



# water

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## The value of rainfed agriculture in a world short of water

**M**any people see rainfed agriculture as risky, but it has the potential to produce large amounts of cereal in dry regions. For this potential to be realised, farmers, researchers and policymakers must work together to improve technology and reconsider economic policies.

Research from the United Nations Food and Agriculture Organization looks at rainfed agriculture in Syria and Kazakhstan. Farmers in these countries often do not perceive rainfed agriculture to be profitable. Crop yields seem low considering the amounts of land, water, labour and capital required. However, new technology is available to help farmers predict uncertain variables such as rainfall. This improved predictability can help to increase the contribution of rainfed agriculture.

Syria has both rainfed and irrigated agriculture. Current policies do not support the sustainable use of natural resources, as water is used to grow low value crops, such as wheat. Kazakhstan has predominantly rainfed agriculture, particularly in the north. Economic policies do not provide incentives for farmers to produce commodities competitively, as they receive comparatively low prices for crops. With higher transportation costs and lower yields, farmers cannot compete in both domestic and export markets.

In Syria, researchers worked with farmers to make recommendations for fertiliser applications at different levels of water availability. Improved land management practices, which supplemented rainfed agriculture with selective irrigation (supplemental irrigation), led to a steady increase in wheat yields. In Kazakhstan, however, smallholder farmers were unwilling to take risks regarding their cereal crops, although research showed that the probability of rainfall in certain areas is good, enabling farmers to produce more crops and raise their income.

The research shows:

- Although yields have improved in Syria, the change in cropping patterns has increased the use of groundwater for irrigation and water tables are now declining. A legal framework is needed to stop groundwater depletion and enforce and encourage collective action to conserve water.
- Syrian farmers receive 60 percent more than the international price for their wheat. This gives them a strong incentive to

produce more by investing in fertiliser and supplementary irrigation.

- Kazakh farmers receive only 55 percent of the world price for their wheat, so they lack incentives to invest in fertilisers or improved crop varieties.

- Since the break-up of the Soviet Union, farmers in Kazakhstan find it difficult to compete in international markets. The marketing system is poorly developed and has weak external links, meaning that if grain surpluses increase, prices may fall.

- Many farmers in Kazakhstan continue to operate under barter systems and are often forced to sell their products for low prices.

In terms of agricultural economic policies, farmers follow incentives which offer

the highest short-term returns. The challenge for economic policymakers is to find a balance between improving the financial welfare of farmers and achieving sustainable food security.

The research recommends:

- In Syria, policymakers must give more attention to the sustainability of groundwater. Policies must define groundwater rights clearly between different users.
- Policies should consider the resource costs (such as labour and fertiliser costs) of the major crops grown to let markets determine the output price and ensure farmers are earning a profit.
- In Kazakhstan, extension services need to support farmers by promoting new rainfall management practices more effectively.
- Removing taxation on farmers and securing access to markets will allow them to benefit more from international grain prices.

**M. Ahmad, A. Rodríguez and A. Braslavskaya**  
Mahmood Ahmad, Food and Agriculture Organization,  
Regional Office for the Near East, Cairo, Egypt  
[Mahmood.ahmed@fao.org](mailto:Mahmood.ahmed@fao.org)

'Food and water insecurity: re-assessing the value of rainfed agriculture' *Water and Science Technology: Water Supply*, 5:1, by M. Ahmad, A. Rodríguez and A. Braslavskaya, 2005  
[www.iwaponline.com/ws/00501/ws005010109.htm](http://www.iwaponline.com/ws/00501/ws005010109.htm)



## Efficient water use tackles food insecurity

**A**s food security issues increase, water resource management becomes more important. There is a need to increase the efficiency of water use in both irrigated and rainfed agriculture. At the same time, it is essential to limit the demand for food that requires a lot of water to produce.

Water productivity – the produce or value derived from each unit of water – must be increased. It is estimated that an additional 5600 km<sup>3</sup>/year of water needs to be made available by 2050 to eradicate malnutrition. This is almost three times the current global amount used for irrigation. However, this figure could change depending on people's changing diets: how much they consume, how much is wasted, what kind of food is demanded.

Current agricultural practices often lead to the overuse of groundwater, water logging of agricultural land, salinisation (increased salt concentrations) and the high use of flowing water. The negative impacts of this approach include declining water quality and supplies. Research from the Stockholm International Water Institute, Sweden, discusses the potential for improving rainfed and irrigated food production systems.

There must be changes in practices to produce more food per unit of water:

- Securing water use rights and land tenure will improve water management in irrigated and rainfed systems.
- Developing appropriate tillage methods could improve soil quality; current methods often damage it.
- Rainwater harvesting and supplementary irrigation can reduce the impact of dry seasons.
- Improved management of existing irrigation systems, including investment in new irrigation and storage infrastructure, will reduce water wastage.
- There is a need for effective support services for rainfed farmers, particularly improved marketing skills, affordable credit systems and improved extension services.

