. It is supposed to prevent unrestrained grazing by cattle.

[2] Lantana is a pest plant that needs to be cleared in order to make room for more desirable species. It must be cleared several years in a row before it is completely destroyed.

[3] Loose bolder structures designed to catch silt that is suspended in flowing water. Check dams also act to slow the velocity of flowing water, thus preventing additional erosion.

[4] Village-level committees that are supposed to be the Forest Officer's vehicle of participatory development in the villages.

[5] Groups of women set up at the village level. The intention is to empower women, both economically and politically.

[6] A federation of the self-help groups in the watershed.

Activity	Level of Use	Level of Maintenance
AED		
Check Dam[7]	Moderate	Moderate to Low
Gabion[8]	Heavy	High to Poor
Community Well[9]	Heavy	High
Retaining Wall[10]	N.A.	High
MYRADA		
Community Toilet	Heavy	High
Bridge[11]	Light	Moderate
Path to Temple[12]	Moderate	Moderate
Community Well	See Above	See Above
Tank Cleaning[13]	N.A	Unknown
Self-Help Group[14]	Heavy	High
Village Infrastructure Committe[15]	Not yet fully implemented	—
Watershed Federation[16]	Heavy	High
Stream Nala Widening[17]	Not yet occured	—

[7] In Kattery, the term "check dam" refers to masonry structures built across small waterways. They are designed to hold water for up to several months after the rainy season.

[8] Same as check dams in Arki, but these are held together by a wire mesh.

[9] This activity is being implemented with MYRADA. The AED builds the dam, but MYRADA helps with the placement process, purchases the pump, installs it and electrifies it.

[10] A masonry structure build on the side of a large stream to prevent erosion from the bank.

[11] A concrete foot bride to a temple located across a small stream from the main road.

[12] A concrete footpath was built from the village school, down a steep hill, to an important village temple.

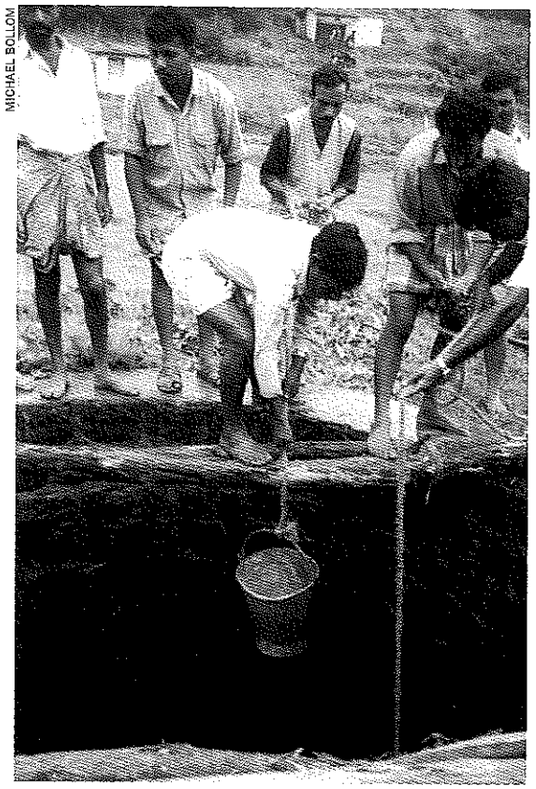
[13] MYRADA organised the cleaning and repairing of a village water tank.

[14] Groups set up at the village level to deal with local problems. Men and women have separate groups. One of the primary focus of these groups has been to facilitate personal savings by using a micro-finance type program.

[15] Village-wide organisations to deal with infrastructure in the villages.

[16] This was originally formed by the AED, with a fairly random selection of people some of whom were not even from the watershed. This organization became defunct quite quickly. The Federation has since been revived by MYRADA. It is now a federation of the self-help groups in the watershed.

[17] The Watershed Federation (with the help of MYRADA) is working with the AED to widen and deepen the main nala (drainage stream) in the valley. Work on this activity has not yet begun.


MICHAEL BOLLOM

Villagers maintain their community well (Kattery, Tamil Nadu)

understand the mechanisms through which programmes have affected the treatment area, and also in some manner predict the future impacts.

