

A woman in a red sari is carrying a large, heavy copper pot on her head. She is standing by a river, and the background shows a rocky bank and trees. The text is overlaid on the image in green and white.

# World Water Wisdom Annotated Bibliography

## Indigenous Knowledge & Water

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and  
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# Beyond Farmer First

rural people's knowledg

Participatory

# Challenging the Professions

Frontiers for rural developme  
Robert Chambers

# Rural Develop Putting the



Women weaving traditional *ciondo* baskets, Kenya



Agnes Mughl: an innovator with her biopesticide of Neem tree leaves, Aloe leaves and Chilli peppers, Kenya

***WORLD WATER WISDOM***

**AN ANNOTATED BIBLIOGRAPHY**

**OF**

**INDIGENOUS KNOWLEDGE AND WATER**

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and  
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All photographs by William Critchley unless indicated.



## INTRODUCTION

This annotated bibliography is a by-product of the project ‘Indigenous Knowledge and Water Interactions’. IKWI was funded by NUFFIC, the Netherlands Organisation for International Co-operation in Higher Education, and both implemented and supported in kind by the Vrije Universiteit Amsterdam’s Centre for International Cooperation (VUA-CIS)<sup>1</sup>. The project was basically intended to pull together what is known/ has been written about the interface between indigenous knowledge and water, and to carry out some select case studies of local innovation in two countries, Kenya and India. One of the first products of this small research project was a conference paper which is annotated here: entry 88. An international workshop entitled ‘World Water Wisdom’ was held in Delft in February 2003 to present the research findings from Kenya (William Critchley) and India (Marit Brommer).

The ultimate product of the project will be a journal paper – and that is where this annotated bibliography comes into the picture. Why not, we thought, formalise our literature notes as we prepared to write that paper, and develop an annotated bibliography as a self-standing product? If we had been given the sole task of developing an annotated bibliography on the subject, then this document could, and probably would, have been considerably longer. But we have simply taken the references we thought would be useful in the paper and annotated these. So it is not comprehensive, and because of the slant of the paper, it does have a technical bias towards agricultural use of water and a geographical bias towards India and Kenya - for obvious reasons.

The sources of material are various. The library at VUA-CIS has provided many of the references, as have the libraries at the Royal Tropical Institute and IRC (International Water and Sanitation Centre, Delft). NUFFIC has been tapped for information – mainly through its publication the *IK & Development Monitor*, and the newsletter that succeeded it from 2001. There were many other minor sources also. Naturally the internet provided another main hunting ground. Books are included, as are journal papers, magazine articles, special publications – and newspaper cuttings where relevant.

Our referencing system follows no international standard: it is a simple system where we try to lose as many full stops as we can (*isn’t Warren DM just as clear as Warren D.M.?*) and we’ve put all article/ book/ presentation/ grey literature titles in italics, and not used italics at all for journals etc. That looks better – and we believe strongly in presentation. And that was a reason for trying to keep the entries more or less to a standard length. For ‘keywords’, we started using anything that seemed to be important, then tried to rationalise these. So *Water scarcity* and *Water shortage* were clearly the same thing and had to battle it out for one entry. In this case *Water scarcity* won. While indexing the keywords, some were clearly important yet we found we hadn’t been consistent: *Poverty* for example had a single entry. Through “edit/ find” we identified several more entries where *poverty* was explicitly mentioned. We didn’t define the number of keywords for each entry, and had no rules of order, save that – for consistency – of entering country or location last.

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<sup>1</sup> See (website) entries 119 and 134 respectively for more information about these two organisations



Every annotated bibliography is different. Some are little more than elaborated reference lists with keywords. Others take the easy way out of using *verbatim* abstracts as the ‘annotation’. Because of our intended end use, we have often thrown in short quotations: these we can then lift out and use in our article. And we have occasionally inserted some facts and figures – once again so that these can be used. So the reader will see under the *Water* heading, for example, a number of data regarding water shortage and numbers of people without adequate clean water supplies or sanitation. We have felt it useful to set entries in context: where a hefty book is ‘the standard’ or ‘a seminal work’ we have tried to identify it as such. And where there are connections and links we have pointed these out too.

The bibliography is organised into two sections. The first section is grouped under four headings: *Indigenous Knowledge; Water; IK and Rural Development; and IK and Water*.

The first, ***Indigenous Knowledge*** comprises, mainly, articles that discuss the theory of IK as a knowledge system, and underline its importance. Definitions abound, but each more or less has the common denominator of ‘*knowledge systems of indigenous people*’. All these IK references are recent, reflecting the burgeoning interest in the topic, essentially in the last decade. Ellen et al (2000: entry 6) consider that the marginalisation of IK has been so rapidly put into reverse that it may even be going too quickly in the opposite direction. While most authors view IK and western knowledge as clearly different, Agarwal (1995: entry 2) goes against the grain in his argumentation, holding that it is simply not possible, nor useful, to differentiate between these knowledge systems, which according to him, are essentially intermingled. One of the central debates amongst the IK theorists is whether codifying indigenous knowledge in some way undermines it.

It was not difficult to find references to ***Water*** in 2003 – which of course was the international year of freshwater, and the year of the third World Water Forum in Japan. In fact there was a deluge of documents, many of them syntheses of the global situation with respect to domestic and agricultural water. Perhaps three main themes stand out. The first is growing water scarcity (look at how many times we have used that term as a keyword!) and the litany of gloomy prognoses for the future, especially in the light of climate change. The second is water conflict. Again this is a topic that comes up time and time again. As water becomes more scarce, so conflict – both local and international – will develop into an issue. The third theme runs rather against this mainstream of argument. Some authors, notably Lomborg (2001: entry 30) point out that water shortages are essentially a *local* issue rather than one which is universal, and judicious management can mitigate many of the associated problems.

***Indigenous Knowledge and Rural Development*** constitutes the third heading. NUFFIC’s *IK and Development Monitor* – referred to already, was, according to Eyzaguirre (2001: entry 7) ‘*a lone voice bridging the scientific and development communities through the application of IK in natural resources*’. That was from 1993 through to 2001 when, it was felt, its job had largely been achieved in developing that connection. If the writings under our first heading constitute those of the scientific community, then this third heading gives the development specialists their voice. Their appreciation of IK’s role in development essentially had its roots in the participatory, ‘*farmer first*’ approach, highlighted by the writings of Chambers and colleagues (entries 49, 50, 51). Many of the writings in this section are based on field experience where specialists have worked with local people – appreciating them as knowledgeable partners in the process - for rural development. Participatory methodologies

abound in these writing, but on close scrutiny many amount to more or less the same thing: applied common sense moulded into different frameworks.

The final heading includes the core of the proposed publication. That is *Indigenous Knowledge and Water*. It was often difficult to know whether to place documents in this or the previous section, as there was often overlap. Water, and especially soil water (our main area of interest) are clearly part of rural development. We have tried, but not always succeeded, to be consistent. There is no shortage of writings dating from the mid 1980s onwards, regarding indigenous practices in terms of soil and water conservation (for example Kerr and Sanghi 1992; entry 96) or rainwater harvesting (for example Pacey and Cullis, 1986; entry 106). A huge amount of interest in documenting traditional systems was generated in the last two decades. However we have also looked for examples of how IK has been used, or can be used, creatively. That is our main concern. Here Critchley and Mutunga (2002: entry 87) discuss experience with farmer innovators, and some case studies from our current study are reported in Critchley and Brommer (2003: entry 88).

Under those four headings we have annotated 'hard copy' publications. The second section comprises, simply, websites. These have been kept separate, as only a few of them relate to a specific technical area: many are organisations' sites for example, where they provide specific and general information, and often lists of publications. Others serve a networking function. For simplicity we have merely listed these in alphabetical order. An authors' index and an index of 'keywords' concludes the annotated bibliography.

While operating under a restricted budget, we have tried to make the document as attractive and readable as possible, and Wendelien Tuyp has helped us achieve that, by taking charge of layout and design. She has also filled in some extra, important website entries that we overlooked at first. Her help is much appreciated. Most of the photographs included, incidentally, are from the fieldwork carried out in India and Kenya during 2002.

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January 2004



## Section One

### INDIGENOUS KNOWLEDGE

1. Abbot MB (unpublished draft article)  
*Hydroinformatics systems in multi-knowledge environments*  
[knowledge.engineering@skynet.be](mailto:knowledge.engineering@skynet.be)

The basis behind this article is that there are occasions where two or more different knowledge systems have to function simultaneously and interactively. The paper introduces five different multi-knowledge environments, of which two are connected to indigenous knowledge. First is '*combinations of modern-scientific knowledge with at least one local, autochthonic knowledge, where the latter is accepted as an equal partner, such as commonly occur in stakeholder participation in construction and management projects*'. Secondly, and discussed at length in this paper is: '*when the local autochthonic knowledge(s) [usually in the plural] are repressed, but come to insurrection as a result of the project*'.

*Keywords:* Knowledge systems

2. Agrawal A (1995)  
*Indigenous and scientific knowledge: some critical comments*  
Indigenous Knowledge and Development Monitor, vol 3, no 3, pp 3-5

This piece by Arun Agrawal delves deep into the theory of IK and its relationship with western 'scientific' knowledge. His point of departure is that there are '*certain contradictions and conceptual weaknesses in most of the writings on indigenous knowledge*'. So what are these contradictions and conceptual weaknesses? The key to his argument is that it is impossible to draw a clean line between indigenous/ traditional knowledge and scientific/ western knowledge. This difference would ultimately rest on a small and finite number of characteristics. But the attempt '*fails on each of the three counts: substantive, methodological and contextual*'. He concludes by arguing that it makes more sense to talk about '*multiple domains and types of knowledge, with different logics and epistemologies*'. And his second main conclusion is that '*It is only when we move away from the sterile dichotomy between indigenous and Western, or traditional and scientific knowledge, that a productive dialogue can ensue which focuses on safeguarding the interests of those who are disadvantaged*'.

*Keywords:* IK theory; Knowledge systems

3. Bruinsma W (2003)  
*An introduction to indigenous knowledge*  
Unpublished presentation to the workshop 'World Water Wisdom' held at IHE, The Hague, 19<sup>th</sup> February 2003

Bruinsma covers a full range of issues pertaining to indigenous knowledge, starting with the basic question of '*what is knowledge?*' and moving on to '*what types of knowledge are there?*' Much indigenous knowledge is actually 'tacit' (unspoken, silent) whereas the IK that

tends to be publicised is the codifiable, minority ‘explicit’ knowledge. IK is simply defined by Bruinsma as ‘*The knowledge that people in a given community have develop over time, and continue to develop: local, traditional knowledge, adapted to local situations, often tested over centuries of use*’. He explains why IK is important: it often tends to be sustainable and more efficient than that introduced by outsiders.

*Keywords:* Knowledge systems; IK definitions

4. Brush SB and Stabinsky D (eds) (1996)  
*Valuing local knowledge: indigenous people and intellectual property rights*  
Island Press, Washington DC, 337 pages

Peasant farmers’ ‘botanical gardens’ in their backyards may be lost unless recognised and rewarded - thus the position that this edited volume takes, which is to propose that indigenous knowledge be treated as a form of intellectual property. In the first chapter we are told that ‘*the proposal to create intellectual property for IK is attractive because it links biological resources to cultural knowledge and it offers a means to connect the users of plant resources to those who maintain them*’. Working definitions of IK (‘*popular or folk knowledge*’; alternatively ‘*knowledge systems of indigenous peoples*’) and indigenous peoples (‘*term best used in regions with a colonial history*’) are proposed. Narratives about the environment are discussed: the dangers of too simplistic an interpretation are highlighted, as well as warnings about the introduction of biases through a covert exercise of power. Environmental writers beware!

*Keywords:* Indigenous peoples; Intellectual property rights; IK definitions; Homegardens

5. Büschi S, Erni, C, Jurt L and Rüegg C (eds) (1997)  
*Indigenous peoples, environment and development*  
International Working Group for Indigenous Affairs. Department of Social Anthropology, University of Zürich. IWGIA document no 85, Copenhagen, 359 pages

The dangers of stereotyping indigenous peoples with respect to their resource use is one clear message from this edited volume. The concepts of ‘*primitive polluters*’ and ‘*ecological noble savages*’ are too extreme to be acceptable. The truth generally lies somewhere in between. There is a useful nine-point characterisation of indigenous resources use. In summary these points are: *decentralised, low external input, not self-poisoning, costs born currently, diverse/integrated, insulted systems, sensitive and responsive systems, subsistence systems and self-regulating*. There is an examination of what rights are embodied in which international protocols. However rhetoric and practice can be quite different. With respect to the implementation of these international agreements – and especially the Convention on Biodiversity with its noble pledges about IK and indigenous peoples - we are told for example that ‘*cases of creating conservation areas with full support of local people remains rare*’.

*Keywords:* Indigenous peoples; International agreements; Biodiversity

6. Ellen R, Parkes P and Bicker A (eds) (2000)  
*Indigenous environmental knowledge and its transformations: critical anthropological perspectives*  
Harwood Academic Publishers, The Netherlands, 356 pages

Ellen and colleagues have produced an erudite volume on the basis of a workshop held at the University of Kent (UK) in 1997. It spans both definitions and an analysis of indigenous knowledge – what it is, why it is important and what its limitations are – and moves on through several fascinating case studies from around the world. Terminology, we are warned, is a tricky area. For example the name ‘*Indigenous Peoples*’ is ‘*a veritable semantic, legal, political and cultural minefield*’. The authors point out that the historical marginalisation of IK has (in some fields at least) been put into reverse and may even be accelerating to an alarming degree. One particular theme that appears and reappears is that the very documentation and attempt to transfer IK is, in some way, contradictory to its essence. Nevertheless IK’s importance is not doubted. A particularly interesting chapter (no 10: pp 293 – 317) by J P Brosius discusses the celebrated case of the Penan Hunter-Gatherers in Sarawak, Malaysia who have become ‘*icons of resistance for environmentalists worldwide*’. Brosius is especially concerned at mis-reporting by environmentalists, and the latter’s impact on the Penan who through some ‘*ethnographical hall of mirrors*’ are seduced by these pseudo-scientists into believing that they have more IK than they actually do.

*Keywords:* IK definitions; IK limitations; Indigenous peoples; IK case studies

7. Eyzaguirre PB (2001)  
*Global recognition of indigenous knowledge: is this the latest phase of ‘globalisation’?*  
Indigenous Knowledge and Development Monitor, vol 9, no 2, page 40

Pablo Eyzaguirre – in this comment column – questions whether the recognition of IK (with particular respect to biodiversity) in statements and agreements from international bodies implies ‘globalisation’ of IK. He talks of this recognition as ‘*stunning evidence of how far IK has moved onto global development and biodiversity agendas*’. His worry is that global recognition of IK creates a greater demand to access and use the knowledge as widely as possible – but this might occur ‘*with little support for the maintenance of local cultural processes, livelihood practices, community access and control over the natural resources that underpin IK*’. His worry is one that has been voiced often elsewhere: that taking validated ‘nuggets’ of IK outside their context may be useful to a researcher or even help development elsewhere but may undermine the knowledge systems itself. His answer is that it is our duty to empower local communities to document and manage their own IK themselves.

*Keywords:* Knowledge systems; Globalisation; Biodiversity

8. von Liebenstein G (2001)  
*Linking local and global wisdom*  
Indigenous Knowledge and Development Monitor, vol 9, no 3, page 40

On the last page of the last issue of the ‘Indigenous Knowledge and Development Monitor’ Guus von Liebenstein – the Director of Nuffic-CIRAN – gives a valedictory comment on the

state of the art with respect to IK and development. The journal which began as a response to the need for information on IK, he believes contributed to a growing appreciation for IK amongst development professionals. Globally IK is being endorsed as a valid knowledge system. Despite the fact that western scientific knowledge still dominates, *'the situation is changing as decision makers in developing countries .....are beginning to realise that IK is the single largest resource not yet mobilised for [development]'*. He continues by highlighting his conviction that IK needs to be integrated into the formal education system and particularly in higher education. He ends by stating *'....capacity building should include IK. The reason for this cannot be stated too often: development is no longer the exclusive domain of science and technology.'*

*Keywords:* Capacity building; Higher education

9. Long N and Long A (1992)  
*Battlefields of knowledge*  
Routledge, London and New York

Long and Long's edited volume looks at various aspects of 'knowledge'. It contains the quotation (in Chapter 9 *Dynamics of Knowledge* by Arce A and Long N) *'Knowledge is constituted by the ways in which people categorise, code, process and impute meaning to their experiences'*. This chapter stresses that the above is true of both 'scientific' and 'non-scientific' knowledge. Knowledge furthermore should not carry with it the implication of 'discovering real facts'. Those who hold that view are biased towards objectivism.

*Keywords:* Knowledge systems

10. NGLS (United Nations Non-Governmental Liaison Service) (2002)  
*Permanent Forum on Indigenous Issues established at the UN*  
NGLS Roundup 93, 6 pages [www.unsystem.org/ngls](http://www.unsystem.org/ngls)

The first Permanent Forum on Indigenous Issues was held in New York at the UN headquarters, in May 2002. There were 900 participants. It is estimated that there are some 300 million indigenous people living in more than 70 countries worldwide. This forum had been suggested by the 1993 Vienna World Conference on Human Rights and was established by the UN Economic and Social Council in July 2000. Its mandate is to focus on indigenous aspects of the issues on the ECOCOC agenda. Various issues were brought to forward at the forum. These included the right to food, environment, human rights and health. Kofi Annan pledged his strong commitment to the cause and concerns of the indigenous peoples.

*Keywords:* Indigenous peoples

11. Ortiz O (1999)  
*Understanding interactions between indigenous knowledge and scientific information*  
Indigenous Knowledge and Development Monitor, vol 7, no 3, pp 7-10

This article returns to one of the central themes of the IK & DM magazine – how can indigenous knowledge and scientific knowledge best be integrated in the interests of sustainable development? A typology is presented of cognitive interactions between IK and

scientific information and a model for information interpretation. It is based on experience from an integrated pest management extension programme in the Peruvian Andes. Four main types of interaction between farmers' knowledge and scientific information are identified. *Formative interaction* occurs when new knowledge is formed and in some cases replaces previous beliefs. *Modifying interaction* happens when farmers' knowledge is slightly adjusted by scientific information. *Reinforcing interaction* occurs when scientific information confirms the farmers' own knowledge. Finally *confusing interaction* describes when there is a conflict between the two types of knowledge.

*Keywords:* Knowledge systems; IK theory; Sustainable development

12. Warren DM, Slikkerveer LJ, Brokensha D and Dechering WHJC (1995)  
*The cultural dimension of development: indigenous knowledge systems*  
Intermediate Technology Publishing, London, 582 pages

The authors explain the importance of understanding indigenous knowledge (IK) – '*the local knowledge that is unique to a given culture or society*' - because IK constitutes the information base for a society which facilitates communication and decision-making. They describe how IK systems have come to play an important role in the international debate on cultural policy and development planning. The book contains forty-six papers from a wide variety of disciplines, including anthropology, sociology, geography agricultural sciences and others. One of the main outcomes of this comprehensive work is the conclusion that '*local people do know a great deal about their environment, in which they have often lived for generations*'. Furthermore, the authors plead for IK to be into account in the planning and implementation of development generally. The case studies not only illustrate the latter point, but they also provide powerful evidence in support of the propositions.