This will require changes in governance, the terms of agricultural trade, investment in human resources and the way that land and water resources are valued. Political commitment to improving the efficiency of



**Villagers collect drinking water far away from their village in Myanmar. Their village lacks clean drinking water.**

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## case study

### Water access in Ethiopia: can conflict be avoided?

Indigenous laws and customs in Ethiopia have traditionally resolved conflicts over natural resources. However, these indigenous systems are coming under threat from new laws.

Many communities in Ethiopia experience water scarcity: people in the Awash River Basin spend up to six hours per day collecting water. Conflicts over water resources are common in arid areas, both within and between communities. Development initiatives can also create problems: disagreements over inappropriate infrastructure and tensions between beneficiaries and non-beneficiaries can lead to conflict. This conflict causes environmental damage.

Research from the International Workshop on African Water Laws, South Africa, argues that indigenous systems regarding access to natural resources can play a fundamental role in resolving community conflicts. The Gadaa institution in the Ethiopian Oromo society governs access to and distribution of water and other natural resources (such as management of grazing lands and forests) and is central to conflict resolution. Conflicts over scarce resources are settled by Gadaa elders using traditional principles of conflict resolution. Rural communities greatly respect the traditional laws for governing access to natural resources and conflict resolution.

These traditional conflict resolution systems are fundamental to sustainable development, but are threatened by the enforcement of statutory laws and regulations. Modern constitutional laws have more power than Gadaa laws and operate against these traditional laws.

Key policy lessons suggest:

- Communities respect customary laws for resolving conflicts. Ignoring these will have negative consequences for local and national development.
- A combination of statutory and traditional conflict resolution mechanisms may increase cross-cultural understanding between development organisations, government institutions and communities.
- Indigenous institutions should have complete authority regarding access to scarce natural resources.
- Local communities should be involved in planning development projects from the beginning.
- National water resource policies should clearly recognise the role of traditional institutions in water resource management and conflict resolution.

Desalegn Chemed Edossa, Mukand Singh Babel and Ashim Das Gupta  
dchemeda@yahoo.com

*Indigenous systems of conflict resolution in Oromia, Ethiopia*, International Workshop on 'African Water Laws: Plural Legislative Frameworks for Rural Water Management in Africa', Johannesburg, South Africa, by Desalegn Chemed Edossa, Mukand Singh Babel, Ashim Das Gupta and Seleshi Bekele Awulachew, 2005  
[www.nri.org/waterlaw/AWLworkshop/DESALEGN-CE.pdf](http://www.nri.org/waterlaw/AWLworkshop/DESALEGN-CE.pdf)

water use is necessary.

The research recommends:

- National strategies for food and nutritional security should be established for all countries. Countries also need policies and river basin targets for flows of water that maintain vital ecosystems functions, such as supporting fish stocks.
- Current and proposed trade regimes need to be assessed based on their impacts on water resources and ecosystems.
- Governments should raise public awareness about the amounts of water needed to produce different kinds of food.
- Current agricultural subsidies do not encourage efficient water use; these

should be replaced by environmentally friendly subsidies, with rewards for efficient water management.

- Governments must explore the possibility of establishing mechanisms to share the benefits of water use amongst all people, not just farmers.
- The United Nations must continue to pursue programmes that reduce the long-term vulnerability of communities and food systems to extreme weather events.
- Research on food production should consider changes in consumer preferences, purchasing power, trade outlets and the food processing industry. If trends in diets continue in the same direction, pressure on the environment and public health will increase.

Jan Lundqvist and Malin Falkenmark  
Stockholm International Water Institute, Hantverkargatan  
5, 112 21, Stockholm, Sweden  
T +46 522 13989 [janlu@tema.liu.se](mailto:janlu@tema.liu.se)

'Let it Reign: the new water paradigm for global food security', *Final Report to Commission on Sustainable Development 13*, Stockholm International Water Institute, by Jan Lundqvist and Malin Falkenmark, 2005  
[www.sivi.org/downloads/Reports/2005%20CSD%20Report%20Food.pdf](http://www.sivi.org/downloads/Reports/2005%20CSD%20Report%20Food.pdf)

## Community priorities for water rights

**Water is becoming a scarce resource in many places. As access is threatened, communities seek to protect their rights to water. Water rights are negotiated within communities. However, they can also be negotiated between communities and others sharing water in river basins.**

As competition for water rises, communities of water users become involved in negotiating access to water. Obtaining improvements to water supplies is an important motivator for many communities, particularly in rural areas. Another motivation is the need to defend water rights against competing users.