Target Objectives

This indicator measures project sustainability. If many of the units that have been installed under some activity are not functioning or improperly maintained while outside support is still coming in, it is likely that even fewer will function after outside support is withdrawn. Such an activity is not sustainable.

Measurement Procedures

The execution of this indicator is highly time consuming. Determining the extent to which programme activities are being used and maintained requires that members of the evaluation team visit at least a sample of units from every activity in the watershed. During the test evaluation this entailed a lot of travelling, much of it over difficult terrain. Even though the PI elected not to visit all installed units, the travel time required to execute this indicator consumed over one third of the Field Visit phase of the evaluation. If an evaluation must be completed very quickly, investigators may prefer to omit this indicator.

During his reconnaissance trips the PI gathered lists, from both the NGO and the state department, of all activities being implemented in each RWS. In future evaluations, this should be done during the Gearing Up phase. Plans must then be made to survey all the activities in order to determine how frequently they are being used and how well they are being maintained. At this point sampling becomes an issue. During the present evaluation, if an activity had only a few units in the watershed, the evaluation team surveyed all of them. If this was not possible, only those units in the selected villages were surveyed. For some activities, so many units existed that even this was not possible. In such cases, random visits were made to the units.

Before going to the field, evaluators must define the terms "heavily used", "lightly used", "well maintained' and "poorly maintained" for each activity. For example, the evaluation team decided that smokeless stoves used for cooking everyday be defined as "heavily used".


MICHAEL BOLLOM

In order to qualify as "heavily used", smokeless stoves needed to show evidence of daily use (Arki, H.P.)

Explicit definitions prevented qualitative appraisals from becoming too subjective.

Developing these definitions can challenge the imagination, especially when it is difficult to determine what it means to "use' or 'maintain" units of a particular activity. For example, how does one use a check dam? In such cases, only levels of maintenance can be checked for. Definitions of both use and maintenance should be formulated in consultation with the people who have designed the activity.

Outlook and Recommendations

This indicator gave the evaluation team a clear understanding of how well the IGBP's work is proceeding, on an activity-by-activity basis. While it relates little about the Project's impacts, it is essential for understanding the mechanisms through which the Project is making an impact.

This indicator is a valid, if only partial, measure of programme sustainability—when units in an activity are being heavily used and highly maintained it is very likely that the activity is sustainable. While it is not perfect, this indicator is also sufficiently reliable. A single field visit may miss periods of high or low use. To circumvent this the procedures for this indicator combine a field survey with participatory discussions. In addition, this simple indicator requires no special equipment to use and, because it is a purely participatory indicator, it does not require the use of control groups. For these reasons this indicator is strongly recommended, except in the case of extreme time constraints.

7. DEPENDENCE OF PROGRAMME ACTIVITIES ON OUTSIDERS

Like *Use, Outsiders* is a process indicator that provides information about the sustainability of a particular activity. While *Use* gives information regarding use and maintenance of units in an activity, *Outsiders* tells evaluators whether the operation and maintenance of an activity is dependent upon outside expertise, funding, etc. If it is, the activity will probably cease to function after project funds dry up.

In many cases, deciding whether someone is an "outsider" is quite easy. A foreign consultant brought in from abroad is an outsider. In some activities, however, the definition of who is actually an outsider can be difficult. Essentially, an "outsider" is someone who would not be involved with an activity were it not for programme funding. This can even include local peo-


MYRADA

While it is important that this check dam be maintained, desilting has only occured under the organisation and direction of outsiders (Kattery, T.N.)

ple who carry out certain tasks under the employ of the programme. For example, in Arki one of the SUTRA staffers is a young woman who has always lived in the Arki watershed. In all the activities analysed she is an "outsider" in the sense that she will cease to carry out her current responsibilities once the IGBP withdraws it's funding and the SUTRA office shuts down.

Target Objectives

If a project's local programmes are operated and/or managed by outside personnel, then levels of active local participation are lower. In addition, the presence of outsiders is an indicator of project sustainability and replicability. If local people cannot manage and operate an activity by themselves, it will eventually collapse when outside support is withdrawn. In addition, if an activity can be run without the help of outsiders, it is also more likely to be widely replicable in other areas.