*Keywords:* IK theory; IK case studies; Knowledge systems



## WATER

13. Ashton PJ (2002)  
*Avoiding conflicts over Africa's water resources*  
Ambio, vol 31, no 3, pp 236-242

Water allocation and distribution priorities within a country are aligned with national development objectives; however regional efforts are needed to secure water resources for the peoples of Africa as a whole. 85% of Africa's water resources are shared between several countries and competition between 'upstream' and 'downstream' countries for the same water resource is considered to pose the greatest potential conflict threat. This is in relation to data showing that 24% of the population in the year 2000 live in countries with water scarcity – a figure which will rise to 57% by the year 2025, due to (projected) population growth. While the author considers it unlikely that water 'wars' will occur, preventative strategies are essential to defuse conflict.

*Keywords:* Water conflict; Africa

14. Barker R, van Koppen B and Shah T (2000)  
*A global perspective on water scarcity/poverty: Achievements and challenges for water resource management*  
International Water Management Institute, Colombo, 16 pages

Despite the advances in global food security, it has become increasingly clear that productivity alone will not win the war against the hunger. It is recognised more and more that water security is an increasingly important element of any poverty eradication programme. Irrigation consumes about 70 percent of the world's available water. The authors raise questions when it comes to achieving the goal of '*more food produced with less water*'. The answer lies in improving the efficiency of canal irrigation systems. They feel that there is an urgent need for '*new strategies to improve the productivity of water in both irrigated and rain-fed agriculture, and ensure access to water and technologies by the poor*'.

*Keywords:* Water scarcity; Poverty; Rural development

15. Barrow C (1987)  
*Water resources and agricultural development in the tropics*  
Longman Scientific and Technical, Harlow, Essex, 356 pages

In his forward to this book Chris Barrow explains that there are many texts which cover irrigation, water supplies and rural development – but few that try to bring them together. That is what this book succeeds in doing. It is a rich source of information, studded with detail and statistics; this makes it a very valuable reference book. There are two sections: the first covers *background and principles* and the second looks in some detail at *technology and practice*. Much of the second section is devoted to irrigation, though rainfed agriculture and water harvesting systems are also mentioned. Traditional methods of lift irrigation are described: for example the *mot* (India), the *shadouf* (widespread) and the Archimedean screw

(Asia/ Middle East). Socio-economic, institutional and political factors are not overlooked and the author tells us that *'a considerable...proportion of the difficulties associated with developing agriculture in the tropics are neither environmental nor technological'*.

*Keywords:* Water resources; Irrigation; Agriculture

16. Brown LR (2003)

*Plan B: rescuing a planet under stress and a civilisation in trouble*

Norton and Co, New York, 222 pages

[www.earth-policy.org](http://www.earth-policy.org)

Leslie Brown is the 'high priest' of the international environmental lobby, and his writings are characterised by an evangelical fervour. This latest book is no exception: its very title hints as much. It is easy to take exception to many of the dire warnings, but much of his account of the way the world is heading makes uncomfortable reading. His central message is that we are living off the earth's capital, rather than the interest generated. With respect to water, one of his main concerns is the extent to which groundwater is being depleted for agriculture – particularly in India and China. *'Over 25% of India's grain may be based on overpumping of aquifers'* he warns. So what are his solutions? With respect to water he suggests (a) a more realistic pricing policy, (b) raising irrigation efficiency through, for example, more drip irrigation systems, (c) strengthening of local water use associations, (d) promotion of rainwater harvesting and (e) raising non-farm water productivity: for example by non-flush toilets in India.

*Keywords:* Environment; Groundwater; Water harvesting; Pricing mechanisms; India; China

17. Cosgrove WJ and Rijsberman FR (2000)

*World Water Vision: making water everybody's business*

Earthscan, London, 108 pages

The clearest point that comes out of this document is that the world is facing a water crisis. However, the authors note that *'... the crisis is not about having too little water to satisfy our needs. It is a crisis of managing water so badly that billions of people – and the environment – suffer badly'*. More than 40 groups of people around the world worked on the development of their visions of sustainable management of water in their region or sector. They then put effort into writing their views with - at the back of their minds - the motto *'from vision to action'*. Their individual reports have been published separately. This current publication aims to reflect the visions of many in just one single global statement. It can be seen as the most comprehensive analysis of the world's water resources study ever undertaken. Based on contributions from thousands of experts involved in regional, national, and sector consultations, it aims to provide a diagnosis of water resources and the pressures on them, as well as stipulating the steps that need to be taken to improve the situation.

*Keywords:* Water resource management; Water resources; Water scarcity

18. CTA (1998)  
*Water: will there be conflicts?* SPORE, vol 74, pp 1-2

Many strongly water stressed countries will become less self-sufficient in food production as populations rise. According to the World Water Council, by the year 2050 water stress will be a feature of 35 countries in Africa. There is a need for low-cost methods for improved water harvesting, for major water savings through more effective irrigation systems, and a more efficient use of treated wastewater. The fear that water scarcity will cause local and international conflicts is becoming a reality. This two page leading article provides a box that shows that seven major river systems in Africa are in danger of leading to conflicts between countries. One example is the Okavango where the situation is 'tense' between Botswana, Angola, Namibia and Zimbabwe.

*Keywords:* Water scarcity; Water conflicts; Agriculture; Wastewater

19. CTA (1995)  
*Water: the limiting resource* SPORE, vol 57, pp 1&2

'World-wide' opens this leading article 'there are some 80 countries with 40% of the total world population, which are experiencing water shortages.....nearly one billion people are without clean drinking water....dirty water accounts for as much as 80% of the disease in developing countries...' In sub-Saharan Africa, we are told, 265 million people have no access to safe water – and demand for water will inevitably increase in the future. The article urges that ways must be found not only of meeting that demand but also to maintain the natural water cycle upon which future survival depends. Traditional systems of small-scale irrigation and water harvesting are cited as examples of indigenous responses from which we should learn.

*Keywords:* Water scarcity; Water harvesting; Africa

20. Department for International Development (2001)  
*Addressing the water crisis, healthier and more productive lives for poor people.*  
*Strategies for achieving the international development targets.*  
DFID, London, 54 pages

This strategy paper sets out the UK Government's strategy regarding water and its links to poverty elimination. It begins by stating the intention of DFID to achieve International Development Targets (IDTs). The first section of the paper describes the 'impending water crisis' in the world: one billion (of six billion in total) people have only unsafe water to drink, and over two billion lack sanitation. The paper goes on to look at how, within the three main elements of the ITDs (*economic well being; human development; environmental sustainability and regeneration*) three high-priority areas will be targeted. These are (a) to have appropriate policies adopted by all countries by 2005, (b) to reduce by half the proportion of people with unsafe drinking by 2015 and (c) to reduce by half the proportion of people without sanitation by 2015. There are three very useful annexes covering global water – and other environmental resource - statistics, drawn from World Bank and UN sources.

*Keywords:* Strategy; Poverty; International Development Targets

21. Economist, The (2003)  
*Priceless: a survey of water*  
The Economist, July 19<sup>th</sup> 2003, London, Special Supplement, pp 3-15  
[www.economist.com](http://www.economist.com)

The Economist magazine carries occasional supplements on topics of special interest: this survey on water was produced to coincide with the international year of fresh water and to follow the Third World Water Forum held in Kyoto, Japan during March 2003. The survey also acknowledges the Johannesburg Earth Summit (the World Summit on Sustainable Development) that had taken place in August 2002, and had agreed to reduce the number of people without safe access to clean water and basic sanitation by half, by 2015. The Economist's survey is based on various UN reports, OECD studies and various books. Not surprisingly one of the main arguments put forward in this survey is that pricing mechanisms can be a powerful tool to improve water supply and guard against its waste. There are articles within this survey on dams, water harvesting in India and the role of the private sector in water development.

*Keywords:* Pricing mechanisms; Dams; Water harvesting

22. Falkenmark M (1999)  
*Forward to the future: a conceptual framework for water dependence*  
Ambio, vol 28, no 4, pp 356-361

Fundamental regional differences are highlighted in terms of the vapour flow of 'green water' – involved in biomass production - and the liquid flow of 'blue water'- in aquifers and rivers. There are real conflicts of interest between the need to produce more biomass (food and other products) upstream (thus decreasing river flows), and the requirements of people for water downstream. The world's regions can be divided into five clusters according to water resource predicaments. A particular problem is in the semi-arid regions where water will increasingly limit food production per capita as the population grows. The other two key challenges are water pollution and conflict resolution. The author gives a conceptual framework showing the dependence of the world ecosystem, including human beings, on the 'bloodstream of the biosphere', in other words the water cycle. Falkenmark warns against simplification of water problems.

*Keywords:* Green water; Blue water; Water conflict; Water scarcity; Water cycle; Semi-arid zones

23. HARAMATA (2003)  
*Ensuring access to water resources*  
HARAMATA, 'Bulletin of the Drylands: People, Policies, Programmes'.  
International Institute for Environment and Development, London. pp 12–15

While agreeing on the growing problem of provision of water – especially in the drylands with growing populations – *HARAMATA* points out that 'views on how to address these problems diverge widely'. There is a basic schism between the 'cost recovery' school (many economists, governments and donors) and the civil society groups who argue that water plays a vital function in human life and therefore cannot be considered simply in economic terms.

The article goes on to introduce a third player in the debate: a newcomer that holds that access to water is a basic human right. There is also a discussion on international waters, where few protocols have been signed in Africa. Taking one main conclusion from the book *'Drawers of Water'* (which is profiled in this article: see entry 40) the solutions are complex and go beyond a simple *'state vs private sector'* dichotomy.

*Keywords:* Policy

24. IUCN: The World Conservation Union (2000)  
*Vision for Water and Nature*  
IUCN, Canada and Switzerland [www.waterandnature.org](http://www.waterandnature.org) 223 pages  
(and 6 page synopsis folder)

IUCN's *Vision for Water and Nature* is subtitled *'A World Strategy for Conservation and Sustainable Management of Water Resources in the 21<sup>st</sup> Century'*. This is an extremely comprehensive report, packed tight with statistics and argument – and strategies for the future built around an ecosystem approach. The first 55 pages comprise the report itself, divided equally into *'the vision'* and *'a framework for action'*. The remainder comprises annexes. By 2025, we are informed, the world will need to make available 20% more water to supply the extra three billion people expected on the planet. Water abstractions are predicted to increase by almost 50% in that period. There are six separate *goals* put forward: each is supported by a *target* and *actions* required to achieve those goals. The sixth goal is *integrated knowledge [to be] applied to ecosystems management* and its related target: *scientific and indigenous information, knowledge, know-how and technologies are developed and used to improve the management of freshwater and related ecosystems*.

*Keywords:* Strategy; Ecosystems; Knowledge systems

25. Keraita B (2002)  
*No water to waste, not even wastewater*  
SPORE 101, October 2002, CTA, The Netherlands, page 16

Wastewater irrigation is the topic of this one page 'viewpoint' article in SPORE magazine. Bernard Keraita notes that, worldwide, 20 million hectares are reportedly under wastewater irrigation. He believes that this area will expand in the near future. While there can be a public health danger if the level of pathogens are high, one major advantage of wastewater, writes Keraita, *'...is that it contains high levels of nutrients, reducing the need for, and cost of, fertilisers'*. Lower levels of treatment (to negate the toxic effect of pathogens) are required compared with those needed for freshwater. The key now is to persuade policy-makers and donors of the importance of this potential source for irrigation.

*Keywords:* Wastewater

26. Kijne JW (2003)  
*Unlocking the water potential of agriculture*  
FAO -Rome, ITReport, unpublished document, Rome, Italy  
[ftp://ftp.fao.org/agl/aglw/docs/unlocking\\_e.pdf](ftp://ftp.fao.org/agl/aglw/docs/unlocking_e.pdf)

This paper posted on the web examines present and future water availability for food production at a time of increasing demands for water from other users: for sanitation and drinking-water in mega-cities, for industry, and for the environment. It is based on the results of the electronic conference on *Water Source of Food Security*, organised by the Land and Water Development Division of FAO from 15 September to 1 November 2002. The paper discusses the present and future availability of water resources in relation to poverty alleviation and rural development. It looks at issues arising from the desire to enhance water productivity in agriculture. The paper discusses approaches to reduce the adverse environmental impacts of water resource development for ecosystems like wetlands, which provide valuable 'ecosystem services', such as recharging groundwater, attenuating floods, and buffering sediment and pollution. The final topic is modernisation of irrigation water management, defined as a process of technical and managerial upgrading. The paper concludes with the choices that governments and funding agents face in trying to ensure that water scarcity will not curtail the world's capability to produce enough food for the future global population.

*Keywords:* Water scarcity; Poverty; International agreements

27. van Koppen B (1999)  
*Sharing the last drop: water scarcity, irrigation and gendered poverty eradication*  
Gatekeeper Series no 85, International Institute for Environment and Development,  
London, 20 pages

In a climate of growing water scarcity, the irrigation sector has a substantial role to play in implementing water savings – but this must be done while still supporting the poorest section of the world's farming communities. The danger is that the richer individuals will increasingly marginalise poor farmers, and especially poor women, as water grows scarcer. Van Koppen lays down three areas that need to be pursued. These are (a) reducing water consumption by the better off; (b) protecting current water rights of poor women and men, and (c) developing new irrigation infrastructure targeted at this same group. This booklet is concise, readable and includes a number of examples presented in boxes.

*Keywords:* Water scarcity; Gender; Poverty

28. Lee MD and Visscher JT (1992)  
*Water harvesting: a guide for planners and project managers*  
IRC Technical Paper Series, no 30  
International Water and Sanitation Centre, The Hague, The Netherlands, 106 pages

This booklet arose from experience in Eastern Kenya, where a DANIDA/ Ministry of Agriculture project had been involved in implementation of various types of water harvesting – for drinking water and agriculture – in the 1980s. While containing excellent descriptions of a wide range of technologies it falls short of being a technical design manual. The three

main technical sections look at (a) rooftop harvesting (b) surface catchments systems and (c) groundwater dams. It covers key issues to be taken into consideration when planning water harvesting systems. We are informed that aspects related to community involvement are crucial to the development of sustainable systems, yet these are complex and no 'blueprint approach' can be given.

*Keywords:* Water harvesting

29. Liniger H (1995)

*Endangered water; A global overview of degradation, conflicts and strategies for improvement*

Development and Environment Reports, University of Berne, no 12, 117 pages

In this concise and readable text Hans Peter Liniger gives an overview of water from a global point of view. He looks at the water cycle from a technical perspective, and then brings in the human dimension, reviewing how people use water. The book goes on to review the problem of water degradation, in terms of quantity and quality. Conflicts between users, and the interface between conflict and degradation are analysed. There are plenty of water data – from world river discharges to per capita consumption of water for various uses in various countries. A '12 point strategy' is proposed for sustainable management of water resources in the future. The report ends with a case study of the water resource degradation, conflicts and strategies of the Ewaso Ng'iro basin, Kenya.

*Keywords:* Water resources; Water conflicts; Water cycle; Strategy; Kenya

30. Lomborg B (2001)

*The Skeptical Environmentalist: measuring the real state of the world*

Cambridge University Press, Cambridge, UK, 515 pages

Bjørn Lomborg sets out, in this methodically researched book, to challenge the 'doom and gloom' set of environmentalist who hold that the world's environmental problems are worsening and spell disaster unless something radical is done, quickly. Chief amongst Lomborg's targets is the former head of the Worldwatch Institute, Lester Brown (see entry 16). Lomborg's view, simply put, is that as the economy of the world expands, so environmental problems tend to disappear, as people have more time and money to address these problems. Thus he favours an indirect approach. Chapter 13 deals with the question of water. His stance is that although there are regional and logistical problems – and water conflict may become worse as populations increase - we basically have sufficient water to go round. His message is simply 'let's manage better what we have'. Strangely, that message is hardly different from that of the environmental lobby.

*Keywords:* Environment; Water conflicts

31. Merz J et al (nine others) (2003)  
*Water: a scarce resource in rural watershed of Nepal's Middle Mountains*  
Mountain Research and Development, vol 23, no 1, pp 41-49

Water is a major issue in the Middle Mountains of Nepal, where rainfall can be highly variable as well as being concentrated into a four-month monsoon period. Flooding during the monsoon is followed by water shortages for domestic and agricultural use. This article discusses water availability in two watersheds, and is based on a survey of water need and supply – partially based on people's perceptions. On average, during the dry season, a household uses 120 litres per day in one watershed and 160 litres per day in the other. Water resources are becoming increasingly scarce, and decreasing availability of water for agriculture is a popular perception. Water quality is also declining. The article concludes that new forms of water management at watershed scale have to be introduced.

*Keywords:* Water scarcity; Domestic water; Nepal

32. NGLS (United Nations Non-Governmental Liaison Service) (2002)  
*Third World Water Forum and Ministerial Conference held in Japan*  
NGLS Roundup 101, [www.unsystem.org/ngls](http://www.unsystem.org/ngls). 6 pages

This NGLS Roundup gives a concise overview of the Third World Water Forum held in Japan in March 2003. Representatives from 170 different countries attended the forum. Worldwide more than 1.2 billion people lack access to safe water and 3 billion have inadequate sanitation. Other statistics of importance are that (according to a report by the World Water Assessment Programme) over the next 20 years the average supply of water per person is expected to drop by one third. 20% of the world's population, in 30 countries faced water shortages in 2000 – a figure that will rise to 30%, in 50 countries by 2025. However in many countries a lack of water is not the problem – water shortage stems from inefficient use, pollution or unsustainable use of groundwater in aquifers. There is a divided debate on the use of water for agriculture: agricultural scientists say that farm water use (especially for irrigation) must be increased by 15-20% in the next 25 years to reduce hunger. Environmentalists argue that agricultural water use needs to be *reduced* by at least 10% to protect rivers, lakes and wetlands for those who make their livelihoods there and to satisfy the demands of cities and industries.

*Keywords:* Water scarcity; Irrigation; Agriculture

33. Overseas Development Institute (2002)  
*The 'Water Crisis': faultlines in global debates*  
ODI Briefing Paper July 2002, London. [www.odi.org.uk/rpeg/wpp](http://www.odi.org.uk/rpeg/wpp) 4 pages

Less than 1% of the world's fresh water flows in rivers or is held in lakes. 20% lies underground. These sources are expected to come under increasing pressure as the world's population rises. The article tells us that '*This global 'water crisis', as it is often labelled, is a major feature of the development landscape... international meetings regularly focus on images of empty reservoirs, overflowing sewers ...these images help to raise concern over the lack of access to clean water...but also point to the faultlines between different approaches to tackling the issue.*' This paper goes on to give facts and figures regarding water shortages



and predictions for the future. The 'faultlines' referred to exist in particular over financing arrangements and institutional structures necessary to deliver better water supplies. Three core factors are given, as being central in addressing these faultlines in the debate. These are *processes, politics and livelihoods*.

