Agricultural water management

IFAD
Investing in rural people

Scaling up note

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Tanzania – Water Supply and Health Project in Marginal Areas

Scaling up results in agricultural water management

Water is of fundamental importance to human development, the environment and the economy. Access to water and water security is paramount to improving food security, incomes and livelihoods of rural communities.

Reliable access to water remains a major constraint for millions of poor farmers, mostly those in rainfed areas, but also those involved in irrigated agriculture. Climate change and the resulting changing rainfall patterns pose a threat to many more farmers, who risk losing water security and slipping back into the poverty trap.The need, therefore, to strengthen the communities' capacity to adopt and disseminate agricultural water management technologies cannot be overemphasized.

Agricultural water management includes the management of water used in crop production (both rainfed and irrigated), livestock production and inland fisheries. Improved agricultural water management in these production areas is the answer to both global food security and poverty reduction. Current food production must be doubled in order to meet the food needs of the world by 2050; this increase must come from areas presently utilizing rainfed agriculture, as well as from the expansion and improvement of existing irrigated agriculture.

IFAD has had a strong and long-standing engagement in rainwater and irrigation management, and has accumulated significant know-how in developing appropriate physical infrastructure, along with associated organizational and institutional development. IFAD recognizes the essential role of good governance and capacity-building in making the investments associated with water infrastructure serve the intended beneficiaries.

This note discusses how the impact of agricultural water management in crop production (including forage) can be scaled up while making use of IFAD's comparative advantage in working with smallholder institutions and the fiscal space offered by partners in development.

What is to be scaled up?

The scaling up agenda in agricultural water management will be pursued through an integrated water resources planning approach, with interventions that are matched to the specific needs of each community. Rural communities have different needs for water, such as for household use, subsistence farming, market-oriented farming, livestock watering and off-farm uses.

There are both direct and indirect beneficial and sustainable impacts from investments that develop new and/or rehabilitate or upgrade existing community-based irrigation schemes in a participatory manner. These impacts include: (i) increased crop production through yield and quality improvements; (ii) higher cropping and livestock intensities and diversification, resulting in increased farm-based income; (iii) increased farm employment opportunities; (iv) improved asset accumulation by the rural poor; and (v) improved access to water for other uses. These impacts contribute to improved household food security, nutrition and income. IFAD's investments will be used to scale up improved agricultural water management through better management of water in rainfed farming systems and through participatory, community-based irrigation.

Water management in rainfed farming systems. The majority of the rural poor depend on rainfed farming systems for their livelihoods, which account for about 72 per cent of the world's harvested crops and rangelands (IWMI, 2007). Practices that improve water retention and percolation at field level – such as no till, mulching, contour ridging, infiltration pits, among others – will result in more water being available in the soil for plant growth, thus increasing productivity and groundwater recharge as well.

The technologies for water management in rainfed farming systems include: (i) flood-based farming systems (spate irrigation), whereby flood water is diverted from a river to low-lying areas for crop, rangeland and forest watering, as well as for harvesting livestock drinking water; and (ii) water harvesting, i.e. the collection and storage of water in reservoirs and tanks (natural or man-made), or facilitating the infiltration of water into the ground. Some techniques for in-field water harvesting are contour ridges, bunds, grass cover strips, microcatchments around the crop and terracing.

Participatory, community-driven irrigation (with access to markets). Community-based irrigation is made up of smallholder farmers who group together to share common irrigation infrastructure and improve access to markets. It should be noted that the non-farm sector growth in rural communities adjacent to irrigated agriculture is usually greater than in those dependent only on rainfed agriculture.

The two main models of participatory community-driven irrigation are family/individual household-owned microscale irrigation and group-owned irrigation schemes (Box 1).

Family/individually owned microscale irrigation. Microscale irrigation is developed by an individual household using a localized source of water, such as a shallow or deep well. Microscale irrigation is mainly used for household food security and for the production of high-value crops in urban or peri-urban areas. The landholding of a typical household is usually less than 0.5 hectares.

The technologies used for applying water include buckets, treadle pumps, sprinklers and drip irrigation. The latter is gaining popularity as a technology that has higher water application efficiency and requires less energy. With rural finance support and initial capitalization, the individual household is responsible for financing the development, operation and maintenance (O&M), and subsequent renewal of the irrigation infrastructure.

Box 1: Focus for IFAD irrigation investments

Family-owned microscale schemes: (i) develop value chains for irrigation equipment suppliers in order to build local capacity for manufacturing, distribution, repair and maintenance; (ii) enable farmers' access to finance for purchase of irrigation equipment and other inputs; and (iii) build the capacity of producers to enable them to access high-value markets for their produce.

Small-scale group-owned and managed schemes: (i) finance all irrigation infrastructure from headworks at water sources to downstream development at farmgate level; (ii) support the development of farmers' organizations; and (iii) facilitate access to finance and markets.

Medium and large-scale group-owned and managed schemes: (i) cofinance the development of irrigation infrastructure with other international financial istitutions, such as the Asian Development Bank, the African Development Bank, the OPEC Fund and the World Bank, which have the capacity to finance bulk water infrastructure from the water source to field edge; (ii) engage in downstream development; and (iii) facilitate access to finance and high-value markets.

Group-owned and managed irrigation schemes. Such schemes can be categorized by the scale of the infrastructure[1] and the type of ownership. The scale of infrastructure can be small, medium or large, and defined by the developed land area.[2] Categorization depends on the country context, but a typical generalized categorization is small scale (< 200 hectares), medium (200-1,000 hectares) and large scale (> 1,000 hectares) irrigation schemes. These are usually developed in a participatory manner by households organized into groups and established as water user organizations, which are able to access water for irrigation and undertake downstream development.[3] Each farmer typically has a landholding of up to 2 hectares. Either the community or one of the government agencies can identify the need for and initiate a project to establish an irrigation scheme. Participating farmers cover the full O&M costs of the irrigation system.