Measurement Procedures

Gathering the data involves informal discussions with people who use and/or operate units from all NGO and state department activities. The visits for *Use* and *Outsiders* should be undertaken simultaneously. While investigating use and maintenance issues, the evaluation team asks questions regarding the people who keep each particular activity in operation. This involves obtaining answers to a series of questions: Who operates the units of this activity on a day-to-day basis (and where do they come from)? Who maintains them? Who supplies the spare parts? Where do the finances for on-

THE FINDINGS: DEPENDENCE ON OUTSIDERS*

ARKI		KATTERY	
Activity	**Dependence on Outsiders**	**Activity**	**Dependence on Outsiders**
Forest Department		**Agricultural Engineering Department**	
Nursery	High	Check Dam	Medium
Plantation	Medium	Gabion	High
Live Fencing	Medium	Community Well	Low
Lantana Clearing	Medium	Retaining Wall	High
Check Dam	High		
Village Development Committee	High		
SUTRA		**MYRADA**	
Smokeless Stove	None	Community Toilet	None
Stove Technician (Mistry)	Low	Bridge	None
Solar Cooker	Medium	Path to Temple	None
Para-vet (Dunger Dai)	High	Community Well	Low
Nursery (Napier Grass)	High	Tank Cleaning	N.A.
Napier Grass Plantation	Medium	Self-Help Groups	Low
Nursery (Sapling)	High	Village Infrastructure Development Committees	Medium
Compost Pit	None	Watershed Federation	Medium
Women's Group	High	Stream (Nala) Widening	High
Watershed Federation	High		

*at the time of evaluation

going operations come from? If group action is necessary, who organises it? The answers to many of these questions require follow-up interviews with the people named, in order to determine why they are present in the watershed and who pays their salaries. Information gathered in the field are then verified during the Participatory Sessions, which take place later.

Outlook and Recommendations

Participation and sustainability are very difficult concepts to concretise and measure. Like *Use*, this is a valid, if partial, measure of both—if the operation and maintenance of an activity is not dependent upon outsiders, then the activity has a much higher potential for survival when the programme funds cease. Given a thorough investigation of who operates and maintains an activity, this indicator should also be fairly reliable. While various evaluators may begin their investigations with different units, their questions should lead them to similar answers regarding those responsible for operation and maintenance of the overall activity.

Outsiders is, along with *Use*, a time-consuming indicator. On the other hand, no special equipment is required. Time constraints aside, this was a very important indicator for understanding the sustainability of a project's various activities. If, however, time constraints are severe, and if information about processes is significantly less important in comparison to studying impacts, it should be omitted from the indicator set.

8. REPLICATION

Target Objectives

This indicator is a measure of replicability. If local people replicate some programme output without support, it implies that there is a local demand for the units, a willingness to pay for them, and the necessary skills to construct, use and probably maintain them. In such a case, the programme is definitely replicable, at least in the surrounding areas. It is also likely to be replicable in other locations with similar geo-climatic conditions and socio-economic resources.

Measurement Procedures

The methodology for this indicator is rather ad hoc. Evaluators simply need to scan for and inquire after evidence of programme outputs that have been upgraded or replicated without project support. Inquiry is probably the best starting point, especially for information regarding replication, because copying of programme units may be taking place in remote areas, or areas outside of programme coverage. Any leads should be followed up and personally confirmed by evaluators. While gathering data on replication, evaluators should also inquire about facilities that have been upgraded or modified. All leads should be personally confirmed. Evaluators should also look for evidence of up-gradation and modification when they are conducting surveys for the indicators *Use* and *Outsiders*.

Outlook and Recommendations

To its credit, this indicator is fast, easy and requires no special tools to execute. Given the nature of what is being investigated, it also makes little sense to use a control group with this indicator (cutting expenses even further). Although it is a valid indicator (at least for smaller activities), it will be of little use *vis á vis* resource-intensive activities. It is simply not realistic to think that local people will have the capacity to finance and execute activities that require large investments such as check dams or community wells. These are activities which, at least in the Indian context, can only be implemented by the state, or large NGOs.