*Keywords:* Policy; Water scarcity

34. Postel S (1989)  
*Water for agriculture: facing the limits*  
Worldwatch Paper 93, 53 pages

Though now nearly 15 years out of date, this Worldwatch paper rings many warning bells that still resonate today. The focus is on irrigation and provides a thorough overview of the status of the world's irrigated land. Statistics abound, and that makes this a very useful reference source in itself. The paper predicts that in several decades irrigation systems will be poorly matched to altered rainfall regimes and redistributed water supplies. Sandra Postel gives various measures that could contribute to improved water management but considers them nevertheless merely as stopgaps. These include restoration of critical watersheds, and stepping up of breeding regimes to produce salt-tolerant and more drought resistant crops. There is a particularly interesting section on '*water in the greenhouse world*' where the author explores the impact of climate change on irrigation. Considerable investment is likely to be needed to compensate for the effect of higher temperatures and changed flow regimes. What is really needed, the author believes, is that society should recognize water's natural limits and begin to bring human numbers and demands into line with them.

*Keywords:* Agriculture; Irrigation; Water limits; Water cycle; Climate change

35. Postel S (1999)  
*Pillar of sand : can the irrigation miracle last?*  
World Watch Institute, Washington DC, 313 pages

A key lesson from history is that most irrigation-based civilisations fail. As we enter the third millennium AD, the question is: *will ours be any different?* Irrigation has been a powerful tool of human advancement for 6,000 years. It remains a cornerstone of agriculture today, as farmers strive to meet the increasing food demands of ever larger populations. In *Pillar of Sand*, Sandra Postel examines the challenges to our modern irrigation society - from mounting water scarcity and salinisation of soils, to rising tensions between countries over shared rivers. She explores irrigation's role in the rise and fall of early civilisations and connects the lessons of the past with the challenge of making irrigation thrive into the twenty-first century and beyond. The publication points the way toward protecting rivers and vital ecosystems as we aim to produce enough food for a projected 8 billion people by the year 2030. The author shows how innovative irrigation technologies and strategies can alleviate hunger and environmental stress at the same time. And she calls for a new ethic of sufficiency and sharing in response to impending water limits.

*Keywords:* Irrigation; Water resources; Water limits; Response to change; International agreements

36. Rockström JR (2001)  
*Green water security for the food makers of tomorrow: windows of opportunity in drought-prone savannas*  
Water Science and Technology, vol 43, no 4, pp 71-78

Johan Rockström argues that the crucial problem in terms of water ‘shortage’ is more efficient use of vapour flow, ‘green water’, rather than ‘blue water’ quantities contained in rivers and lakes. His argument is that most calculations on water availability focus on diminishing amounts of blue water availability – especially for domestic and industrial uses (he cites a commonly quoted figure of 190 m<sup>3</sup> /capita/ annum for these two uses). However most water is actually required for food production (around 1,500 m<sup>3</sup> /capita/ annum) of which some is ‘blue water’ for irrigation, but in most areas of the world the majority of food is produced under regimes of rainfed farming, which utilise ‘green water’ or vapour flow directly from rainfall. Thus his central message: let us try to make better use of rainfall for food production to alleviate water stress.

*Keywords:* Water scarcity; Blue water; Green water

37. Rosegrant MW, Cai X and Cline SA (2002)  
*World Water and Food to 2025; Dealing with Scarcity*  
Published by the International Food Policy Research Institute (IFPRI) and the International Water Management Institute (IWMI)  
<http://www.ifpri.org/pubs/books/water2025book.htm>

The increasing demand for water among households, industry, the environment, and especially agriculture is making global water scarcity a perilous possibility. What steps can we take to avert threats to global food supply, the environment, and the livelihoods of those lacking access to clean water? Using state-of-the-art computer modelling to show how water availability and demand are likely to evolve, *World Water and Food to 2025* contends that if current water policies continue, so will high levels of food insecurity, environmental degradation, and water-related ill health. The authors show exactly which policies and actions could ensure sustainable and efficient water use, enough food for the world’s people, and adequate drinking water for all, since further neglect of water issues could produce a genuine water crisis, which in turn could lead to a food crisis.

*Keywords:* Water scarcity; International agreements

38. Tao F, Yokozawa M, Hayashi Y and Lin E (2003)  
*Terrestrial water cycle and the impact of climate change*  
AMBIO, vol XXXII, no 4, pp 295-301  
[www.ambio.kva.se](http://www.ambio.kva.se)

The authors assess climate change scenarios by running a macro-scale water balance model and 2 General Circulation Models. Their results demonstrate that between 2021 and 2030 water demand will increase worldwide due to climate change. Water shortage is expected to get worse in many parts of the world, including western Asia, northern and southern Africa and central South America. A significant increase in surface runoff is predicted in southern Asia and a significant *decrease* in northern South America. Results are presented for the

different models, for temperature, precipitation, soil moisture deficits and surface runoff. What is striking is the differences between regions in all these parameters.

*Keywords:* Climate change; Water cycle

39. Third World Academy of Sciences (TWAS) (2002)  
*Safe drinking water: the need, the problem, solutions and an action plan*  
Third Worlds Academy of Sciences, Trieste, Italy, 23 pages

This readable and nicely presented booklet looks primarily at – as its title suggests – drinking water problems. Noting that 75 % of all diseases in developing countries arise from polluted drinking water, the point is stressed that clean water is paramount. Various statistics are cited about the growing problem of water shortages. It is noted that in low income countries 90% of water is used for agriculture, and the remainder for industry and domestic uses. Particular concern is expressed regarding groundwater: ‘*aquifers are currently being depleted faster than they are replenished in parts of India, China and the United States*’. Regarding re-use of wastewater, there is a good section on the ‘reed bed recycling system’ together with elegant and clear diagrams.

*Keywords:* Water scarcity; Wastewater

40. Thompson J, Porras IT, Tumwine JK, Mujwahuzi MR, Katui-Katua M, Johnstone N, and Wood L. (2001)  
*Drawers of Water II: 30 years of change in domestic water use and environmental health in East Africa*. International Institute for Environment and Development, London, 116 pages

The first ‘drawers of water’ study was carried out in East Africa in 1972. This booklet is a summary of the main research results – and a comparative ‘before and after’ longitudinal analysis - when the original sites were revisited 30 years after. The field of study concerns domestic water use and environmental health in East Africa. One of the main findings of the original study was that *quantity* of water available was more important than *quality* in terms of disease prevention. Although there is some progress noted – for example 31% of rural households in Kenya have an improved water supply, up from 25% in the first study – there are many disturbing statistics. The most worrying is that, on a regional level, the mean daily per capita water use has gone down by 30% from 60 litres to 40 litres. One avenue of hope is evidence that community management of water supply is growing in importance and shows signs of leading to sustained improvements.

*Keywords:* Domestic water; East Africa

41. UNEP (2001)  
*The Fair Share: water strategy in the context of sustainable development and poverty alleviation in Africa*.  
International Conference on Freshwater, Bonn (3-7 December 2001), 20 pages

This slim document – which was developed in preparation for the 2002 World Summit on Sustainable Development - summaries the problems facing Africa in terms of water resources

and offers (in rather general terms) both options and strategies for improved water resource management. More than 300 million people in Africa lack reasonable access to safe water. Even more lack sanitation. In sub-Saharan Africa only about 51% have access to safe water and 45% access to sanitation. Currently 14 countries are subject to water stress and a further 11 will join them in the next 25 years. Agriculture is the largest user of water in Africa accounting for 88% of total use – yet irrigation covers only 6% of cropland. Unless urgent and effective land conservation and watershed management measures are taken, food insecurity will get worse. One of the problems is that conventional approaches to water management do not involve the members of civil society as stakeholders. Furthermore water resources often call for the involvement of more than one country where resources are shared.  
*Keywords:* Water resource management; Poverty; Strategy; Africa

42. United Nations Population Fund (2003)  
*Global Population and Water: Access and Sustainability*  
UNFPA, Population and Development Strategies, no 6, 74 pages

This UNPFA report covers the population, gender and health dimensions related to the ongoing debate on water resources. It deals with global population; sustainable development; access to water; international agreements; millennium development goals: water, food and sustainable development; human needs; gender and women's empowerment; water consumption and sustainability; managing water use; competing demands; water regulation; water access and hazards to health; water-related diseases and their effect on reproductive health; malaria during pregnancy; anaemia during pregnancy ; *and* chemical contaminants and reproductive health.

*Keywords:* Water resources; Sustainable development; International agreements

43. Valdiya KS and Bartarya SK (1989)  
*Diminishing discharges of mountain springs in a part of Kumaun Himalaya*  
Current Science, vol 58, no 8, pp 417-426

This article is one of the few documented pieces of evidence of the 'low flow' problem in the middle mountains of the Indian Himalayas, where spring flow in the dry, summer season has diminished significantly over the last few decades. While there is evidence of reduced rainfall (in some parts of the catchment – though not on average: see Figure 8) and increased irrigation usage upstream, the authors point the main finger of blame at the deforestation of vulnerable hillsides in the catchment area for the disruption to the hydrological regime. In 40% of the villages in the Gaula catchment there is evidence of drying of springs: discharges have decreased by 25 – 75% over the past 5 – 50 years.

*Keywords:* Water scarcity; Low flow; India

44. Wester P and Bron J (1998)  
*Coping with water: water management in flood control and drainage systems in Bangladesh.*  
Liquid Gold, Paper 4, International Institute for Land Reclamation and Improvement (ILRI) Wageningen, The Netherlands, 87 pages

Improved water management is 'of utmost importance' for Bangladesh: nearly 80 million people live and farm on the floodplains. This report presents current water management practices in Flood Control and Drainage (FCD) systems – which cover over a third of the 'Net Cultivated Area' - and analyses the specific nature of water management in FCD systems. Many of the intended benefits from FCD systems have not however materialised. The main conclusion drawn is that water management in FCD systems is complex and fundamentally different from water management in large-scale irrigation systems. To move towards sustainable water management in Bangladesh, fundamental institutional change and the development of innovative participatory water management strategies is imperative.

*Keywords:* Water resource management; Participation; Water conflict; Innovation; Gender; Bangladesh

45. Wiesmann U, Gichuki FN, Kiteme BP, and Liniger H (2000)  
*Mitigating conflicts over scarce water resources in the highland-lowland system of Mount Kenya.*  
Mountain Research and Development, vol 20, no 1, pp 10-15

The paper summarises the complex ecological and socioeconomic dynamics prevailing in the highland-lowland system of Mount Kenya – the Ewaso Ng'iro North Basin - and presents a multilevel strategy for mitigating the emerging conflicts over water resources. Mount Kenya acts as a water tower for its footzones and adjoining lowland areas. Populations in these areas are growing rapidly and new land use systems – for example irrigated horticulture for export - require more water. Low flow levels in the dry season are a particular problem. This leads to conflict between users.

*Keywords:* Water conflict; Water scarcity; Low flow; Kenya

46. World Bank (1996)  
*Sustainable development of Africa's water resources*  
FINDINGS: Agriculture and Environment Infrastructure, no 74, 3 pages

Two thirds of sub-Saharan Africa's rural population and one quarter of its urban dwellers are without safe drinking water (*or were, in 1996*). Poverty is expected to affect an estimated 600 million people in SSA by the year 2000, and these are the people who have the greatest water-related problems. As a result of a study entitled *African Water Resources: Challenges and Opportunities for Sustainable Management* the article outlines a long-term strategy for water resource management. The strategy recognises and uses the large reservoir of African capacity, emphasises a participatory approach and builds upon existing achievements. Policies that favour economic instruments in water allocation and pricing are proposed.

*Keywords:* Sustainable development; Strategy; Poverty; Participation; Africa

## INDIGENOUS KNOWLEDGE AND RURAL DEVELOPMENT

47. Blunt P and Warren DM (1996)  
*Indigenous organisations and development; IT studies in indigenous knowledge and development*  
Intermediate Technology Publications, London, 253 pages

The emphasis of this book is the need for development practitioners to *'let local people decide what is best for them'*: the authors argue that such an acceptance should lead to a greater sensitivity to the many options available, and persuade change agents not simply to assume that external forms are the best. What are indigenous organisations actually? These include local-level institutions with a community base, such as women's groups, ethnic associations, traditional religious bodies and so forth. In order to let local people decide, we need to understand how the community is organised and what kind of social, cultural, ritual aspects should be taken into account. The book contains several local planning and management systems, local levels of technology and development. Fifty percent of the contributions are case studies from Africa, the other half is divided between contributions from the Pacific, South Asia and Canada. Support comes from all over the world that indigenous organisations *'often stress the importance of good social relationships, and of harmony, as well as having more practical aims'*.

*Keywords:* IK case studies

48. Cartier van Dissel S and de Graaf J (1998)  
*Differences between farmers and scientists in the perception of soil erosion: a South African case study*  
Indigenous Knowledge and Development Monitor, vol 6, no 3, pp 8&9

The article puts forward differences between farmers and scientists in their perception of the causes and effects of soil erosion. This is illustrated by a case study carried out in South Africa. The study revealed a number of differences between the perceptions of farmers and scientists and quite marked variation between farmers' views as well. One basic difference we are told, centred on the perception of the environment as a whole. The scientist preferred a time-erosion process explanation of the different soils within the landscape. To the farmers, the soils were put in place by God. Apparently the farmers only considered 'erosion' to be a problem when gullies or rills were formed. The farmers did not acknowledge that splash erosion occurred. In many ways this article goes against the grain of current thinking which holds that farmer know and understand well what erosion means, what causes it and what they can do to address it.

*Keywords:* Farmer perception; Soil erosion; Gullies; South Africa

49. Chambers R, Pacey A and Thrupp LA (1989)  
*Farmer first: farmer innovation and agricultural research.*  
Intermediate Technology Publications, London, 219 pages

The title of this book *farmer first* has passed into development jargon as a guiding principle – implying resource-poor farmers and their felt needs should not be ignored in favour of the agenda of scientists. The book presents a new paradigm and methods for agricultural research. Starting with farmers' own capacity for innovation, contributors from the agricultural and social sciences, ecology, economics and geography make the case for a *farmer first* mode to complement the traditional transfer of technology paradigm. This is a collection of papers from a seminal workshop held at the Institute of Development Studies at the University of Sussex in July 1987, entitled 'Farmers and Agricultural Research: Complementary Methods'. Two quotations capture the essence of the book. On page xix in the introduction : '*indigenous technical knowledge has been more and more recognized as valid and useful.....farmers have again and again been found to be rational..*' On page 3 we read that: '*... farmers, especially resource poor-farmers, continuously experiment, adapt and innovate*'. Chamber's earlier book *Rural Development: putting the last first* (published in 1983 by Longmans) is also a valuable early reference to farmer participation in the development process.

*Keywords:* Transfer of technology; Agriculture; Participation; Rural development; Innovation

50. Chambers R (1997)  
*Whose reality counts?*  
Intermediate Technology Publications, London, 297 pages

Through analysing experience - of past mistakes and myths, and of the continuing methodological revolution of PRA (participatory rural appraisal) – Robert Chambers looks towards the future of such participatory approaches. He suggests a new term '*Participatory Learning and Action*' to cover more accurately what is, or should, be happening in participatory development processes. He expresses his astonishment at the analytical abilities of poor people – abilities that have been uncovered by PRA-type exercises. '*Whether literate or not, whether children, women or men, they showed that they could map, list, rank score and diagram often better than professionals*'. However a cautionary note is expounded upon in this book: PRA has spread so rapidly and become so much the 'right approach' that there are all manner of bad practices that have crept in. We have to beware of '*domination, rushing, routines and ruts, gender bias, upper to upper bias, taking without giving, and arousing unmet expectations*'.

*Keywords:* Participation; Rural development; Sustainable development

51. Chambers R (1990)  
*Microenvironments unobserved*  
Gatekeepers Series no 22, International Institute for Environment and Development,  
London, 18 pages

This booklet is essential reading to those who are looking for local creativity amongst poor farmers. Often, it is argued, production is concentrated, and experiments carried out, in areas

of resource conservation (water, soil, nutrients) which are overlooked by outsiders. These resource rich pockets or ‘microenvironments’ need to be sought out, and not ignored as they often are by ‘development tourists’. Chambers again questions the transfer-of-technology (TOT) paradigm which, he argues, needs to be replaced by a *farmer first* approach (entry 49). Explanations of non-adoption are now sought in the technology itself rather than ignorance of the farmers or the methods of communication.

*Keywords:* Transfer of technology; Rural development; Intensification; Microenvironments

52. Darkoh MBK (2003)

*Agriculture and biodiversity conservation in Africa through indigenous knowledge*  
pp 73-86 in Lemons J, Victor R and Schaffer D, *Conserving biodiversity in arid regions* Kluwer, Boston

The book from which this chapter is taken has biodiversity as its main theme. But it is not possible to talk about biodiversity without encompassing natural resource management and agriculture. Darkoh does precisely this – and adds indigenous knowledge to the equation. In his introduction he lets us know where he stands ‘*A blend of modern science and indigenous knowledge will be required to face the challenges of increasing agricultural production and managing the environment on a sustainable basis in the decades ahead in Africa*’. Darkoh puts forward a powerful case for IK to be integrated into efforts to develop resources in Africa. There is also one well-referenced section on IK and how it can be integrated into policy.

*Keywords:* IK definitions; Biodiversity; Africa

53. Gupta AK (1996)

*Respecting, recognising and rewarding local creativity: Knowledge networks for biodiversity conservation and natural resource management*  
Indian Institute of Management, Ahmedabad, India. 16 papers compiled (no sequential page numbers)

Anil Gupta has been at the forefront of indigenous knowledge studies - and particularly innovation by land users - since the early 1990s in India. He was the founder of the SRISTI (the Society for Research and Initiatives for Sustainable Technologies and Institutions), which supports the *Honey Bee Network*, which in turn produces a magazine (*Honey Bee*), featuring local innovations. This volume is in fact a compilation of the most important papers written by Gupta – and colleagues – on the general theme of local creativity. There are 16 of these, variously dated between 1990 and 1996. The underlying theme is the justification of local creativity as an essential component of improvements in natural resource management and biodiversity. See also entry 139.

*Keywords:* Innovation; Networking; Creativity; Biodiversity



54. Hurni H (1996) 'with the assistance of an international group of contributors' (1996)  
*Precious Earth: from soil and water conservation to sustainable land management*  
International Soil Conservation Organisation, Bonn, 89 pages

This state-of-the-art booklet was compiled by a leading group of soil conservationists in preparation for the ISCO conference in Bonn in 1996. It takes the reader through the current level of knowledge regarding degradation of land and water resources. The booklet then provides an overview of current thinking and action, and includes ideas on how to initiate and build positive momentum towards *sustainable land management*. It contains a 4-page section on taking account of local knowledge where examples are given of traditional practices from around the world. They are put into the development context. We are told, for example '*Recognition of local techniques can help to identify practices suitable for adoption or adaptation, with a view to improving or reinforcing accepted methods and processes without destroying local societies and environments*'.

*Keywords:* Sustainable land management; Rural development

55. Kolawole OD (2001)  
*Local knowledge utilization and sustainable rural development in the 21<sup>st</sup> century*  
Indigenous Knowledge and Development Monitor, vol 9, no 3, pp 13-15

The abstract of Kolaole's article begins with the bold statement that '*Local or indigenous knowledge is essential for rural development*'. Though of course few would now disagree, this represents a sea-change from the thinking of even 20 years ago. He summarises the difference between western knowledge systems (WKS) and indigenous knowledge systems (IKS) – warning us that the word 'traditional' (in bold!) finds objection by many development specialists with its connotation of being old and static. Two useful methodological summaries are presented: first the stages of local knowledge development, being *observation* leading to *experimentation* and on to *validation*. The second – on the basis he says of the literature and observational evidence – regards the utilisation of local knowledge. Here we have *awareness* leading on to *perception*, to *motivation* and through *evidence* to *utilisation*. The author (from Nigeria) believes that *ex situ* preservation of knowledge is important in ensuring its preservation – and disagrees with Agrawal (2001: see entry 2) in that respect. He goes as far as saying that '*the poor the oppressed and the disadvantaged*' could be reached by the development of information spread through the internet.