Participatory and community-based approaches to the management of water and other natural resources are receiving increasing support in national and international policies. Involving communities offers many advantages, especially for the management of water in river basins and sub-basins containing many different user groups. In organising water management together, communities can make use of: local knowledge; mutual trust; everyday observation; informal sanctions; familiar ways of cooperating with each other and resolving conflicts.

**As competition for water rises, communities of water users start negotiating access to water**

Farmer-managed irrigation systems, community-built water supplies and many other local activities to develop and manage water and other natural resources have demonstrated the potential for local management. However, cooperation across wider areas, involving multiple communities and user groups who are often strangers to each other, create additional challenges. Furthermore, there is a danger that participatory and community-based approaches may romanticise and oversimplify the complexity of communities.

New research highlights the need for more realistic assumptions. Community-based approaches must address diversity and conflict within communities, large differences in knowledge and power, cross-cutting social and economic ties to the wider world and the need for institutional improvisation. Researchers studying the management of common property resources (such as irrigation systems, forests and fisheries) have synthesised useful principles for designing sustainable institutions.

However, these principles may be misleading, unless adapted to the specific context of each different community and river basin.

Outsiders, such as non-governmental organisations and government agencies, can help communities defend their rights to water, for example through legal empowerment, participatory planning and technical advice.

From a community perspective, such assistance will be most effective if it

responds to community priorities for:

- accommodating local practices and resource rights, for example through policies that secure local rights, without forcing formal registration
- representation in key decisions, for example inclusion in decisions about drought response and planning of new projects
- expanding access to technical and legal information, for example through training for community members to act as 'paralegals', funding for legal aid and improved availability of hydrological information and expert support
- communicating and forming networks with allies, for example coalitions of groups to fight for protection of rivers and watersheds within specific problem regions, or to advocate their interests in national debates about legislation that threatens local rights to water
- obtaining meaningful solutions for infringement of rights, for example through improving the capacity of local officials to mediate disputes
- creating forums for conflict resolution at the sub-basin and basin level.

**Bryan Bruns**

PO Box 4614, Santa Rosa Beach, Florida, 32459, USA  
[BryanBruns@BryanBruns.com](mailto:BryanBruns@BryanBruns.com)

*Community-Based Principles for Negotiating Water Rights: Some Conjectures on Assumptions and Priorities*, paper read at the International workshop on African Water Laws: Plural Legislative Frameworks for Rural Water Management in Africa, at Gauteng, South Africa, 26 -28 January 2005  
[www.nri.org/waterlaw/AWLworkshop/BRUNS-B.pdf](http://www.nri.org/waterlaw/AWLworkshop/BRUNS-B.pdf)

## Women and water in Sierra Leone

**There are abundant water resources in Sierra Leone but the introduction of 'western' approaches to management has led to unfair access and control over water, particularly in mining regions. This creates major challenges to securing water rights for everybody in the country.**

A sustainable approach to water use in developing countries requires women's participation. Research from Texas State University, USA, examines how Sierra Leone's largest ethnic group, the Mende, are involved in water programmes.

Women have social obligations to manage water for activities, such as shallow-water fishing. Women make and own scoop-nets and choose how to use fish catches. This is empowering in an otherwise communal society. There is also a traditional connection between fishing and female rites of passage, which are organised by Sande, a religious-political organisation. Men respect and revere this organisation.

By contrast, modern western development approaches view water primarily as an economic resource. Many programmes implemented by western managers and government scientists have damaged the social relations of the Mende.

For example, new legislation allowing mining companies to create artificial reservoirs left women in affected communities unable to participate in shallow-water fishing while men continued deep-water fishing using canoes and gill nets. This affected relationships between men and women regarding who performs community activities and reduced female empowerment through Sande.

The research shows:

- Viewing water as an economic resource sometimes reduces traditional female roles in relation to water management.
- Water professionals are often ignorant of the historical reasons why indigenous people do not accept western management practices.
- Indigenous populations do not always respect or adhere to plans made by governments or foreign corporations.
- Local people are particularly suspicious of projects that do not consult them or seek consensus views. This weakens the reliability of project data collected from these people.

Incentives to improve community cooperation, such as easier access to water and educational campaigns, have not been successful because of community suspicion and scepticism resulting from previous experiences with 'development projects'.

**Legislation allowing mining companies to create artificial reservoirs has left women unable to participate in shallow-water fishing**

The conflict between indigenous approaches to water management and modern, western styles adopted by the government and mining businesses

leaves Sierra Leone's population in danger of losing their rights to water. Cultural practices, particularly those of women, must be integrated into future programmes if water projects are to succeed.

The research suggests:

- Water use data from both historical reports and recent studies should be used.
- Beliefs communicated in African oral traditions must be documented as a record of cultural values for future action.
- African nationals working with overseas experts on water projects or water-based mining ventures must consider local values and environmental issues.
- Politicians and mining companies must respect indigenous systems of water management.