Another weakness of this indicator is that it is not particularly reliable. It relies too much upon luck—evaluators must be told by some informed party that a case of replication exists, or the evaluators must stumble upon the replicas themselves.

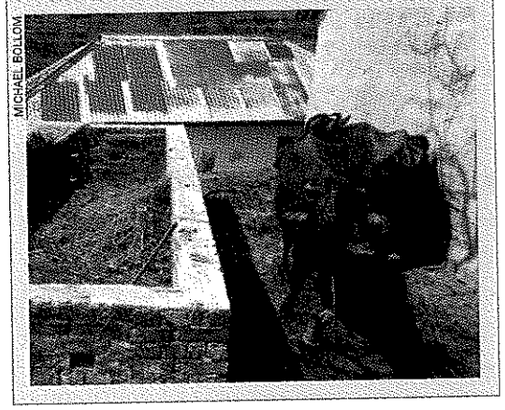
In addition, this is only an incomplete indicator of replicability. Replicability depends upon many factors, including geography, climate, level of development, socio-economic institutions and the structure of the state. Even if an activity is being replicated in the watershed being evaluated, this does not mean it is replicable elsewhere. An evaluation can only conclude that a activity is potentially replicable.

In the end, this indicator is recommended, but only for want of a better alternative. Other monitoring and evaluation specialists would be well served to either expand upon this indicator, to make it more reliable and applicable to a wider range of activities, or develop a new one.

THE FINDINGS: REPLICATION

Having mixed feelings about the utility of this indicator, the PI asked the evaluation team to abandon it after a few days in the field. Although confidence in this indicator has been restored, there are nevertheless no findings to report. One, isolated case study is worth relating, if only as an example of how findings from this indicator might appear.

A farmer in Kolka village, Arki RWS built an almost exact duplicate of the SUTRA compost pit in that village. (Like the original, this one was only being used to store cow manure.) When the SUTRA staff was asked about this copycat pit, they said that its owner was now asking to have the IGBP reimburse him at the rate paid for the SUTRA compost pit. It seems that SUTRA paid handsomely for itís original pit. The copycat farmer built his pit much more cheaply with an eye to the profit he could make if reimbursed at the SUTRA rate. This is less a case of authentic replication than an attempt to manipulate development aid for personal profit.


MICHAEL BOLLOM

9. SOCIAL CAPITAL

While the indicators *Use* and *Outsiders* produce information that is crucial to the determination of sustainability, they do not address the issue of social organisation and mobilisation. When programme investments are on common land or public land (which is generally the case), then they are, in practice, owned simultaneously by everyone in the watershed, and

by no one[9]. Commonly owned resources are difficult to manage and maintain. In the absence of some norms or institutions, there is no way to prevent over use, ensure maintenance, solve disputes, etc. Solutions to these problems must be found if a programme investment is to be used sustainably.

Post-Independence India has not provided strong, decentralised political institutions to manage local soil and water resources. Appropriate government departments generally exist at the state level, but these are largely distant bureaucracies, not local democratic institutions. Under the IGBP's overall plan, partner state departments and NGOs were supposed to co-operate towards the goal of building up the sort of social capital that could locally manage watershed issues (Honore and Chaturvedi, 1997).

As defined here, "social capital" can be any organisation or institution that facilitates group co-operation towards a social goal.[10] Anything from an interest group or chamber of commerce to a village council or political party can act as a vehicle of social organisation and mobilisation. Even if the indicator *Social Capital* only incorporates such easily identifiable organisations, measuring its strength would be difficult. Should evaluators count the number of such organisations, the attendance at the organisations' meetings, or the number of meetings that they hold? Although this would be difficult, it could be done. But are these even relevant pieces of information? Just because organisations exist and hold meetings, it does not mean that they have any capacity for social mobilisation?

This problem is made even more complex by the nature of Indian politics, where social organisation and mobilisation often occurs through what are called "demand groups"—loosely organised pressure groups that spring up around some contentious issue, then quickly disappear after the conflict has subsided.[11] Because demand groups are usually in the dormant stage, it is not possible to measure their strength through a survey of existing social organisations.