*Keywords:* Knowledge systems; Methodology; Dissemination; IK definitions

56. Lok R (2001)  
*A better understanding of traditional homegardens through the use of locally defined management zones*  
Indigenous Knowledge and Development Monitor, vol 9, no 2, pp 14-19

Homegardens are a feature of rural landscapes throughout the humid tropics. They are intensive, multistorey systems that optimise moisture, fertility and labour close (by definition) to home. Almost invariably these are indigenous systems. Rossana Lok investigates homegardens in Central America in this well illustrated article. She emphasises

that there are ‘*three basic interrelated strategies employed in the homegardens: the regulation of water and humidity, the use of management zones and the general tendency to maintain – and if possible increase – the diversity of floristic species*’. Ms Lok focus here on the use of management zones. These zones may refer to different vertical levels of management: the storeys involved and the species that occupy those storeys. But they may also describe zones of different moisture availability – for example where vegetables are grown from wastewater. In many ways this ‘zoning’ is an attempt to deconstruct what appears at first to be ‘chaotic’, but is in fact a highly sophisticated system of producing food and optimising natural resources close to home.

*Keywords:* Homegardens; Microenvironments; Wastewater; Central America

57. van Marrewijk A, van Cooten I, Leidekker E, Boven B and Bruinsma W (2002)  
*Editorial comment*  
IK WorldWide, February 2002

Leading on from von Liebensteins’ closing comment on the back page of the final edition of the *Indigenous Knowledge and Development Monitor* the replacement newsletter *IK WorldWide* (of which this is the first issue) picks up the theme of IK and higher education. Three compelling reasons are set out as to why IK should be integrated into higher education – based on responses from readers. These are: *first* IK has a valuable contribution to make to other knowledge systems: local knowledge adds value to global knowledge when the two are linked. *Second*, IK is sustainable and has its roots in sustainable use of resource. This is key in development. *Third*, western knowledge systems are largely irrelevant to the local context of countries in the South. If integrated into higher education IK can be the link that makes higher education more accessible [to] rural groups. The comment concludes by saying ‘*The editorial team sees these and responses as evidence that IK is being assigned an increasingly clear-cut place in various countries*’.

*Keywords:* Higher education

58. Mathias E (1995)  
*Framework for enhancing the use of indigenous knowledge*  
*Indigenous Knowledge and Development Monitor*, vol 3, no 2, pp 17&18

A framework is provided to help practitioners make better use of indigenous knowledge. It reviews past efforts and suggests future action to enhance the application of IK. The specific objectives of this framework are first to increase and improve the available information on IK, and second to enhance the application of IK in development strategies. The framework itself comprises four columns: these are entitled (1) *What to do* (2) *How to do it* (3) *Status* and (4) *Needed*. An example is ‘*Provide guidelines on how IK can be used*’ in column (1). ‘*Policy papers for Government officials and policy makers, and guidelines for development planners*’ are given under column 2. This is followed by a discussion of ‘status’ in column 3 – which in this case tells us that there are only a few useful policy papers and guidelines are largely missing. In column 4 we are told that country-specific guidelines need to be formulated and packaged.

*Keywords:* Planning framework; IK application

59. McCracken JA, Pretty JN and Conway GR (1988)  
*An introduction to Rapid Rural Appraisal for agricultural development*  
Sustainable Agriculture Programme. International Institute for Environment and Development, London, 96 pages

One of the first widely available standards on participatory appraisal, this A4 size booklet is still a useful guide to the tools (rather grandly here styled the '*suite of techniques*') that can be used in the field. These included semi-structured interviews, ranking, labour calendars, stories & portraits, diagrams and maps & transects. While the title 'Rapid Rural Appraisal' has been left behind long ago (developing into 'Participatory Rural Appraisal' before being reborn as 'Participatory Learning and Action') the basic concepts and content have not changed fundamentally. One of the most interesting legacies of this publication is the annotated bibliography attached as an appendix. Here the history of RRA/ participatory appraisal is traced from its roots in the late 1970s. This is followed by an interesting 'key workers' list which was basically a 'who's who' of those active in RRA/ IK circles at the time. Many of these are names that appear and reappear in this annotated bibliography.

*Keywords:* Participation; Methodology

60. Michael YG and Herweg K (2000)  
*From indigenous knowledge to participatory technology development*  
Centre for Development and Environment, University of Berne, Switzerland.  
52 pages

This booklet is a summary of some aspects of Yohannes Gebre Michael's PhD study set in Ethiopia. The most relevant chapter to this bibliography is Ch. 4 '*Understanding indigenous conservation as a starting point for technology development*'. Having stressed the importance of IK, the authors go on to describe various local practices which are categorised into biological/agronomic and mechanical/ physical. There is some technical description, but also a focus on social organisational aspects. The booklet closes with five traditional Ethiopian proverbs regarding soil and farming. One is '*Sterility applies to human beings, but not to land*'. Another tells us that '*The beautiful is borne from the ugly, and the good yield is obtained from stony plots*'.

*Keywords:* Indigenous soil and water conservation; Ethiopia

61. Pretty JN (1995)  
*Regenerating agriculture*  
Earthscan Publications Ltd, London, 320 pages

Jules Pretty begins his book with '*a vision for agriculture*'. He talks of the need to combine productivity with environmental sensitivity and regard for rural communities. '*It is a book*' he states on page 1 '*about the skills and ingenuity of local people and communities; about innovative agriculturalists.....*' Pretty looks at the scale of the challenge facing agriculture today and details the concepts and characteristics of alternative, sustainable agricultural practices. 20 case studies and data from more than 50 projects in 28 countries are used to identify success in the implementation of sustainable practices and its replication elsewhere. There are various sections that touch on the issue of water: water harvesting, irrigation and

drainage issues are covered. In many ways this book has become a standard reader on 'the new approach' to agriculture and its interface with poverty, people and the environment.

*Keywords:* Sustainable development; Agriculture; Poverty; Best practice; Innovation

62. Pretty J, Guijt I, Thompson J and Scoones I (1995)  
*Participatory Learning and Action: a trainer's guide*  
International Institute for Environment and Development, London, 267 pages

'Rapid Rural Appraisal' was the original name for what had developed into, by 1995 when this guide was written, the broader and more inclusive discipline of 'Participatory Learning and Action'. This book became, for many development workers, the authoritative manual on how to conduct participatory exercises. While there are many overlaps with previous materials (see for example McCracken et al, 1988; entry 59) there are new elements introduced, focussing not just on the actual 'tools' involved, but also on theory behind adult learning and group dynamics. The book is practical, well illustrated and has helped guide countless numbers of field exercises throughout the world.

*Keywords:* Participation; Methodology

63. Ranasinghe H (1995)  
*Traditional tree-crop practices in Sri Lanka*  
Indigenous Knowledge and Development Monitor, vol 3, no 3, pp 17-19

Hemanthi Ranasinghe looks at the close relationship between women and trees in Sri Lanka, covering homegardens, community forestry, and protection and management of forests and wildlife. These traditions apparently go back thousands of years. A particularly telling comment is '*the art of agroforestry is an ancient one, while the science of agroforestry is new*'. The article goes on to describe various tree-crop based systems: these are *Chena* (shifting) cultivation; intercropping of coconuts; tea coffee and cacao under shade trees; fruit trees in combination with rubber; palmyrah palm with rubber; *Kandyan* and other homegardens; Pastoralism-forestry-apiculture; mangroves; and medicinal trees with pastures. The author points out that intensification is not just necessary, but a fact (the amount of agricultural land per person has fallen to 0.27 ha on average) and traditional agroforestry is a good basis from which to start.

*Keywords:* Agroforestry; Homegardens; Intensification; Microenvironments

64. Reij C, Scoones I and Toulmin C (eds) (1996)  
*Sustaining the Soil: indigenous soil and water conservation in Africa*  
Earthscan Publications Ltd, London, 260 pages

Capturing the spirit of the 1990s, this edited book gives compelling evidence from the field of rich traditions of soil and water conservation. Case studies – derived from the first phase of a project entitled *Indigenous Soil and Water Conservation* – are presented from 16 countries in Africa. These range from the Atlas mountains in Morocco, to the Jos plateau in Nigeria, and from the highlands of Ethiopia to the highveld of Swaziland. Each case study is presented by one or more local researchers. The techniques covered include terraces, pit cultivation, grass

strips and water harvesting. However the message is not simply that indigenous systems are 'the answer'. There are several examples of where traditions are being lost – for various reasons including out-migration. Nevertheless the central message is that we should look for tradition before imposing outside ideas.

*Keywords:* Indigenous soil and water conservation; Africa

65. Reij C and Waters-Bayer A (eds) (2001)  
*Farmer Innovation in Africa: a source of inspiration for agricultural development*  
Earthscan Publications Ltd, London, 362 pages

Farmer innovation is held up to be one of the most important untapped resources in Africa's drylands in this edited volume – which is based on two farmer innovation projects in Africa. Many of the 32 chapters are written by African partners in the two projects (*Indigenous Soil and Water Conservation*, and *Promoting Farmer Innovation*). The main technical focus is on soil and water conservation measures, and several examples are given of farmer creativity in the absence of appropriate research recommendations. The book is divided into six parts: an introduction to innovation, building partnerships, process and analysis of innovation, evaluation, joint experimentation and policy.

*Keywords:* Innovation; Indigenous soil and water conservation; Policy; Africa

66. Reijntjes C, Haverkort B and Waters-Bayer A (1992)  
*Farming for the future*  
ILEIA, Leusden, 250 pages

The central focus of this book is the potential of LEISA (Low External Input and Sustainable Agriculture) as an option for the developing tropics – where few other sustainable possibilities exist. There is a dual technical and socio-economic focus, with a specific section on indigenous knowledge and related farming practices. It explains how development workers can assist small-scale farmers in making the best use of low-cost local resources to solve their agricultural problems. The emphasis is on participatory technology development (PTD) to find site-specific solutions. This can only be achieved however when farmers and scientists are linked together in developing LEISA technologies. Throughout the book there is a wealth of information, with case studies and specific examples of LEISA in action.

*Keywords:* Agriculture; Participation; Methodology

67. Richards P (1985)  
*Indigenous Agricultural Revolution: ecology and food production in West Africa*  
Hutchinson, London, 192 pages

Paul Richard's book in 1985 can be said to be a trend-setter. The book argues forcefully and practically for a new relationship between science and the small farmer. Scientific research should seek out changes already taking place within the smallholder farming sector and aim to build upon the best of these local initiatives. He sums up his main argument as follows: *'Intellectuals, development agencies and governments have all pursued environmental management problems at too high a level of abstraction and generalisation.. Many*

*environmental problems are, in fact, localised and specific, and require local ecologically particular responses. ...One of the answers explored below is through mobilising and building upon existing local skills and initiatives'* . Richards holds that the new concept of 'people's science' implies the replacement of 'experts' by agents who are facilitators and catalysts for change.

*Keywords:* Innovation; Rural development; Agriculture

68. Scoones I and Thompson J (1994)  
*Beyond Farmer First: rural people's knowledge, agricultural research and extension practice*  
Intermediate Technology Publications, London, 301 pages

In his foreword, Robert Chambers explains how '*much has happened*' since the publication of *Farmer First* (see entry 49) in 1989. He argues that despite the fact that '*growing numbers of professionals have made personal changes and accepted risks by advocating and adopting a farmer-first approach*' there are many who have merely taken on board the rhetoric yet remain trapped in a the old 'transfer of technology' paradigm. This book concentrates on how to overcome the shortcomings of *farmer first* initiatives, especially those to do with the fundamental issues of power and knowledge. The 35 papers assembled and edited by Scoones and Thompson arose from a workshop at the Institute of Development Studies, University of Sussex in 1992. Several focus on farmer's experiments and knowledge exchange, and case studies are presented from a wide range of countries.

*Keywords:* Farmer experimentation; Farmer to farmer extension: Transfer of technology; Empowerment

69. Smith LC (1997)  
*Introducing MIKS: a methodology for the utilization of indigenous knowledge*  
Indigenous Knowledge and Development Monitor, vol 5, no 2, pp 8&9

Lars Smith believes that the best approach to using IK is to liken it to the way that a management consultant approaches expert knowledge in a business organisation. The latter knowledge, he says, is largely ephemeral, context specific and the property of the business organisation itself. The holder of IK is compared to the business 'client' and development specialists are likened to the 'management consultant'. Smith has developed a methodology to assist these 'clients' in using their knowledge that he terms MIKS (*methodology for the utilisation of indigenous knowledge systems*). The article ranges around the theory and power of MIKS ('...*The theory behind MIKS is based on the observation that one cannot explain the behaviour of a person or any other living system in terms of cause or effect...it is certainly an advanced methodology, specific, well-defined and widely applicable..*' ). The problem with this article is that for all the theorising the reader is left none the wiser as to what MIKS really, practically, entails. A case study with respect to IK and rural development would have been most useful.

*Keywords:* Methodology; IK application

70. USAID (2002)  
*Nature, Wealth and Power*  
USAID in collaboration with CIFOR, Winrock International, World Resources Institute, International Resources Group, 35 pages

This booklet concerns rural development in Africa, and claims to be ‘*a preliminary statement of lessons learned from more than 20 years of natural resource-based development in rural Africa*’. The title, it emerges, is drawn from the conviction that programmes that integrate *nature (environmental management)*, *wealth (economic concerns)* and *power (good governance)* have the best possibility of positive results. The first section deals with ‘*knowledge management*’. This is followed by others on ‘*local land use planning*’ and then ‘*social learning, innovation and adaptive management*’. It is in this third chapter where the importance of local innovation is highlighted. The final two sections are ‘*building capacity*’ and ‘*cost-effective services*’.

*Keywords:* Innovation; Rural development

71. Warren DM (1993)  
*Using IK for agriculture and rural development: current issues and studies*  
Indigenous Knowledge and Development Monitor, vol 1, no 1, pp 7-10

In this first number of the influential *Indigenous Knowledge and Development Monitor* – which continued until 2001 – Michael Warren sets out the state of the art with respect to IK and rural development. Warren was at that time the Director of the Centre for Indigenous Knowledge for Agriculture and Rural Development (CIKARD) at Iowa State University. His main points are to highlight the reservoir of IK that is largely untapped in developing countries, but also to acknowledge that development planners and policy makers are beginning to take notice of existing knowledge systems and their potential importance. He points out that social scientists working within the CGIAR system (Rhoades and Prain at CIP; Fujisaka at IRRI; Ashby at CIAT; and Rocheleau at ICRAF are some of the well known names mentioned) have come up with some of the ‘best recent studies’ in this field. Warren waves a warning flag against the danger of merely documenting and drawing up inventories of IK. He writes: ‘*There is need for research on the adaptability of these systems involving rapid changes in population growth, environmental degradation, and shift from extensive to intensive approaches to agriculture and natural resource management*’.

*Keywords:* IK application; Response to change

## INDIGENOUS KNOWLEDGE AND WATER

72. Abay F, Haile M and Waters-Bayer A (1999)  
*Dynamics in IK: innovation in land husbandry in Ethiopia*  
Indigenous Knowledge and Development Monitor, vol 7, no 2, pp 14&15

The documentation of indigenous innovations in soil and water conservation is only a starting point: the next step is publicising those innovations, communicating them to others, and making them accessible to cultivators in comparable situations elsewhere. That is the central message from this Ethiopian case study which falls under an Africa wide programme entitled 'Indigenous Soil and Water Conservation phase II'. The authors go on to describe one particular technical innovation by a farmer – Ato Yohannes Tesfay – which comprises dry stone walling to divert water from a river for irrigation. The detail in the walling techniques is the real innovation here: we are told how, in order to strengthen the structure, the farmer has pushed a second layer of stones into the first and this then uses the force of the water to '*Press one stone against the other and effectively tie them together*'. Hence the local name for this type of riverside wall: the 'devil's tie'. We are told that: '*people in neighbouring villages observed and copied this technology and now.....the practice has spread throughout Irobland*'.

*Keywords:* Innovation; Land husbandry; Dissemination; Ethiopia

73. Adams WM and Watson EE (2003)  
*Soil erosion, indigenous irrigation and environmental sustainability, Marakwet, Kenya*  
Land Degradation and Development, vol 14, no 1, pp 109-122  
[www.interscience.wiley.com](http://www.interscience.wiley.com)

This article studies local and outside perceptions of erosion under the traditional irrigation systems of the Marakwet in the Kerio Valley of Kenya (see also Kipkorir et al, 1983, entry 97). Generally outsiders' views – dating back to comments from the District Colonial Administration in the 1940s – hold that the ingenious traditional furrow construction is undermined by the wasteful and erosive irrigation water application. The authors agree that these observations are '*not mistaken....because there is no doubt that a considerable amount of erosion does occur in association with Marakwet irrigation*'. However the local Marakwet interviewed did not generally view erosion as problematic: it was accepted as a dynamic of the changing environment in which they live. The authors conclude that '*it is not clear whether over perhaps the last two centuries Marakwet irrigation has maintained extent and productivity [sustainably], or whether it has been essentially mining a limited resource.*'

*Keywords:* Irrigation; Soil erosion; Kenya



74. Advisory Committee on Technology Innovation (1974)  
*More Water for Arid Lands: promising technologies and research opportunities*  
National Academy of Sciences, Washington DC, USA, 153 pages

When this booklet came out in the early 1970s it was eagerly seized upon by those working in the arid lands of Africa and India. For the first time traditional knowledge of water management was being widely acknowledged and disseminated. The booklet covers more than these systems however and devotes chapters to recycling of water, various forms of irrigation and all manner of water saving mechanisms related to irrigation and domestic water supplies. Chapter 2 concentrates on runoff agriculture – giving examples of traditions from from Israel, Pakistan and Niger. Chapter 5 goes on to consider wells in all their ancient (and still current) forms, including the famous *qanats* (spreading from North Africa to Pakistan) with their horizontal tunnels leading far into aquifers.

*Keywords:* Water harvesting

75. Agarwal A and Narain S (eds) (1997)  
*Dying Wisdom: rise, fall and potential of India's traditional water harvesting systems*  
Centre for Science and Environment, New Delhi, India, 404 pages  
[www.cseindia.org](http://www.cseindia.org)

In indigenous knowledge and water terms, this book is a 'block-buster'. It has done an enormous amount in the few years since its publication to raise awareness of India's extraordinary historical wealth of water harvesting tradition. The book is filled with details of various technologies and lavishly illustrated – both with photographs and technical drawings. The authors say that there were two factors that prompted them to come up with this account of India's water harvesting heritage. The first was the growing 'anti-dam' movement in the country (so, they wondered, what alternative sources of water could there be?) and the second was their discovery of '*the extraordinary water harvesting devices of the Thar Desert called kundis*'. The book sets out an inventory of water harvesting by 15 different regions in India, then proceeds to comment on the state of affairs and how this tradition could be revived instead of being left in abeyance and ignored by India's leaders. They hope that the report '*will have a major impact on the consciousness of the country*' and dedicate the report to the native wisdom of the rural communities of India.