**Fenda A Akiwumi**

Texas State University-San Marcos, 601 University Drive, San Marcos, Texas 78666, USA  
 T +1 512 2450326 FA1010@txstate.edu

'Indigenous people, women and water: the importance of local knowledge for project planning in an African context', by Fenda A Akiwumi, pages 188-197 in *The Business of Water and Sustainable Development*, Greenleaf Publishing: Sheffield, edited by Jonathan Chenoweth and Juliet Bird, May 2005



## Managing groundwater for dry season irrigation

**Using groundwater for dry season irrigation has been the preferred strategy of the Bangladesh government for many years. For example, the privatisation of irrigation in the 1990s led to huge growth in the number of shallow tube-wells.**

However, groundwater must be managed carefully: there is not enough information available on national groundwater resources to understand or predict long-term environmental impacts of continued use. Research from the Presidency University, Bangladesh, studies the Barind Multipurpose Development Project (BMDP), a 15-district groundwater irrigation project. The BMDP has a special emphasis on sustainability – environmental, social, economic and technical. It has developed an institutional model that allows the project to be financially independent. This model of sustainable development has been replicated in other parts of the country.

Most water projects in Bangladesh have a narrow focus, such as flood control, drainage or irrigation. Social, economic and environmental factors are largely ignored

and there is little monitoring or evaluation. BMDP consciously tries to overcome these problems to meet the challenges of creating the physical and social infrastructure necessary for groundwater irrigation in a semi-arid area.

For example, the project encourages maximum use of carefully spaced deep tube-wells (DTWs) minimises water wastage. BMDP extension officers manage 'target areas' for each well, and they receive incentives for expanding the number of farmers using each DTW. The BMDP also constantly monitors quality and quantity of groundwater and aquifer levels. Thousands of poorly maintained rainwater collection tanks have been renovated. BMDP covers all its operational costs through charging user fees for water through an innovative pre-paid coupon system.

The approach has several positive features:

- Water user groups, consisting of users from many different social groups and institutions, give feedback to BMDP managers to improve project performance.
- Sixty percent of BMDP officials and its entire field staff come from local communities.
- The governing body of the BMDP includes Members of the Parliament from all 15 districts, who work with other members of government and civil society. This ensures political support to carry out project objectives.
- A large afforestation campaign and distribution of medicinal plant seedlings are examples of the project's environmental

improvement activities.

The BMDP has encountered several problems, the most significant being when hand wells used to collect drinking water began to dry up in DTW target areas. This has highlighted a need to integrate the planning of irrigation projects with drinking water supplies. Several other important issues still need addressing:

- Some water users feel that fees are too high and are changed too frequently. There is a trade-off between meeting the full cost of operations and providing a service to the poorest people.
- The role of water user groups could be expanded to make irrigation management institutions more representative. Instead of being limited to feedback on irrigation services, groups could be included in making management decisions.
- Although such projects can improve environmental quality in the local project area, many environmental parameters need close monitoring. For example, very little is known about the environmental implications of shifting from growing mixed winter crops to a rice monoculture, which groundwater irrigation makes possible.

**I.M.Faisal, S.Parveen and M.R.Kabir**

I.M.Faisal, Civil Engineering, Presidency University, House 11a Road 92, Gulshan 2, Dhaka 1212, Bangladesh

[imfaisal@yahoo.com](mailto:imfaisal@yahoo.com)

'Sustainable Development through Groundwater Management: a case study on the Barind Tract,' *Water Resources Development* 21:3, by I.M.Faisal, S.Parveen and M.R.Kabir, 2005

## useful websites

Business Partners for Development (BDP) Water and Sanitation Cluster

[www.bpd-waterandsanitation.org](http://www.bpd-waterandsanitation.org)

Chartered Institution for Water and Environmental Management

[www.ciwem.org.uk](http://www.ciwem.org.uk)

Global Water Partnership

[www.gwpforum.org](http://www.gwpforum.org)

International Water Association

[www.iwahq.org.uk](http://www.iwahq.org.uk)

Water Aid

[www.wateraid.org.uk](http://www.wateraid.org.uk)

Water and Sanitation Programme

[www.wsp.org](http://www.wsp.org)

Water - World Resources Institute

[www.wri.org/water](http://www.wri.org/water)

WCA infoNET

[www.wca-infonet.org](http://www.wca-infonet.org)

World Health Organization works on aspects of water, sanitation and hygiene.

[www.who.int/water\\_sanitation\\_health](http://www.who.int/water_sanitation_health)

World Water Council

[www.worldwatercouncil.org](http://www.worldwatercouncil.org)

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**id21**

**Institute of Development Studies**

**University of Sussex, Brighton, BN1 9RE, UK**

**T** +44 (0) 1273 678787 **F** +44 (0) 1273 877335 **email** [id21@ids.ac.uk](mailto:id21@ids.ac.uk)



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