Measurement Procedures

With these ideas in mind, the evaluation team began to develop an indicator of social capital while working in Arki RWS. Instead of focusing on processes (i.e., groups, meetings, attendance), the team looked for outcomes. Investigations revolved around the question: Had local citizens recently confronted any watershed related problem (i.e., had there been any instances where groups of local citizens attempted to solve some soil and/or water conservation problem)? This would be used as evidence that social capital exists.

[9] I am quite aware of the distinction between common and public property. In India, however, the state is often very removed from the management of public lands, in which case public and common lands are treated very similarly by local people

[10] Ideas about social capital have been drawn largely from Robert D. Putnam's *Making Democracy Work* (Princeton: Princeton University Press, 1993).

[11] The term "demand group" was coined by Rudolph and Rudolph in their book *In Pursuit of Lakshmi* (Chicago: University of Chicago Press 1987).

THE FINDINGS: SOCIAL CAPITAL

No instances of social capital were uncovered in Arki. Even the women's groups and their federation had engaged in almost no meaningful social or political activities. The people of Arki RWS on the whole seemed to have little idea that they could act together to solve their water problems. For example, while conducting a water resource mapping at the spring in Senj village, several women related how five or six years ago this spring used to run dry in the summer months. This was, of course, an inconvenience for them. Their solution, however, was to walk two kilometres away to a different spring during the summer. Had there been some social capital in this village, these women might have pulled together, either to fix the problem themselves or force some government agency to do so for them.

In Kattery, on the other hand, the evaluation team uncovered at least five instances of people uniting to address water issues. In each case, the social capital that was chronicled was being built up by MYRADA. Two of these stories are worth recounting, in detail, as they illustrate how local people can address their own water problems if properly empowered.

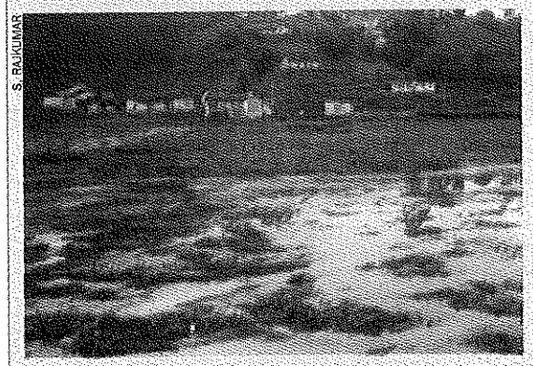
The Leaky Water Pipe

Mellodyarahatti Village relies upon an artesian spring for much of its drinking water. The water is piped from its source at the spring to a storage tank up hill from the village, about 500 metres away. From there it is distributed through pipes to the village. A little over a year ago, the pipe from the spring to the tank began to spring leaks. Unable to fix these leaks themselves, the villagers of Mellodyarahatti attempted to solve this problem as a group. They worked through the Village Infrastructure Development Committee (VIDC), which had recently been formed with the help of MYRADA. With MYRADA's direction (but not assistance), representatives of this Committee have successfully lobbied appropriate government authorities. New pipes have already been delivered and installation technicians are on their way.


MICHAEL BOLOM

Widening the *Nala*

The main *nala* (stream) that drains Kattery watershed is subject to periodic floods. This is because many who own land adjacent to the *nala* have slowly encroached upon the flood plain. The *nala* is now only a few metres wide in most places, with a meter-high embankment to keep the water flowing along its course. Heavy monsoon rains cause the *nala* to breach its embankments and floods the area around Palada Village, often resulting in great financial losses for many of the farmers.


S. RAJKUMAR

Since being revitalised by MYRADA, the Watershed Federation has addressed this issue, with some success. Prior to 1992, individual petitions to widen and deepen the *nala* had occasionally been submitted to the District Magistrate (DM) in Ooty, but nothing came of them. In 1993, the AED had proposed *nala* widening under the RVP, but the Ministry of Agriculture and the IGBP rejected it.