*Keywords:* Water harvesting; India

76. Agarwal A and Narain S (1999)  
*Making Water Management Everybody's Business: water harvesting and rural development in India*  
Gatekeeper Series no 87, International Institute for Environment and Development, London. 20 pages

This booklet followed the landmark of *Dying Wisdom* by the same authors (see entry 75) and was a precursor to the important book that emerged (same authors with Indira Khurana) in 2002 entitled *Making Water Everybody's Business* (see entry 77). We are told at the beginning of this slim volume that '*In India as the 21<sup>st</sup> century approaches, nearly 44 million people are affected by water quality problems and availability of water is also a huge*

*problem in many areas, with the per capita availability of water expected to be half its 1947 level*'. The authors believe that most of India's needs could be met – mainly through reviving the rich tradition of rainwater harvesting. However these need to be underpinned by community based decision making systems and institutions and 'enabling legal and financial measures which promote community action'. The messages contained in this booklet – broadly summaries of those found in the two books between which it is sandwiched in time – are not merely relevant for India, but for much of the developing world.

*Keywords:* Water harvesting; India

77. Agarwal A, Narain S and Khurana I (eds) (2001)  
*Making Water Everybody's Business: practice and policy of water harvesting*  
Centre for Science and Environment, New Delhi, India, 456 pages

Following the acclaimed success of *Dying Wisdom* (entry 75) two of the same editors went on to produce this sequel. Again the focal area is India. This volume is in fact the edited proceedings of a three day conference, held in 1998, entitled the *Potential of Water Harvesting: Technologies, Policies and Social Mobilisation*. Opened by the President of India, Shri KR Narayanan, the conference was organised by the Centre for Science and Environment to follow-up *Dying Wisdom* because, CSE believed that '*the community-based water harvesting paradigm still had great relevance in this modern day and age*'. The book looks at not only traditions, but also rural water harvesting programmes in India and analyses their effectiveness. Urban water harvesting is accorded a section on its own, and there is another section which concentrates on technology. There are over 50 pages comprising 12 chapters dedicated to policy.

*Keywords:* Water harvesting; Policy; India

78. Ahmed S (2001)  
*En-gendering policy discourse on water management: negotiating gender relations and changing water worlds-insights from rural Gujarat*  
Institute of Rural Management, Anand, Working Paper 162, 39 pages

This paper gives a brief overview of gender concerns in water policy and details the social actors around conflicting water needs and priorities. Rural Gujarat, in north-western India is the area of focus. In Gujarat, we are told, water can be seen as a '*cultural marker of social stratification*' and a '*social marker of changing gender relations in the context of water scarcity and attempts to involve women in water management*'. The paper starts with a look at the water economy of Gujarat state: nearly 80% of Gujarat's total drinking water requirement is met from underground sources. Groundwater is being drawn down by mechanised overexploitation: about 80% of villages are officially classified as having 'no source'. Water provision and development is a very complex issue. The author implores NGOs to embrace these complexities to empower rural women, and move beyond a project-focused approach.

*Keywords:* Gender; Water conflicts; Policy; India

79. Bandler H (2001)  
*Dealing with future water resources requires looking to the past*  
Journal of Water Supply: Research and Technology – AQUA vol 50, no 6,  
pp 387-394

Bandler describes how the indigenous inhabitants of Australia have managed and used their limited water resources in the past, and illustrates various different indigenous technical practices for water harvesting, such as the occurrence of *native wells*. These wells vary in depth from half a meter to about six meters, and have been found in remote areas, even in the desert. For some wells, special covers were built to minimise evaporation and to ensure the maintenance of water quality. Aboriginal people also utilised surface water courses and underground water sources. Special hydraulics structures were built to protect and harness potable water, as well as to obtain food from water in many places. Though he states that only few of the hydraulic structures built by the Aborigines can be widely replicated for water supply or food exploitation, Bandler adds that *'it is, however, important to recognise the significant heritage treasure bestowed on the present and future generations from Aboriginal Australians concerned with the task of dealing with the demand of water for the population on a continent with very limited water resources'*.

*Keywords:* Water scarcity; Australia

80. Benites J, Vaneph S and Bot A (2002)  
*Conservation Agriculture: planting concepts and harvesting good results*  
LEISA, vol 18, no 3, pp 6-9  
[www.ileia.org](http://www.ileia.org)

There is a growing movement in soil conservation circles to embrace minimum tillage as a better way of keeping moisture in the ground, while simultaneously reducing the loss of carbon through less exposure of organic matter to the air and reduced fuel consumption by machinery. The centre of this smokeless revolution is Brazil. According to the authors, in the early 1970s farmers in Paraná, Southern Brazil, recognised that continuing soil erosion and declining crop yields were forcing them to abandon land. Terracing of new land was expensive and led to poor results. They then *'abandoned the plough, broke their compacted soils, introduced cover crops, stopped the burning of crop residues and developed cutting rollers to turn crop residues and cover crops into mulch. This mulch layer eliminated rainfall impact on the soil, reduced the speed and quantity of runoff and virtually eliminated soil erosion. It also significantly increased soil fertility and yields, and reduced the labour and cost of land preparation'*. A win-win situation indeed.

*Keywords:* Conservation tillage; Soil erosion; In-situ moisture conservation; Terracing; Brazil



*Eragrostis pallemis* – thatching grass for sale, Namibia

Traditional thatching with *Eragrostis pallemis*, Namibia



Homestead, Venda: South Africa

Traditional terraces in hillside fields, Venda, South Africa



Women queuing at spring,  
India



Pipeline for domestic water supply,  
India

Watering livestock at home, India



Groundwater irrigation –  
drawing down the water table?  
India



Village water supply – a mountain spring in the *Haute Atlas*, Morocco

Women drawing water from a sand river, Kenya



Water pan for domestic supply and irrigation water, Kenya

Well for vegetable irrigation and sales of water, Kenya



Participatory mapping, India



'Demi-lune' (half moon) water harvesting structure, Niger



'Demi-lune' (half moon) water harvesting structure with grass, Niger



Participatory planning,  
Kenya



Water harvesting in Turkana –  
before the rains, Kenya  
Credit: P.D. Smith



Water harvesting in Turkana – after  
the rains, Kenya  
Credit: P.D. Smith





Traditional *Mot* irrigation, India



Irrigating kitchen gardens with wastewater, India



Watermill, India



Rainfed bench terraces, India



Joint Forest Management, India

Improved traditional  
irrigation scheme, India



81. Bose SK, Ghani O, Emdad Hossain ATM, Mridha NN and Muhammad T (1998)  
*A compilation of indigenous technical knowledge for upland watershed management in Bangladesh*  
UNDP, FAO and FARM Programs Netherlands, PWMTA-Farm Field No. 11,  
49 pages

The authors describe 52 indigenous technologies and practices in this document. Most of these technologies involve forest management, water and soil conservation methods, intensive production systems or cultural rituals. Since similar indigenous technologies are also found in other countries of this region, it was felt that some sort of platform was needed to collate these: hence this document as one of several. Some of the more widespread indigenous techniques are; using bamboo as containers for fetching and storing water; the creation of checkdams, *godha* (made from bamboo, wood, soil); holes (*kua*) dug out in sedimentary rock (1m wide by 0.5m deep) where water oozes out naturally through the subsurface layers. The indigenous people are making the best possible use of the limited available water, and have done so for centuries. Because these technologies are widespread and recognisable and can be created locally, the authors believe strongly in the sustainability of local technologies - and these should not be forgotten in development programmes.

*Keywords:* IK case studies; Water scarcity; Bangladesh

82. Chambers R, Saxena NC and Shah T (1989)  
*To the Hands of the Poor*  
Intermediate Technology Publications, London, 269 pages

With a focus on India and poverty, this book explores how poor people can gain more from rural India's vast and often underestimated potential from groundwater, and from growing trees. It is argued that rights, and creating competitive markets, can be used to free the poor from hassle, enabling them to own and gain more from lift irrigation and trees. The authors – who aim this book at a wide audience of policy makers, academics and practitioners – find there to be an inherent paradox in such poverty co-existing alongside such wealth of natural resource. In lift irrigation and tree planting they see a way out of the poverty cycle. Both, they say, offer large-scale potential that could be exploited. The book emanates from a seminar that took place at the Institute of Economic Growth in Delhi.

*Keywords:* Rural development; Irrigation; Poverty; Groundwater

83. Critchley WRS (2000)  
*Inquiry, initiative and inventiveness: farmer innovators in East Africa*  
Phys Chem Earth (B) vol 25, no 3, pp 285-288

This paper describes lessons from a project in East Africa – *Promoting Farmer Innovation* (PFI) - that has confirmed the existence of a considerable tradition of land husbandry practices in the drier areas. There is also a continuous process of creative farmer innovation - the dynamic that leads to improved systems and the development of new tradition. The three most common categories of technical innovation found under PFI are: water harvesting, organic matter management and gully harnessing. All of these are linked directly to soil moisture and fertility management. The paper goes on to describe a methodology for utilising

‘farmer innovators’ as learning points for fellow farmers. While the approach has been remarkably successful, some outstanding issues are raised: these include how best to monitor the performance of these techniques, local intellectual property rights (or ‘ownership’ of novel systems) and cost-effectiveness.

*Keywords:* Innovation; Intellectual property rights; Water harvesting; Land husbandry, East Africa

84. Critchley WRS, Reij C, and Sez nec A. (1992)

*Water harvesting for plant production: case studies and conclusion*

World Bank Technical Paper no 157, Washington DC, vol II, 134 pages

This document reports a study carried out between 1987 and 1990 which investigated water harvesting systems, both indigenous and introduced, throughout sub-Saharan Africa. Case studies of thirteen systems from six different countries (Burkina Faso, Niger, Kenya, Somalia, Sudan and Zimbabwe) are presented. These are complimented by photographs and technical drawings. In the analytical section, conclusions are drawn under the headings of techniques and engineering, production, socio-economic and project management aspects. Prior to the 1970s there was little knowledge about or documentation of, small-scale, traditional water harvesting in Africa itself. Nevertheless from this time onwards there was a surge in interest in WH and a proliferation of project involvement in such systems. Many had adopted inappropriate (over-costly or technically ineffective) methods. This volume examines the reasons for success or failure and compares and contrasts traditional and introduced systems.

*Keywords:* Water harvesting; sub-Saharan Africa

85. Critchley WRS, Reij C and Willcocks TJ (1994)

*Indigenous soil and water conservation: a review of the state of knowledge and prospects for building on traditions*

Land Degradation and Rehabilitation, vol 5, pp 293-314

This literature review explores the current knowledge base regarding indigenous soil and water conservation – with an emphasis on structural techniques. Nearly 150 references are cited. The article seeks to identify the status of indigenous systems: whether these are flourishing or moribund. There are examples of each. In the former category many water harvesting systems in India continue to thrive, as do planting pit systems for water harvesting in the Sahel of West Africa. In the latter category, some hillside terrace systems in Tunisia have fallen into abeyance, and various water harvesting schemes in Israel and north Africa have gone the same way. The authors note, regarding these ancient, abandoned schemes that ‘...there is simply no prospect of the economic resurrection of derelict, archaic infrastructures. These should remain the preserve of archaeologists rather than agriculturalists.’ The article ends with a suggested methodology for ‘building on traditions’.

*Keywords:* Indigenous soil and water conservation; Water harvesting; Methodology

86. Critchley W and Mutunga K (2002)  
*The promises and perils of 'farmer innovation'*  
Sci.Dev Net Articles. [www.scidev.net](http://www.scidev.net) One page

In this two page net article Critchley and Mutunga pick up the theme of farmer innovation programmes – and the potential pitfalls that must be avoided. Here consideration is given to the 'favoured-farmer syndrome', where so much attention is lavished on certain individuals that project efforts can become counterproductive. Three suggestions are made to ensure that the farmers selected by projects as innovator role models don't fall foul of their comrades. These are (a) don't choose farmer innovators who are so exceptional that they are on the very margins of society (b) avoid handing out incentives to these farmers (c) 'rotate' attention: in other words move on from the original innovators to others who have newly adopted the techniques and make them the new learning points in the programme.

*Keywords:* Innovation; Favoured-farmer syndrome; IK limitations

87. Critchley WRS and Mutunga K (2002)  
*Local innovation in a global context: documenting farmer initiatives in land husbandry through WOCAT*  
Land Degradation and Development, vol 14, pp 143-162

Two years after the initial promise of the project 'Promoting Farmer Innovation' as described in Critchley (2000), an exercise was carried out to document 18 local farmer-developed innovations. The method chosen was the framework provided by the World Overview of Conservation Approaches and Technologies (WOCAT). Some of the technologies described in this paper – all concerning land husbandry/ water harvesting – are (a) turning gullies into gardens (b) digging planting pits for sorghum and millet (c) harvesting water from roads and (d) gravity transport of manure to fruit trees. The paper demonstrates how powerful it can be to build on farmer innovation, especially in areas where conventional transfer of technology approaches have failed. There is also a concluding section that examines the usefulness of WOCAT as a tool. The authors argue that WOCAT can best be used as a tool to guide approach and technology development rather than coming in as an ex-post evaluation tool.

*Keywords:* Innovation; Land husbandry; WOCAT; Evaluation; Transfer of technology; Gullies; Best practices

88. Critchley WRS and Brommer MB (2003)  
*Innovation and Infiltration: human ingenuity in the face of water shortage in India and Kenya*  
Paper presented to the International Symposium on Water, Poverty and Productive Uses of Water at the Household Level, Johannesburg, January 2003  
[www.irc.nl/prodwat](http://www.irc.nl/prodwat)

Based on parallel fieldwork in eastern Kenya and the foothills of the Himalayas in India, Critchley and Brommer uncover local creativity in the face of water shortage. Four case studies are presented from each country. Some of the cases cover domestic water, though most deal with agricultural use. In India there are examples of spring protection and use of wastewater for irrigation. In Kenya a 'gully gardener' is described, as well as an ingenious

locally constructed wind pump. In an analytical section four common themes are identified that run through the case studies: these are (a) *searching for a way out of poverty*, (b) *multiple innovation*, (c) *focus on microenvironments* and (d) *infiltration for production*.

*Keywords:* Innovation; Microenvironments; Intensification; Poverty; Water scarcity; Wastewater; India; Kenya

89. van Dijk JA and Ahmed MH (1993)

*Opportunities for expanding water harvesting in sub-Saharan Africa: the case of the teras of Kassala* Gatekeeper Series no 40, International Institute for Environment and Development, London, 19 pages

The *teras* technique of water harvesting is widespread in the Kassala border area of Eastern Sudan. It offers good opportunities for runoff manipulation and moisture storage. The *teras* system includes two main elements: (1) the cultivated land which is bunded with earth on three sides, and (2) a rainwater collection or 'catchment' area located above the open side of the impounded zone. The small scale, private management and adaptive capacity make it a replicable technology. It is argued that rural programmes should tap the rich source of indigenous knowledge more than is done at present.

*Keywords:* Rural development; Water harvesting; Sudan

90. Dixon A (2001)

*Indigenous hydrological knowledge in southwestern Ethiopia*  
Indigenous Knowledge and Development Monitor, vol 9, no 3, pp 3-5

Wetland farming – the use of natural wetlands for growing crops – has only become common in southwestern Ethiopia over the last 100 years. It was perhaps caused as a response to food shortages elsewhere. It was further pushed during the *Derg* government of the 70s and 80s to meet targets of food production. So wetland farming has expanded rapidly and there are concerns about sustainability which, the author believes, is largely dependent on indigenous wetland knowledge, its evolution and dissemination. The system currently used is based on farmers' knowledge and experience – but the author notes that: '*there is a discrepancy between the knowledge farmers possess and its actual application*'. The author points to a lack of adaptive capacity amongst these communities and questions whether wetland management can be entirely sustainable in the face of rapid change.

*Keywords:* Wetlands; Response to change; Ethiopia

91. Gobin A, Campling P, and Feyen J (1998)

*Bridging gaps in water and labour supply*  
LEISA, vol 14, no 1, pp 16&17

This article takes a case study from Enugu State in southeast Nigeria, where there is a very high rural population density. About two thirds of farmers have practised micro-irrigation for 10-15 years, and this provides an important additional source of income through the production of vegetables, and especially yellow hot pepper. For home garden vegetable cultivation, water captured during the wet season is used. This is added to by wastewater and

water transported in drums from perennial sources. Young plants are kept in a fenced nursery covered with palm leaves for as long as possible to conserve moisture. Fields are irrigated directly from perennial water sources. Peppers are watered in the morning and evening. A mixture of chicken manure and grass is placed round each plant to provide manure and conserve moisture. Three potential technological improvements are suggested which would improve efficiency, by delivering high frequency, low volume applications of water. These are; pitcher irrigation, subsurface pipe irrigation and low-head drip systems.

*Keywords:* Water resource management; Wastewater; Irrigation; Nigeria

92. Grenier L (1998)

*Working with indigenous knowledge: a guide for researchers*

IDRC, Ottawa, Canada, 115 pages

Louise Grenier has produced a neat, well laid-out, spirally bound handbook explores the rationale for research into indigenous knowledge systems. IK, biodiversity and cultural diversity are threatened with extinction and yet are essential to sustained development. Concern about western science setting ‘the rules’ for research is highlighted. International (= western) science tends to be reductionist and views IK as lacking legitimacy because of its nonquantitative, anecdotal nature. The handbook gives eight examples of IK research areas (including *water* – where management, conservation and irrigation are mentioned – *soil* and *agriculture*). Discussing a research framework the book looks at several potential areas for errors. These include ‘socio-cultural errors’, ‘courtesy bias errors’ as well as the more commonly recognised sampling errors and problems in language, understanding and interpretation. This is an excellent guide to IK research – but more than that: it is a valuable background to the whole topic of IK and its place in development.

*Keywords:* IK theory; IK application; Biodiversity

93. HRH The Prince of Orange and Rijsberman FR (2000)

*Summary Report of the 2<sup>nd</sup> World Water Forum: from vision to action*

Water Policy vol 2, pp 387-395

This 8 page summary report of the proceedings of the 2<sup>nd</sup> World Water Forum – which took place in The Hague in 2000 - highlights the main messages of that meeting. In the introduction we are told ‘*A new beginning is clearly needed to avert crises in the century that lies ahead*’. Following on from that it was concluded that water was no longer solely the business of water experts, but there must be direct interaction between all stakeholders. The chairman, HRH The Prince of Orange, asked everyone to maintain the spirit of openness, transparency and participation. Dire warning of impending disaster were brought to the world’s attention: for example half the world’s wetlands were destroyed during the 20<sup>th</sup> century and currently half the world’s rivers are polluted. The four key issues raised by the participants of the forum were: *privatisation*, *charging full prices for water services*, *rights to access* and *participation*. The conclusion of the chair and Rijsberman were that a good start had been made, by involving many non-traditional groups (in other words not the usual ‘experts’). There were clear commitments made by various agencies to pledge more money, set up various organisations and alliances and to honour commitments.

*Keywords:* Water scarcity; Policy; Participation; Pricing mechanisms; Wetlands



94. Huibers FP (1985)  
*Rainfed agriculture in a semi-arid tropical climate: aspects of land and water management for red soils in India.*  
PhD Thesis, Wageningen Agricultural University, The Netherlands, 191 pages

Huibers covers a very wide range of topics under his general theme of rainfed agriculture in the red soil, semi-arid regions of India. Relevant to this bibliography are his chapters on *water management* (which covers water harvesting and traditions thereof) and *approaches to influence the water balance and their effects* (which looks at practices such as mulching, tillage and contour bunding of fields). Traditional approaches to water harvesting are covered quite generally – but are looked upon here as having considerable current value, but Huibers notes that in some cases these systems are falling into disrepair.

*Keywords:* Water harvesting; Mulching; Semi-arid zones; India

95. International Crops Research Institute for the Semi-Arid Tropics (1991)  
*Farmer's practices and soil and water conservation programs*  
ICRISAT and Winrock International Institute for Agricultural Development, 58 pages

This is an edited report from a workshop that brought together representatives from four groups: farmers, researchers, government officials and NGO representatives. This benchmark workshop took place at a time when the 'participatory movement' towards watershed management (and thus soil and water conservation) was beginning to take off in India. Not surprisingly Robert Chambers (*see various of his publications in this annotated bibliography*) was invited to present the keynote address, which forms the first chapter of the book. The contents include sections on (a) indigenous technologies, (b) participatory SWC programmes and (c) recommendations. It formed the basis for the publication, the next year, of Kerr and Sanghi's Gatekeeper publication '*Indigenous Soil and Water Conservation in India's Semi-Arid Tropics*' (see entry 96).

*Keywords:* Indigenous soil and water conservation; Semi-arid zones; India

96. Kerr J and Sanghi, NK (1992)  
*Indigenous soil and water conservation in India's semi-arid tropics*  
Gatekeeper Series no 40. International Institute for Environment and Development, London, 19 pages

Based on a presentation at a workshop held under ICRISAT in India the year before (see entry 95) Kerr and Sanghi contrast the poor performance of government SWC programmes with the evidence of effective indigenous erosion control practices in the semi-arid tropics of the sub-continent. They emphasise the fact that these practices have evolved in different places in response to local agroecological and economic conditions. They point to three principal factors that have determined the development of these practices. These are (a) the relative availability of resources, (b) the preferences, often, of individual farmers and (c) economic factors that have affected adoption. The booklet does not eulogise about ISWC however and points out that '*most farmers do not invest in measures to control [erosion]*'. The conclusion the authors reach has become almost a mantra for IK and SWC these days: '*....soil conservation programmes can become more cost-effective if they are based on an*

*understanding of farmers' perceptions about soil erosion and the conditions under which they adopt and maintain soil conservation measures'.*

*Keywords:* Indigenous soil and water conservation; Soil erosion; Semi-arid zones; Farmer perceptions

97. Kipkorir BE, Soper RC and Ssenyonga JW (eds) (1983)  
*Kerio Valley, past present and future*  
Institute of African Studies, University of Nairobi, 171 pages

The Kerio Valley is one of these least accessible semi-arid regions in Kenya, yet is of great interest because of its productive potential for crops and livestock. At the time the seminar that gave rise to this collection of articles was held, there was much talk about developing 'The Valley'. This raised some consternation however amongst those who were concerned that traditions might be lost – or simply ignored as 'development' came in. One of the most intriguing aspects of the traditional way of life in the Kerio Valley is the intricate irrigation system, where myriad small channels carry water down the escarpment to village fields for supplementary irrigation of sorghum and finger millet. This booklet covers not just the irrigation systems, but various other aspects of the inhabitant's culture and livelihoods.

*Keywords:* Irrigation; Semi-arid zones; Kenya

98. Kolarkar AS, Merthy KNK and Singh N (1982)  
*'Khadin' – A method of harvesting water for agriculture in the Thar Desert*  
Journal of Arid Environments, vol 6, pp 59-66

The *Khadin* system of water harvesting is one of the best known and described ancient water harvesting systems in India. Within this annotated bibliography it is mentioned, for example, in Ray (entry 109), Critchley et al (entry 85) and Agarwal et al (entry 75). *Khadins* are found in Western Rajasthan, and comprise, basically, bunds across valley floors which capture runoff from rocky catchments above. Surplus water passes through a spillway. Sediment is simultaneously captured. Cultivation of crops (wheat, chick peas) is carried out in the residual moisture, after the impounded runoff has infiltrated.

*Keywords:* Water harvesting; India

99. Mendoza MCY (1999)  
*Terracing with the aid of 'gravity flow'*  
Indigenous Knowledge and Development Monitor, vol 7, no 3, pp 18&19

This article presents a case study from Benguet province, Northern Luzon in the Philippines. Maria Mendoza '*came across a remarkable innovation in soil and water conservation*'. That innovation is the use of gravity flow of water (in diversion channels) to help construct terraces on steep slopes. Having removed the top soil from the site to be terraced, the farmer diverts stream flow to that site and places rough materials (sand, stones etc) into the channel to be carried downstream to the terrace where it helps build up the flat terrace bed. The top soil is then replaced to form the growing medium. To hold the terrace in place, stone walls (risers) are preferred, but most new terraces now have to make do with earth risers as stone is

in very short supply. We are told that this technique is very site specific (depending on supply of water) and not widespread. This is an interesting though not very detailed article. One clarification must be made however: the author confuses an 'innovation' – in other words something new – with an '*age-old method for constructing a terrace*' which clearly means that this is a tradition that is being described.

*Keywords:* Terracing; Philippines

100. Merz J, Nakarmi G and Weingartner R (2003)  
*Potential solutions to water scarcity in the rural watershed of Nepal's Middle Mountains*  
Mountain Research and Development, vol 23, no 1, pp 14-18

Following on from an article in the same issue of the journal (see Merz et al; entry 31) highlighting the problems of water scarcity in the Middle Mountains of Nepal, potential solutions are presented here. The authors write that '*new forms of management based on traditional and scientific knowledge must be introduced to solve problems of water supply, water demand and water quality*'. There is a description of traditionally managed ponds along ridges and on slopes for watering of animals. Nevertheless many of these have dried up through lack of maintenance and thus siltation. Rooftop harvesting of water is apparently not a tradition in this area. Harvesting of spring water in plastic lined ponds – relying on the unused portion of spring flow – shows good promise. Another possibility is more use of shallow wells and fog water collection. Micro-irrigation (sprinkler and drip systems) would improve water use efficiency. Mulching is another possibility for rainfed crops. Quality issues are also discussed.

*Keywords:* Water scarcity; Mulching; Nepal

101. Mishra PK (2003)  
*Indigenous and technical knowledge on soil and water conservation in semi-arid India*  
National Agricultural Technology Project, Central Research Institute for Dryland Agriculture, Hyderabad, 151 pages

This volume is a compilation of 140 examples of land management practices from India's semi-arid regions. Mishra *et al* have meticulously assembled the contributions of 18 specialists from various dry parts of the sub-continent. Each technique is presented according to a standard, concise and informative format on a single page. While the book does not pretend to be a technical manual, the concentration of valuable detail could hardly be improved upon in terms of economy of space. The techniques described span a very wide range: these include structural measures (eg stone bunding, wells and water harvesting methods) vegetative techniques (eg grass strips, barriers of various plants and green manuring) and agronomic methods (eg ploughing techniques, mixed cropping, and crop spacing). While a number of the techniques are well known within India at least – field bunding for example - there are others which catch the eye: '*gravel sand mulching*' is one, '*tank silt application*' is another, and '*application of groundnut shells*' a third.

*Keywords:* Semi-arid zones; Indigenous soil and water conservation; Mulching; Water harvesting; India

102. Moriarty P and Lovell C (2000)  
*Simplest is not always best – physical and climatic constraints to community water supply in Zimbabwe*  
Waterlines, IT Publishing, London, vol 19, no 2, pp 9-12

The authors give an overview of their major findings and the relevance of these findings in terms of water resource development, rural livelihoods, and environmental sustainability from nearly ten years of interdisciplinary research in south-eastern Zimbabwe. In 1991 a catchment-community became involved in a pilot project to test a new type of water supply project, based around the provision of a mixed use water source; water for both domestic and productive uses. The long-term nature of the study allowed a number important insights to be developed into the highly complex web of relationships between physical and human aspects of the semi-arid environment. During this time livelihoods did not remained static and the initial cultivated garden, seen initially as proving extra food security, turned into an income stream for the community. The authors state that '*successful development projects are ones that can step outside sectoral or disciplinary boundaries..... Rural communities and their livelihoods are not static. They are part of a wider society, reflecting its trend, and driven by powerful internal dynamics of change and growth*'

*Keywords:* Water supply; Water resource management; Semi-arid zones

103. Morgan P (1997)  
*Small steps count – building on traditional methods for rural water supply*  
Waterlines, IT Publications, London, vol 15, no 3, pp 2-5

Morgan warns in this paper that we should not overlook traditional methods of water provision. Perhaps new technologies will provide more water of better quality, however, upgraded traditional supplies can offer water of improved quality, and can provide facilities which are more sustainable in the long term. He was especially struck by the '*rusty remains of two old, broken hand pumps lying next to a closed well*' when he visited Maputaland in South Africa. The author therefore pleads that in the development process each stepping stone must not be too far from the one preceding it. Building on local knowledge and taking a closer look at traditional indigenous innovations is a cornerstone in this process, especially in remote areas.

*Keywords:* Sustainable development; South Africa

104. Negi GCS and Kandapal KD (2003)  
*Traditional methods of water management in the central Himalayan agriculture*  
Indian Journal of Traditional Knowledge, vol 2 (3), pp 256-264

This article uncovers a rich heritage of traditional methods for water conservation in the Central Himalayan mountains. Worryingly the authors consider that these techniques are degenerating – ironically as a consequence of reduction in water resources (when the opposite might have been expected). The article concentrates on water for agriculture, though rooftop harvesting for domestic consumption is mentioned. There is a description of traditional canal irrigation, and also of irrigation from ponds. Watering regimes are covered. *Khals* are 'age old' rainfall-runoff ponds, where natural depressions are increased in capacity

by mud and stone embankments. The article goes on to consider in-situ, within field, moisture conservation methods. These include bunding, ploughing techniques and strategies, mulching, relay cropping and drainage.

*Keywords:* Irrigation; Indigenous soil and water conservation; In-situ moisture conservation; Mulching; India

105. Olivier J (2002)

*Fog-water harvesting along the west coast of South Africa : a feasibility study*  
Water SA, Water Research Commission, Pretoria, vol 28, no 4, pp 349-360

The author demonstrates an alternative way for the provision of water to water-poor communities along the west coast of South Africa. Many parts of this coast experience severe water shortages throughout the year. However, despite the meagre rainfall, the region is subject to a high incidence of fog ‘*which might provide water for water-poor communities*’. Although water authorities have largely ignored its water yielding potential, ‘*it was used extensively in ancient times*’. The inhabitants of Palestine, for example, built small low circular honeycombed walls around their vines. Historically, both dew and fog were collected in the Atacama and other deserts from piles and stones. In the Canary Islands, fog drip from trees were the sole source of water for man and animals for many years. The article describes further the technical aspects of the rain gauges and fog collectors and shows how the collection of water provide good quality water to the communities along the west coast.

*Keywords:* Water harvesting; Water scarcity; South Africa

106. Pacey A and Cullis A (1986)

*Rainwater Harvesting: the collection of rainfall and runoff in rural areas*  
Intermediate Technology Publications, London, 216 pages

The 1980s saw a spate of project-based water harvesting initiatives in semi-arid regions of Africa. The northern part of Kenya – where Adrian Cullis worked for several years – was one of the ‘laboratories’ of such projects. However many of the projects in Africa were poorly informed, and this book was produced to fill the missing gap of ‘*material on the design, organisation and overall implementation of ‘appropriate’ rainwater harvesting schemes*’. It covers both rainwater harvesting for drinking water and for agriculture. One chapter deals exclusively with tradition in runoff farming. Examples are cited from sub-Saharan Africa, India, Israel and the USA. There is a classification of runoff farming methods: *within field catchments, external catchments and floodwater harvesting*. This remains a very useful, informative introduction to the topic.

*Keywords:* Water harvesting; Semi-arid zones; Africa

107. Pieri C, Evers G, Landers J, O'Connell P and Terry E (2002)  
*No-till farming for sustainable rural development*  
Agricultural & Rural Development Working Paper, The World Bank Washington  
[www.worldbank.org/rural](http://www.worldbank.org/rural) 63 pages

This readable and well illustrated booklet is an excellent introduction to 'no-till farming' (NTF) as developed in Brazil. It covers – though in more detail – basically the same topic as Benites et al, 2002 (entry 80), who, however prefer the term 'conservation farming'. It is not clear why the nomenclature should be different, though Pieri and colleagues admit that the terms are largely comparable. NTF systems have been adopted by a wide range of farmers over the last two decades on some 60 million ha worldwide. NTF, we are told, comprises four intertwined soil and crop management techniques: (a) minimal soil disturbance, (b) permanent vegetative soil cover, (c) direct-sowing, and (d) sound crop rotation. An important effect of these is to conserve water in the soil for plant production. Many of the elements of NTF have apparently evolved through farmer innovation: thus its inclusion here under the category *IK and Water*.

*Keywords:* No-till farming; Conservation tillage; In-situ moisture conservation; Brazil

108. Premkumar PD and Humbert-Droz B (1994)  
*Farmers are Engineers: indigenous soil and water conservation practices in a participatory watershed development programme*  
PIDOW, Myrada. Karnataka, India, 40 pages

Myrada – an NGO – was at the forefront of the participatory watershed development movement in India during the 1980s and 1990s. This is a publication from the PIDOW (Participative and Integrated Development of Watershed) project in Karnataka, where indigenous knowledge and participation were being introduced in an atmosphere of scepticism from one quarter and excitement from another. This booklet is divided into two sections. The first is a treatise on indigenous knowledge, and draws attention to the '*conflict between recommended [technical] practices and farmers' indigenous practices*'. The second part describes, with illustrations and photographs, a number of farmer practices. These include '*boulder bunds*' '*diversion drains*' '*nala (gully) diversion*' and '*silt harvesting structures*'.

*Keywords:* Participatory watershed development; India

109. Ray D (1986)  
*Some agricultural policy effects of encouraging water harvesting in India*  
Agricultural Administration, vol 21, pp 235-248

Ray notes that water harvesting is long established in India and points to three systems of particular note. These are the *Khadin* system in Rajasthan, the percolation tanks and wells in Maharashtra and tanks with gravity fed channels in Tamil Nadu. His reference to '*a recent development in the Shiwalik hills to establish tanks and gravity fed channels which attempt to achieve conservation, afforestation and farm production goals together*' signals the start of the 'joint forest management' movement which has become such a leading light in community conservation today. It is worth quoting the final sentence in his abstract: '*Water*

*harvesting should operate within the framework of local society and not against it*'. While this might sound self evident now, it was quite a novel concept at that time.

*Keywords:* Water harvesting; Joint Forest Management; India

110. Sengupta N (1991)

*Managing common property: irrigation in India and the Philippines*

Indo-Dutch Studies on Development Alternatives:

Sage Publications India Pvt Ltd, 273 pages

The author emphasizes the strength of farmer's organising power, imagination, creativeness, knowledge and local adaptability which, he affirms, should form the starting point when managing irrigation water. Policy-makers should be humble enough to act as assistants or facilitators to these processes. The book begins with a 'theoretical model' of irrigation as a common property resource and moves on to an historical overview of irrigation and irrigation policy in the Philippines and India respectively. Case studies are then drawn upon, from both India and the Philippines. Under these case studies, traditional types of organisation are studied and compared with more recent 'modernised' systems. One chapter is dedicated to communal schemes in the Philippines. The last chapter in this section is entitled '*Misplaced emphasis*' and looks at one example from each country in this light. Finally a conclusion examines the techno-economic basis of cooperation.

*Keywords:* Irrigation; Participation; Policy; India; Philippines

111. Simpson F (2001)

*Conjunctive use of water resources in Deccan Trap*

<http://www.unesco.org/most/bpik13-2.htm>

In Maharashtra State, India, communities practice a wide range of approaches to water conservation and utilisation. Various barriers (contour bunds, check dams) and shallow excavations (contour trenches, farm ponds, reservoirs in bedrock), at right angles to the slope, arrest the flow of surface runoff. Contour hedging and the replanting of non-agricultural land were introduced. Shallow excavations improve the infiltration of water (recharge pits and trenches). Masonry tanks contain the water from springs and seepages. Wells that have been dug are deepened; other wells are re-bored, thus making better use of the aquifer. Water is also collected from the roofs of dwellings. Domestic wastewater is used to irrigate the small kitchen gardens adjacent to dwellings. Since the technologies take indigenous knowledge as a starting point they are sustainable and remain in use today. For the most part, they are compatible with local approaches to land use. They have undergone modification to fit local circumstances, especially with regard to water, soils, bedrock and topography.

*Keywords:* IK case studies; Innovation; Wastewater; India

112. Slingerland M (1996)  
*Mulching in Burkina Faso*  
Indigenous Knowledge and Development Monitor, vol 4, no 2, pp 17-19

Despite the multiple demands on crop residues on the Central Plateau of Burkina Faso (for thatching, animal fodder and fuel), the Mossi use these materials for mulching of fields. Mulching in this context comprises covering the soil with a layer about 2 cm deep which is equivalent to an application of 3-6 tonnes per hectare. This is a tradition and its benefits are multiple, including protection of the soil surface from rain and solar radiation as well as enriching them with organic matter and nutrients. Marja Slingerland describes a study of mulching practices in Tagalla village in Sanmatenga Province. Farmers have clear strategies for where they mulch: low soil fertility is the most important criterion. The main impacts of mulching were given as general increase in crop production (the overall goal) soil moisture conservation, increased soil fertility and protection against wind, rain and sun. What is most interesting in this article is the finding that mulching is practiced – traditionally and for logical reasons – in a semi-arid area, when it is generally assumed to be a technique limited to the more humid zones.

*Keywords:* Mulching; Semi-arid zones; Burkina Faso

113. Ulluwishewa R (1994)  
*Women's indigenous knowledge of water management in Sri Lanka*  
Indigenous Knowledge and Development Monitor, vol 2, no 3, pp 17-19

Rohana Ulluwishewa points out that women have been involved in a wide range of strategies to deal with water issues in the dry zone of Sri Lanka, which covers two-thirds of the Island. The water issues in question include purification, preservation and frugal use. These Sri Lankan women guard the forest – recognising its ecosystem importance generally and specifically its role in providing the source of water to replenish ‘tanks’ (reservoirs). Home gardens are also traditionally the domain of women in Sri Lanka, where judicious use of water around the home leads to highly productive agricultural units. Ulluwishewa discusses women’s strategies for collecting water from different sources depending on seasonal availability. She discusses how wastewater is made use of for irrigating vegetables. For drinking water, filtering is employed as well as rubbing pots with the seeds of a local plant for purification. ‘*Immediate steps*’ she concludes ‘*should be taken to find ecologically sound solutions to the growing water crisis. In this respect, the knowledge which local women have of water management has enormous potential*’.