Then on the night of October 15, 1997 there was a big flood in the valley near Palada. The Federation evidently had made some preparations for this event. At six o'clock the next morning members of the Federation informed the newspapers, the panchayat, the DM, the and AED that they were going on a hunger strike until the issue was looked into. Local newspapers covered the story. The DM promptly came to review the situation. He asked the AED to make surveys and submit proposals. The proposal submitted has been accepted by the DM and is now awaiting the chief minister's approval.

Since many people did not really understand the issue of soil conservation, the team chose to focus on water issues, which are more concrete and of immediate importance to local people. Villagers were asked about problems they may have had with water. When the team uncovered some water problem, they asked how it was dealt with. The team was looking for verifiable stories of groups who had come together and successfully addressed some water problem. Appropriate cases were followed up and noted down in detail.

Outlook and Recommendations

This indicator is a valid measure of social capital—if people have demonstrated the ability to pursue grievances regarding watershed issues, then social capital is present. Unfortunately, this is not a reliable indicator. The questions that the investigators need to ask are necessarily vague, so respondents may not always understand what the evaluation team is looking for. In addition, not everyone in a watershed may even be aware of the social capital that exists. If evaluators do not interview the right people, they will not gain the necessary information.

In addition, it may be difficult to determine change with this indicator. If *Social Capital* was previously non-existent in a baseline survey and then it registers in a subsequent survey, evaluators are safe in assuming that change has occurred. Evaluators can also assume that change has occurred if identical types of social capital are found in the 'before' and 'after' surveys, but the intensity of the social capital has changed. If, however, one or more forms of social capital were found during a baseline survey, but completely different ones are found in a subsequent survey, evaluators will not be in any position to determine if the level of social capital has increased or decreased. It is very difficult to say whether one type of social capital is stronger than another.

While the indicator is inexpensive to use in terms of equipment (absolutely none is required), it must be executed by someone with a sophisticated understanding of social capital, local society, governmental structures and the programme being evaluated. In addition, this person must be a skilled interviewer, although local language capabilities are not essential for such interviews.

Finally, this indicator cannot be executed with any great speed. It involves much open-ended interviewing with various types of people—from farmers to local government officials. In addition, many of these interviews require subsequent discussions with additional informants. These interviews can, however, be carried out concurrently with other parts of the evaluation. Since it is a participatory indicator, it does not require the use of controls.

This indicator is recommended with reservation. It is the best available alternative for measuring the existence of social organisation and mobilisation. It can be abandoned if a more reliable and less time consuming alternative is developed.

CONCLUSIONS

Indicators work! After testing and refining the Programme Evaluation Protocol under field conditions, the Principal Investigator does not hesitate to claim that this indicator set can be used to measure physical and socio-economic realities in rural watersheds, although not always as quickly, cheaply and easily as originally hoped. Exclusive of travel time, a team consisting of the PI and two assistants was able to execute the preliminary PEP in two Representative Watersheds—Arki in Himachal Pradesh and Kattery in Tamil Nadu—in ess than twenty days. This was done with very few expensive tools and with research assistants who had received very little special training.

Of the nine indicators in the set, four—*Height-for-Age, Consumer Durables, Use,* and *Outsiders*—are highly recommended. Two more—*Soil Loss* and *Ground Water,* —are recommended with some reservations. This is because they do not meet all of the original selection criteria—that the indicators be "fast, cheap and easy to use". (For example, both *Soil Loss* and *Ground Water* are labour intensive and a final analysis can only be undertaken after years of data collection.) Finally, while they are usable in their present forms, it is recommended that *Attendance, Replication* and *Social Capital* could be further modified due to reliability problems. The following table contains summary information about the individual indicators.

In general the findings with regards to the impacts of the IGBP programme are inconclusive. This is not surprising given that most of the indicators were not designed to measure change with only a single site visit. 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 set up by MYRADA in Kattery have begun to address community watershed problems. In addition, the Forest Department's programme in Arki has improved both sapling and grass quality. The Forest Department has done this by choosing the tree species to be planted on plantation lands in consultation with local villagers and by granting grass harvesting rights on these lands to inhabitants of nearby villages.

As a final note, it is important to repeat that the point of this book has not been to claim that indicators are a monitoring and