*Keywords:* Gender; Wastewater; Ecosystems; Sri Lanka

114. United Nations Environment Programme (2002)  
*Returning forest to communities: The national joint forest management project, Haryana State, India.* pp 64-67 in *Success stories in the struggle against desertification*. UNEP, Nairobi

Though the dams built (for small scale irrigation) under the joint forest management (JFM) project in the Shiwalik hills of India are not traditional, the main success of this programme has been the participation of villagers, and the integration of their local knowledge in



managing the rehabilitated forest land. This is one striking example of how IK, popular participation and the encouragement of self-governance of natural resources has really worked well. JFM holds many general lessons for integrating IK into development. The results are impressive to see: regenerated forests, reduced erosion in the catchments, income generation from non-timber forest products and improved agricultural production through irrigation. (see also entry 109)

*Keywords:* Joint Forest Management; Dams; Irrigation; India

115. Upreti BR (1999)

*Managing local conflicts over water resources: a case study from Nepal*

Agricultural research and extension network paper, no 5, 14 pages. Overseas Development Institute, London.

Local people in this part of Nepal regulate water resources themselves, and negotiations over access and use of water are features of everyday life. The author presents a case study describing how individuals and institutions have tackled problems relating to spring water in Doluake district in Nepal. Three issues are addressed: factors responsible for the creation of conflict over water use; the way people deal with conflicts, focusing on community negotiation; and thirdly ways people learn from the conflict resolution process. Upreti demonstrates that '*necessity is the mother of invention*' in this case study as he has seen that '*determined efforts were made by the people from the lower hamlet in order to resolve the conflict*'. Another remarkable perception of the author was the need of a socially, respected intermediary (locally called *Purohit*) who is able to communicate within the community: '*Communication promoted a greater awareness of water management issues*'. The document opens up discussion regarding the involvement of local institutions and sharing of similar experiences. These comprise a key strategy in conflict resolution.

*Keywords:* IK case studies; Water conflicts; Nepal

116. Waters-Bayer A (2001)

*Daldal: dams to trap silt and water, an Irob innovation in northern Ethiopia*

<http://www.unesco.org/most/bpik9-2.htm>

(note: this case is an adapted version of an article published in "Farmer Innovation in Africa. A source of inspiration for Agricultural Development" Reij C and Water-Bayers A eds. 2001, Earthscan, London)

The practice described was developed by the Irob in northern Tigray in Ethiopia, on the border with Eritrea. Over four decades, the Irob developed site-appropriate methods to capture soil and water for cropping. They built a series of checkdams in the seasonal watercourses and raised and lengthened the walls every year. This innovation is known in Irobigna as *daldal*. The practice originated in the community. The idea came from two Irob men: one who was regarded as crazy by his neighbours, and another who had served as a soldier in North Africa in World War II and had observed the traditional water harvesting methods used there. Using their indigenous engineering skills, the Irob have continued to improve the practice. Although it is very labour-intensive, it will be necessary for the survival

of the Irob for as long as they want to remain in this rugged area, to which they have a strong cultural and emotional attachment.

*Keywords:* IK case studies; Innovation

117. Quan X, Jun Z and Song-lin Z (1996)

*Wiser use of land: dam-fields in China*

Indigenous Knowledge and Development Monitor, vol 4, no 2, pp 8-10

A tradition of ‘dam-fields’ is described from northwest China. This is a variation on the globally widespread traditional technique of utilising gullies for agricultural production. Dam fields were apparently introduced in this area in the mid 18<sup>th</sup> century, and the practice continues today. The technology comprises making bunds in sequence down gullies to capture both sediment and runoff waters. The final configuration is a series of terraced ‘dam-fields’ long the gully from top to bottom. Dam-fields have been improved with the addition of scientific and technical know-how – for example by the substitution of earth and stone walls in the gullies by concrete structures. Currently the area of dam-fields continues to increase. Apart from admiring the technical skill with which a hazard is turned to productive use, this is an interesting case study demonstrating the possibility of science building on traditions.

*Keywords:* Gullies; IK application; China



## Section Two

### WEBSITES

118. **AIID** – Amsterdam International Institute for Development  
Vrije Universiteit Amsterdam, The Netherlands  
[info@aiid.org](mailto:info@aiid.org)

The AIID is a joint initiative of the Universiteit van Amsterdam (UvA) and the Vrije Universiteit Amsterdam (VU). It was founded as a network linking their best experts in international development and to engage in policy debates. The website offers information on the associated researchers and their work and there is a list with publications (most of it can be downloaded). The research is divided into five themes: Environment and development is one of them. Within this theme, current research is focussed on: Land and water resources, Bio-diversity, Bio-technology, Urban environmental management and International environmental agreements. In cooperation with other organisations AIID also organises seminars, congresses and conferences. Together with the World Bank a Masters and Ph D thesis-competition is organised yearly.

*Keywords:* Network; Research centre

<http://www.aiid.org>

119. **CIS** – Centre for International Cooperation  
Vrije Universiteit Amsterdam, The Netherlands  
[cis@vu.nl](mailto:cis@vu.nl)

CIS is the Vrije Universiteit Amsterdam's centre for tertiary education with partners in Asia, Africa and Latin America and recently, with Eastern Europe. Programmes and projects are designed and implemented together with universities, education institutes and government ministries. Other assignments, like exploratory studies, advisory tasks and consultancies are undertaken for a wide variety of national and international organisations. The activities of the Centre mainly focus on four areas of expertise. These are Education and Development, Information Communication Technology Development, Organisation and Management, and Natural Resource Development. The website provides general information on the projects that are being carried out by CIS as well as listing various CIS publications - in the field of IK and development and other topics. It gives useful links to partner institutes/universities. *[note: CIS is the institution that provided the expertise for this Annotated Bibliography, the latter can be downloaded from its website].*

*Keywords:* Information platform

<http://www.cis.vu.nl>

120. **CSE - Centre for Science and Environment**  
New Delhi, India, [cse@cseindia.org](mailto:cse@cseindia.org)

CSE offers a library search, campaigns, programmes and books. The latest press releases are also available. It is not specifically focused on water, but provides general documentation on environmental issues and international development. A whole series of documents on various topics can be purchased online. Two important publications in the main body of the AB emanated from CSE (entries 75 and 77).

*Keywords:* Information platform; Publishing house

<http://www.cseindia.org/>

121. **CTA – Technical Centre for Agricultural and Rural Cupertino ACP-EU**  
Wageningen, The Netherlands, [cta@cta.nl](mailto:cta@cta.nl)

The main tasks of CTA are to develop and provide services that improve access to information for agricultural and rural development, and to strengthen the capacity of African, Caribbean and Pacific countries to produce, acquire, exchange and utilise information in these areas. A list of publications can be consulted in CTA's catalogue. Newsletters are provided by CTA as well as free subscriptions for Spore, Agritrade and ICT-Update. CTA hosts an E-forum on rural development, where feedback from the actors in the field can be consulted. Visit <http://forum.inter-reseaux.net> to see the contributions of the ones directly concerned with rural development programmes. The dialogue is maintained and contributions are still appreciated, visit <http://forum1.inter-reseaux.net/>.

*Keywords:* Information platform; E-forum; Publishing house

<http://www.cta.nl>

122. **FAO – Food and Agricultural Organisation of the United Nations**  
Rome, Italy, [fao-hq@fao.org](mailto:fao-hq@fao.org)

FAO offers a solid database covering various topics. With respect to water the database **AQUASTAT** (second web page indicated below) is the most valuable. AQUASTAT is FAO's global information system of water and agriculture developed by the Land and Water Development Division of FAO. AQUASTAT provides users with comprehensive statistics on the state of agricultural water management across the world, with emphasis on developing countries and countries in transition. FAO has just launched a new portal **AGORA – Access to Global Online Research in Agriculture** (third web page indicated below) which provides access to over 400 journals from major scientific publishers in the fields of food, agriculture, environmental science and related social sciences.

*Keywords:* Information platform; Publishing house

<http://www.fao.org>

<http://www.fao.org/ag/agl/aglw/aquastat/main/index.stm>

<http://www.aginternetwork.org/en/index.php>

123. **GEF – Global Environment Facility**  
Washington, United States of America  
[secretariat@TheGEF.org](mailto:secretariat@TheGEF.org)

GEF helps developing countries fund projects and programs that protect the global environment. GEF grants support projects related to biodiversity, climate change, international waters, land degradation, the ozone layers, and persistent organic pollutants. The site gives an overview of GEF's activities and projects. Through 'Outreach and Publications', publications that fall into several broad groups can be downloaded. If a document cannot be downloaded, it can be ordered through the secretariat.

<http://www.undp.org/gef>

<http://www.unep.org/gef>

<http://www.worldbank.org/gef>

*Keywords:* Information platform; Publishing house; Biodiversity; Climate change

<http://www.gefweb.org>

124. **GREEN – Global Rivers Environmental Educational Network**  
[green@earthforce.org](mailto:green@earthforce.org)

GREEN is an international network, which has been part of Earth Force since 1999. GREEN has developed its site in order to help children to investigate/monitor water quality in rivers and streams in their own environment; to set up a network of various programmes involving schools and youth; and for monitoring of rivers and catchment. GREEN wants to share experiences and raise awareness around the limited availability of water resources and the need to protect the quality.

*Keywords:* Information platform; Network

<http://www.green.org>

125. **GWP- Global Water Partnership**  
Stockholm, Sweden  
[gwp@gwpforum.org](mailto:gwp@gwpforum.org)

The Global Water Partnership is a working partnership for all those involved in water management. Though GWP deals mainly with Integrated Water Resource Management, a lot of information can be found about water issues worldwide and one can choose the geographical location. A set of publications is available, ranging from technical papers to newsletters. And these can be accessed free online. The latest water news is posted on the site as well.

*Keywords:* Network; Information platform; Publishing house

<http://www.gwpforum.org>

GWA – Gender and Water Alliance  
Delft, The Netherlands  
[suvrat@genderandwateralliance.org](mailto:suvrat@genderandwateralliance.org)

GWA is an associated programme of the GWP. GWA is a network of 133 organisations and individuals from around the world with an independent steering committee. The GWA offers a mix of information and knowledge sharing activities such as electronic conferencing, advocacy leaflets and video, capacity building and pilot programmes. The website is an effort to highlight gender issues in IWRM by providing information through case studies, publications, events, websites and activities of GWA members.

<http://www.genderandwateralliance.org>

126. **IFPRI – International Food Policy Research Institute**  
Washington, United States of America  
[ifpri@cgiar.org](mailto:ifpri@cgiar.org)

Through its policy analyses IFPRI directly supports developing country policy makers, non governmental organisations (NGOs), and civil society in their efforts to help the poor. In addition, the Institute's published research indirectly affects policy changes through opinion leaders, donors, advisers, and media who influence national and international decision-making. IFPRI conducts food policy research and disseminates it through four research and outreach divisions, a communications division, and the 2020 Vision initiative.

*Keywords:* Research centre; Publishing house; Information platform

<http://www.ifpri.org/>

127. **IIED – International Institute for Environment and Development**  
London, United Kingdom  
[info@iied.org](mailto:info@iied.org)

IIED is an independent, non-profit organisation promoting sustainable development through collaborative research, policy studies, networking and knowledge dissemination. IIED aims to transform decision-making at all levels by creating a world-wide network of partners. Amongst others, IIED collaborates with the Regional and International Networking Group (RING) and the Resource Centres for Participatory Learning and Action (RCPLA). IIED has an active publishing programme and their publications catalogue is extensive. PDF files can be downloaded for free; hard copies can be purchased on-line. IIED has published several of the documents reviewed in this Annotated Bibliography.

*Keywords:* Sustainable development; Publishing house; Research centre; Network

<http://www.iied.org>

128. **IIRR** – International Institute of Rural Reconstruction  
Silang, Philippines  
[information@iirr.org](mailto:information@iirr.org)

IIRR is a rural development organisation working in Africa, Asia and Latin America. IIRR promotes people-centred development through capacity building for poor people and their communities, development organisations and agencies. IIRR produces publications on a variety of development themes, aimed at sharing of experiences among development practitioners. Uniquely, most of the publications are produced through a participatory workshop called “writeshop” where community leaders, government officials and planners, NGO personnel and scholars work together.

*Keywords:* Information platform; Learning centre

<http://www.iirr.org>

129. **ILEIA** – Low External Input and Sustainable Agriculture  
Amersfoort, The Netherlands  
[ileia@ileia.nl](mailto:ileia@ileia.nl)

ILEIA is an independent organisation with the mandate to contribute to poverty alleviation through the promotion of agro-ecological approaches. Documentation, analysis and publication of successful experiences in low external input and sustainable agriculture are the major activities. ILEIA produces an accessible, comprehensive and easy-to-read magazine ‘LEISA’ four times a year. Documenting the diverse experiences of small farmers, LEISA highlights their role in the creation of agricultural knowledge and the importance of this knowledge for ecological sustainability and food security. LEISA can be viewed on-line. The website also offers an electronic database ILEIADOC that contains over 10,000 records.

*Keywords:* Publishing house; Poverty

<http://www.ileia.org>

130. **IRC** - International Water and Sanitation Centre  
Delft, The Netherlands  
[general@irc.nl](mailto:general@irc.nl)

IRC facilitates the sharing, promotion and use of knowledge so that governments, professionals and organisations can better support poor men, women and children in developing countries to obtain water and sanitation service they will use and maintain. The site offers information on a variety of issues. Different themes of the centre are addressed, ranging from hygiene behaviour to integrated water resource management. Conferences and events are indicated. One can subscribe to SOURCE, a news service from IRC. IRCDOC is an online catalogue with a lot of publications also available online. IRC is also a publisher, books can be purchased online.

*Keywords:* Publication house; Information platform; News service

<http://www.irc.nl>



131. **IUCN** – The World Conservation Union  
Gland, Switzerland

Through its projects IUCN works to encourage and support sound ecosystem management to demonstrate how this is the only way to sustainable livelihoods for those directly dependent on natural resources. IUCN has launched an electronic network to create a virtual ‘Green Web’ of conservation knowledge to take advantage of the opportunities of information technology. IUCN also offers excellent publications. The Water and Nature Initiative comes from IUCN and is discussed in this bibliography (entry 24).

*Keywords:* Network; Publishing house

<http://www.iucn.org>

132. **IWMI** – International Water Management Institute  
Colombo, Sri Lanka, [iwmi@cgiar.org](mailto:iwmi@cgiar.org)

IWMI is a non-profit scientific research organisation focusing on sustainable use of water and land resources in agriculture and on the water needs of developing countries. Its mission is to improve water and land resources management for food livelihoods and nature. The site is based on five research themes: Water for Agriculture, Smallholder Livelihoods, Groundwater, Institutions & Policy, and Health & Environment. IWMI’s online publication section contains several thousand pages of peer reviewed research on water management. All research publications produced by IWMI can be downloaded for free. The library database contains more than 28,000 citations on integrated water management. There are also links to other online databases as well as many leading journals in the field of integrated water resources management.

*Keywords:* Information platform; Publishing house; Research centre

<http://www.iwmi.cgiar.org>

133. **KIT** – The Royal Tropical Institute  
Amsterdam, The Netherlands

KIT is a knowledge institute specialised in international cooperation and intercultural communication. KIT conducts research, organises training activities and provides consultancy and information services. The website has five main entries: Consultancy & Research, Training, Museum & Theatre and Library & Publication. Its library houses one of the world’s largest collections of scientific and popular books, periodicals, articles and maps concerning developing countries. Over two-hundred titles on Indigenous Knowledge and Water issues can be reserved on line through the catalogue. KIT publishers produce frequently materials and through a catalogue on line all titles can be ordered. KIT also has a number of interesting links in the field of Indigenous Knowledge and Water Management.

*Keywords:* Information platform; Publishing house; Library; Learning centre; Research centre

<http://www.kit.nl>

134. **NUFFIC** – Netherlands Organisation for International Co-operation in Higher Education  
The Hague, The Netherlands  
[nuffic@nuffic.nl](mailto:nuffic@nuffic.nl) and [ik@nuffic.nl](mailto:ik@nuffic.nl)

This website is organised around five *themes*, a list of *products and services*, and *special topics*. The themes are Development Co-operation, Internationalisation, Credential Evaluation and Certification, the International Marketing of Dutch Higher Education, and Nuffic as an Organisation. The special topics serve specific target groups, such as students elsewhere in the world who are examining possible study-abroad destinations ('Study in the Netherlands') and Dutch immigration procedures for academic visitors. NUFFIC offers excellent IK pages (second world wide web page indicated below). A special database of IK best practices (third world wide web page indicated below), which is a co-product with UNESCO, and various informative links to other IK networks and services is freely accessible online and contains excellent information on different IK issues. This information has also been edited into a book entitled 'Best Practices Using Indigenous Knowledge' by Karin Boven and Jun Morohashi, published by NUFFIC and UNESCO in 2002. NUFFIC also has a link to the Global Development Gateway, a forum where 'worlds of knowledge meet'. The development gateway provides comprehensive information on various issues all related to IK. NUFFIC publishes prolifically on indigenous knowledge and development and several of the documents reviewed here originate from NUFFIC.

*Keywords:* Information platform

<http://www.nuffic.nl>

<http://www.nuffic.nl/ik-pages>

<http://www.unesco.org/most/bpikreg.htm>

135. **ODI** – Overseas Development Institute  
London, United Kingdom  
[odi@odi.org.uk](mailto:odi@odi.org.uk)

ODI's mission is to inspire and inform policy and practice, in ways which lead to the reduction of poverty, the alleviation of suffering and the achievement of sustainable livelihoods in developing countries. ODI does this by locking together high-quality applied research, practical policy advice, and policy-focused dissemination and debate. The website offers a library catalogue, with over 16,000 documents that can be accessed on line. ODI also offers a publications catalogue that lists all titles for sale. ODI organises several specialist networks, amongst others the Agricultural Research and Extension Network (AgREN) and the Rural Development Forestry Network (RDFN). ODI has published several of the documents reviewed in this AB.

*Keywords:* Network; Poverty; Research centre; Publishing house

<http://www.odi.org.uk>

136. **OneWorld**  
London, United Kingdom  
[justice@oneworld.net](mailto:justice@oneworld.net)

OneWorld is a civil society online network supporting people's efforts to help build a more fair global society. The site covers the latest news of various development issues. The starting of an *Open Knowledge Network*, aiming to promote the creation and exchange of local content - on vital topics such as health, education and agriculture - as widely as possible across the global South, is especially seen as a good initiative to connect people. Not primarily focused on water.

*Keywords:* Information platform; Network

<http://www.oneworld.net>

137. **Rainwater Harvesting**  
Centre for Science and Environment  
New Delhi, India  
[water@cseindia.org](mailto:water@cseindia.org)

*'Any land anywhere can be used to harvest rainwater; basic principle: catch water where it falls'*

This water harvesting site is hosted by the Centre for Science and Environment (see entry 120) and provides excellent background information on traditional ways of water harvesting in rural areas in India. When visiting the *methods* section, one can take a look at some traditional indigenous systems, but can also take it one step further and visit the modern contemporary systems. This effectively demonstrates the differences between the two systems. CSE promotes *CatchWater* their on-line magazine and calls it *'the CSE campaign for people's water management.'*

*Keywords:* Network

<http://www.rainwaterharvesting.org>

138. **SciDev – Science and Development Network**  
London, United Kingdom  
[info@scidev.net](mailto:info@scidev.net)

The overall aim of the Science and Development Network is to enhance the provision of reliable and authoritative information on science and technology- related issues that impact on the economic and social development of developing countries. SciDev runs a free-access website where both relevant news as web articles are published (see for example entry 86). SciDev also builds a regional network of knowledge and organises capacity-building workshops and other events.

*Keywords:* Network; Information platform

<http://www.scidev.net>

139. **SRISTI** – Society for Research and Initiatives for Sustainable Technologies and Institutions  
Indian Institute of Management, Ahmedabad, India/ Communications for a Sustainable Future (CSF) Colorado, United States of America  
[sristi@ad1.vsnl.net.in](mailto:sristi@ad1.vsnl.net.in)

The main objective of the NGO SRISTI is to strengthen the creativity of grassroots inventors, innovators and ‘ecopreneurs’ engaged in conserving biodiversity and developing eco-friendly solutions to local problems. The site is linked to the Honeybee network, which is dedicated to connecting innovators at the grassroots level through feedback communication and networking in the local language. On both sites, information is shared and respective research papers can be found. One can also become a member and receive newsletters and regular updates. See also entry 53.

*Keywords:* Information platform; Research centre; Network

<http://csf.colorado.edu/sristi/index.html> and the honeybee network can be found at <http://csf.colorado.edu/sristi/honeybee.html>

140. **The African Water Page**  
Water Web Management  
Caterham, United Kingdom  
[info@thewaterpage.com](mailto:info@thewaterpage.com)

The African Water Page is an independent initiative dedicated to the promotion of sustainable water resources management and use. A particular emphasis is placed on the development, utilisation and protection of water in Africa and other developing regions. A good set of documents is available from the database, categorised by organisations and by country. The African Water Page offers a lot of good information on various aspects of water (for instance water and religion, but also water and climate change) and provides links to various other water related sites. Nice pictures as well.

*Keywords:* Information platform; Network

<http://www.africanwater.org/>

141. **UNESCO** – United Nations Educational, Scientific and Cultural Organisation  
Paris, France  
[waterportal@unesco.org](mailto:waterportal@unesco.org)

The on-line services (portal) of the UNESCO site are well managed and provide efficient information. The water page shows a comprehensive overview of links to the entire water sector. Information from both the **IHP** – International Hydrological Programme and the **WWAP** – World Water Assessment Programme are provided. Water Events are categorised by theme, geographical scope, date organiser and type of event, and the links to other water related websites are divided by theme, geographical scope and type of organisation. UNESCO has also devoted space to indigenous knowledge under *Register of Best Practices*

on *Indigenous Knowledge* (a project in collaboration with NUFFIC). Under phase 2 is a PDF file (see third web address below) containing a recent update of best practices collated by Karin Boven. This has also been published as a book entitled 'Best Practices Using Indigenous Knowledge' edited by Karin Boven and Jun Morohashi, published by NUFFIC and UNESCO in 2002.

*Keywords:* Information platform, Publishing house

<http://www.unesco.org/water>

<http://www.unesco.org/most/bpikreg.htm>

<http://www.unesco.org/most/bpikpub2.pdf>

142. **UNRISD** – United Nations Research Institute for Social Development  
Geneva, Switzerland  
[info@unrisd.org](mailto:info@unrisd.org)

UNRISD is an autonomous United Nations agency that carries out research on the social dimensions of contemporary problems affecting development. The site gives updates on current research programmes, together with details of the projects, and shows an overview of future events (as in meetings and conferences). The website provides a catalogue of their in-house and commercially published publications. Many of them may be accessed free online.

*Keywords:* Research centre; Publishing house

<http://www.unrisd.org>

143. **WaterAid** – UK Charity of the year  
London, United Kingdom  
[wateraid@wateraid.org](mailto:wateraid@wateraid.org)

WaterAid is an international NGO dedicated exclusively to the provision of safe domestic water, sanitation and hygiene education to the world's poorest people. Case studies and current research are the most interesting features of WaterAid's website. These are mostly about water and sanitation issues. One can subscribe to the newsletter and to OASIS, WaterAid's journal. The latest edition (autumn/winter 2003) covered a story about the positive effects of rainwater harvesting during a severe drought in southern India.

*Keywords:* Information platform

<http://www.wateraid.org>

144. **Water and Nature Initiative**  
IUCN  
Gland, Switzerland  
[waterandnature@iucn.org](mailto:waterandnature@iucn.org)

The main goal of IUCN's Water and Nature Initiative is the mainstreaming of an ecosystem approach into catchment policies, planning and management. The initiative will develop a

coherent set of activities that are innovative and targeted at guiding future investments and actions in water resources management and nature conservation. The website offers background information on current projects and shows regular updates in water information. Documents can be downloaded on various topics.

*Keywords:* Information platform

<http://www.waterandnature.org>

145. **Water Magazine**  
Auckland, New Zealand  
[joelc@kiwilink.co.nz](mailto:joelc@kiwilink.co.nz)

The WaterMagazine database contains hundreds of links to articles, water industry websites, book and paper reviews, as well as articles and papers only available on this site. One can subscribe by paying a small fee or provide information. Subscribers receive a monthly update and get access to the database for a year. The site reminds us, for instance, that clean water is a finite resource so it is important to manage its use and demand; that wherever possible a total water cycle approach needs to be taken in cities to manage water resources and that the purest source should be used for the highest purpose - namely - human consumption.

*Keywords:* Publishing house

<http://www.watermagazine.com>

146. **Water Year 2003** – International Year of Fresh Water 2003  
United Nations General Assembly  
[wateryear2003@un.org](mailto:wateryear2003@un.org)

This website tells us that 2003 is a year of opportunity. It is a year to focus our attention on protecting and respecting our water resources, as individuals, communities, countries, and as a global family of concerned citizens. 2003 is a year for action and reflection. During this year we have a chance to mend our ways, to take stock and make a difference. By protecting our freshwater, we help to ensure our future and our planet's long-term prospects. *'You can join in celebrating the International Year of Freshwater 2003 by sending your information, ideas, news, documents, images and testimonies, anything that could be shared with others around the world'.*

*Keywords:* Network; Information platform

<http://www.wateryear2003.org>

147. **WHO – World Health Organisation**  
Geneva, Switzerland

The [World Health Organisation \(WHO\)](#) provides everything one wants to know about health issues. WHO has a large publications database, where books, documents, catalogues and the latest news can be found. It is accessible free online. Books, however, need to be purchased.

The WHO works with many countries worldwide and has considerable information on every country on its site. Useful and comprehensive.

*Keywords:* Publishing house; Information platform

<http://www.who.int/>

148. **WOCAT – World Overview of Conservation Approaches and Technologies**  
Centre for Development and Environment  
Berne, Switzerland  
[wocat@giub.unibe.ch](mailto:wocat@giub.unibe.ch)

WOCAT is a network of international soil and water conservation specialists. WOCAT's mission is to provide tools that allow SWC specialists to share their valuable knowledge in soil and water management, that assist them in their search for appropriate SWC technologies and approaches, and that support them in making decisions in the field and at the planning level. WOCAT also contributes to the implementation of United Nations Conventions, such as the Convention to Combat Desertification (UNCCD), the Framework Convention on Climate Change (FCCC), and the Convention on Biodiversity (CBD). WOCAT's website offers three categories of substantial databases ('Approaches'; 'Technologies' and 'Map') which can be accessed free on-line. There are also proformas for data entry.

*Keywords:* Network; WOCAT

<http://www.wocat.net>

149. **World Bank Group**  
**Indigenous Knowledge Program**  
New York, United States of America  
[sessama@worldbank.org](mailto:sessama@worldbank.org)

The Indigenous Knowledge Program's website opens a gateway to different sources on IK. The site seeks to facilitate a multilateral dialogue between local communities, NGOs, governments, donors, civil society and the private sector. The objective of the website is to help mainstream indigenous and traditional knowledge into the activities of development partners and to optimise the benefits of development assistance, especially to the poor. The website has a database on IK and best practices with over 260 case studies and a series of 'IK Notes' which present in some detail, locally driven solutions to complex issues, 'Community Knowledge Exchange Toolkits', and a virtual marketplace to connect proposal seekers with funding agencies.

*Keywords:* Network; IK case studies; Information platform; Best practice

<http://www.worldbank.org/afr/ik>

150. **World Water Forum 3**

March 16-23, 2003 in Kyoto, Shiga and Osaka, Japan  
Secretariat of the 3<sup>rd</sup> World Water Forum  
Tokyo, Japan

Safe clean water for all, need for capacity building, good governance and financing infrastructure were key issues addressed at the 3<sup>rd</sup> forum in Japan. Actions that need to be taken are; creating global awareness and political support, building bridges between water managers, climatologists, hydrologists and disaster management organisations etc. The forum's website gives a good overview on what has been done in the past (research and policies) and what needs to be done in the future and should be visited often.

*Keywords:* Information platform

<http://www.world.water-forum3.com>

151. **WRI – World Resources Institute**

Washington, United States of America  
[front@wri.org](mailto:front@wri.org)

WRI is an environmental research and policy organisation, working closely with governments, the private sector, and civil society groups around the world. WRI's publications can be purchased on-line at <http://www.wristore.com>. WRI hosts a portal called Earth Trends, the Environmental Information Portal. Earth Trends is a comprehensive online database, categorised under various topics. The focus is on environmental, social and economical trends that shape the world.

*Keywords:* Information platform; Research centre; Publishing house

<http://www.wri.org>

152. **WWC – World Water Council**

Marseilles, France  
[wwc@worldwatercouncil.org](mailto:wwc@worldwatercouncil.org)

The World Water Council is the international think tank dedicated to strengthening the world water movement for improved management of the world's water resources. The site covers almost all water-related issues. Once a member of WWC one also receives *Water Policy*, a magazine aiming to provide a forum between diverse parties and different stakeholders. One of the main missions is to promote awareness on critical water issues at different levels.

*Keywords:* Information platform; Network

<http://www.worldwatercouncil.org/>





**KEYWORDS**

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Home-made windmill, Kenya

Farmer with mulched bananas and 'control plot' for comparison, Uganda



Traditional basin irrigation, Morocco

# Indigenous Knowledge and Development Monitor



Editorial

Just before the copy for this issue of the Indigenous Knowledge and Development Monitor was to go to the printer, an interesting call came. Although it was long past the deadline, in this case we were happy to accept an exception. In 2001 the University of North West in Mafeking, South Africa, introduced a new interdisciplinary undergraduate and postgraduate programme in indigenous knowledge systems. This programme has formally been accredited by the South African government. For purposes of resource capacity building in teaching and research, the university is interested in obtaining volunteer teaching assistance. Further information can be found on page 29.

This is only one example of the new initiatives being developed in the field of indigenous knowledge systems in which - and this is true - we see a direct link to formal education and research in indigenous knowledge systems and practices.

In Africa, Asia and Latin America, fieldworkers are working with local communities to chart their own sustainability, and assess possibilities for making use of local or indigenous knowledge systems. This is an example of the benefit of individuals in communities. The utilization of all these resources in policy, and this has also been the case in 1999, for example, in the Framework of the World Bank.

This has created a new approach to the utilization of all these resources in policy, and this has also been the case in 1999, for example, in the Framework of the World Bank. The results of this work are being published in the Indigenous Knowledge and Development Monitor. The communication means of this work are being published in the Indigenous Knowledge and Development Monitor.

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Using and sustaining resources: the Guajá Indians and the babassu palm (*Attalea speciosa*)

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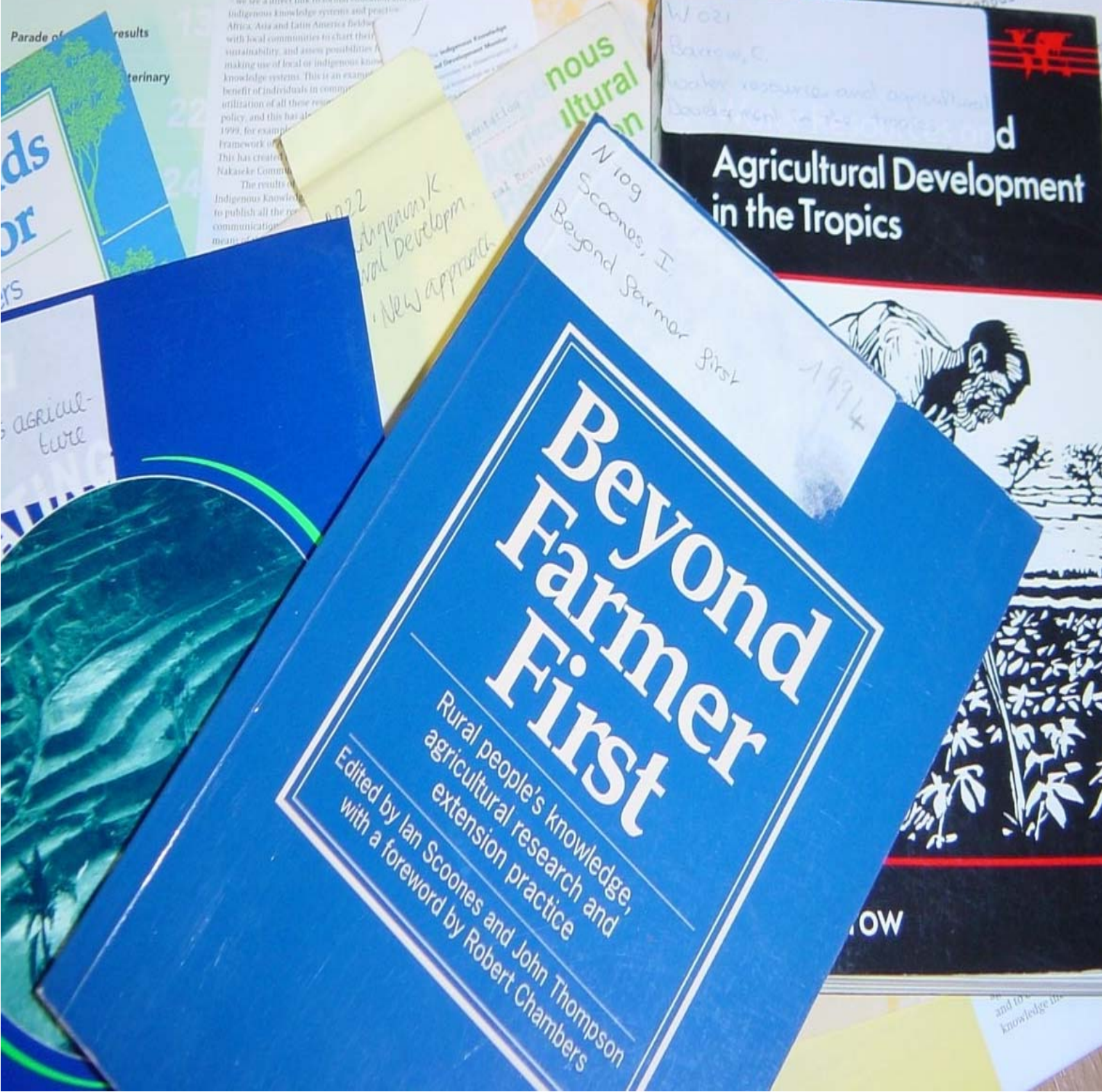
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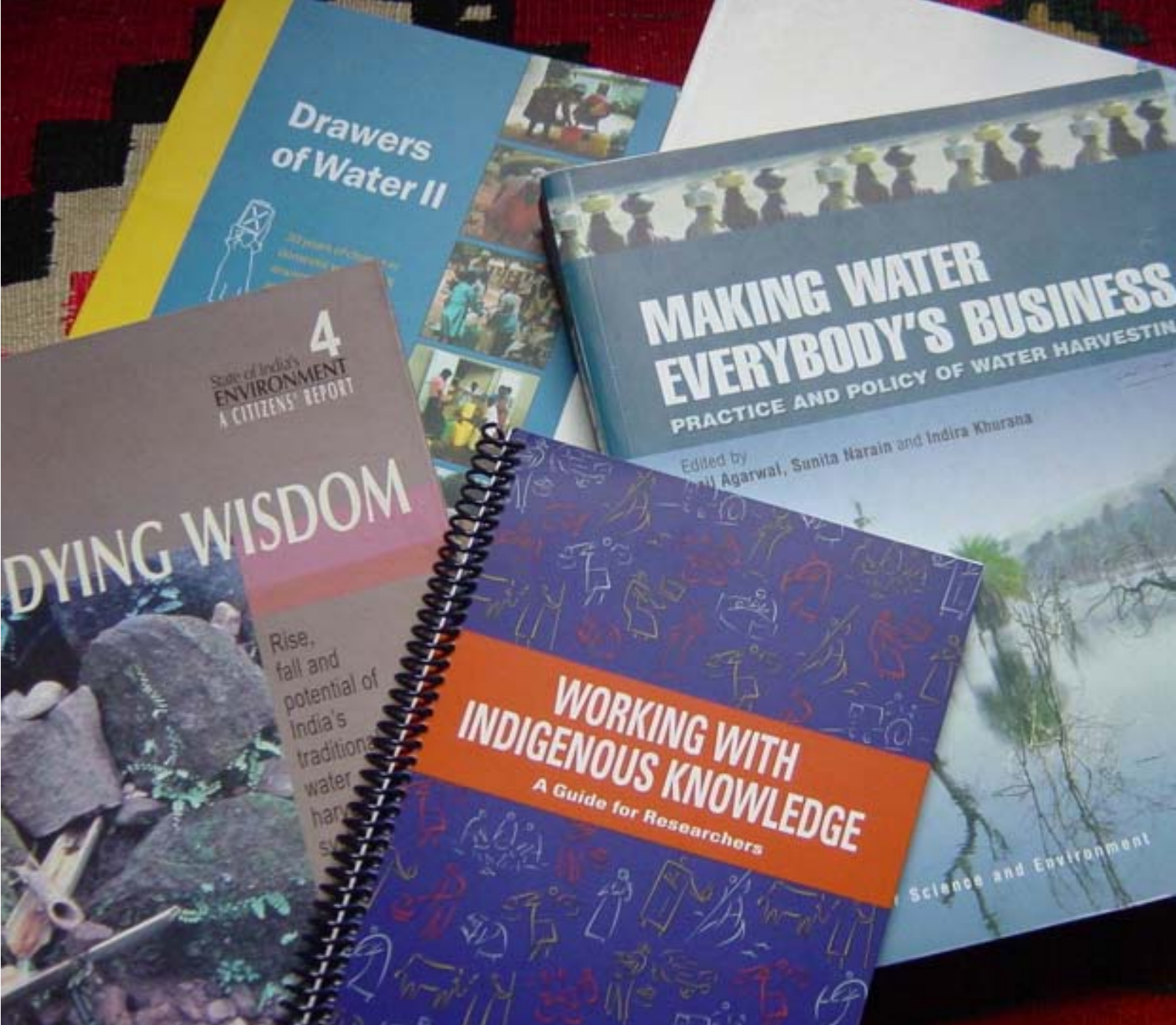
# Beyond Farmer First

Rural people's knowledge, agricultural research and extension practice

Edited by Ian Scoones and John Thompson with a foreword by Robert Chambers

1994





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