IFAD financed the two phases of the Special Country Programmes and the Participatory Small-scale Irrigation Development Programme in Ethiopia, and the Rural Livelihoods and Agricultural Development Project in Malawi through this model.

Scaling up pathways

In scaling up agricultural water management impacts, it is important to conduct an assessment of the local context to identify the best possible pathway to use as an entry point. The potential for scaling up and the identification of interventions is examined below from the perspective of the main development instruments: (i) policy engagement; (ii) project financing; and (iii) knowledge management.

Policy engagement

As noted in FAO (2008), "the policy environment must be supportive of smallholder production, consumption, and marketing of agricultural products." Policy engagement constitutes a major element in scaling up the impact of agricultural water management.

Integrated natural resources (land and water) management policy framework. Land and water governance issues loom large in efforts to match the objectives and modalities of investments and the institutional and policy framework in which these are set. The role of local leadership in the management of land and water is important. For example, in Liberia and Sierra Leone, land and water rights are transferred locally when improving inland valley bottoms (*bas-fonds*). Engaging local authorities involved in project design and implementation in policy dialogue with the central government often proves most effective when based on results, i.e. using positive results from past experiences to leverage support for scaling up.

In the light of increasing water stress, water management policies should provide incentives for the adoption of agronomic and irrigation practices that increase crop water use efficiencies, especially on existing irrigation schemes.

Water user groups should be responsible for O&M of irrigation infrastructure. Governments should be committed to transfer irrigation management to irrigators both in existing and new schemes. Government policy on irrigation development should stipulate that O&M of irrigation systems is the responsibility of the farmers' water user organizations. The policy and legislative framework should provide for the registration of water user associations, sustainable cost recovery of O&M costs, clear separation of responsibilities between farmers and government, and performance monitoring of government irrigation systems.

While governments seem to be keen on irrigation management transfer for run-down irrigation schemes, policy discussions on irrigation management transfer to users of new and rehabilitated schemes should be held during project design. Discussions should cover issues of phasing, timing, capacity and cost-sharing arrangements involved in such transfers.

Targeting poor and vulnerable members of the community. Such community members may not benefit from irrigation systems due to elite capture. Government policies should ensure that vulnerable members of the community are given an opportunity to benefit directly from irrigation development (micro, small, medium and large) through access to secure land and water rights.

[1] Infrastructure is defined as basic physical and organizational structures and facilities (e.g. buildings, roads, power supplies) needed for the operation of irrigated agricuture.

[2] The description of scales is a generalization, as there are differences in categorization of irrigation systems across regions.

[3] Downstream development includes development of in-field irrigation infrastructure, capacity-building of water user organizations in O&M of irrigation systems, and training of farmers in good agricultural practices.

Participatory watershed management and planning. Water management policies should encourage participatory planning, design, procurement and construction of all rural infrastructure. This approach ensures that water infrastructure development responds to the needs of the community and is designed with consideration to indigenous knowledge and climate change. Policies and regulatory frameworks should lead to an understanding of interests of importance to stakeholders (e.g. user committees, river boards, watershed agencies, municipalities, ministries), including nomadic or transhumant watershed users. Watershed planning should include long-term projections with scenario analysis of water resources demand and supply.

Irrigation policies are influenced by other policies, including those related to land, water, trade, local government and the environment, among others. The impact of these policies on the performance of irrigation should be investigated.

In the context of both irrigated agriculture and watershed management, such policy questions are best addressed at the design stage, or during results-based country strategic opportunities programme (RB-COSOP) activities. These particular stages present opportunities for reflection with governments, farmers' organizations, civil society and the private sector on policies that are conducive to or that are likely to block the inclusive and sustainable development of the agricultural water management sector.

Removing the main policy barriers, creating an enabling policy environment and incorporating project-based experience into national strategies can have a major payoff in terms of paving the way to a scaling up strategy.

Box 2: Attributes of sustainable agricultural water management interventions

- Interventions are identified and selected by the communities through a facilitated participatory process of watershed management planning.
- Beneficiary communities have secure land and water rights as individuals or groups.
- Participatory design of the physical and organizational infrastructure, which takes into account the communities' existing capacities and multiple use requirements. Attention is given to the needs of all community members, with particular attention to women and young people.
- The cost of developing infrastructure is shared between beneficiary communities, the public sector and the private sector, depending on the level of commercialization of the intervention.
- The intervention takes into account the beneficiaries' capacity to pay for operation and maintenance (O&M).
- An effective framework, which allows for decentralization and devolution of water management powers to water users, is in place. Issues of phasing, timing, capacity of beneficiaries and cost-sharing are discussed and agreed at the outset.
- O&M and management of infrastructure is the responsibility of beneficiaries organized into formal or informal water user groups. The responsibility for O&M is assigned before major construction works start. If subsidies are foreseen, they are within a level that the government can guarantee to provide in the future.
- Assessment of options for social, environmental, technical and economic viability and selection of the optimum option are undertaken with the participation of beneficiary communities.

Project financing

To scale up the impact of improved water management in rainfed and irrigated agriculture systems, projects should:

(i) At the RB-COSOP stage, identify potential partners to cofinance investments in agricultural water management, if it is identified as a key intervention area by the government in line with the investment models described above.

(ii) Prepare watershed management action plans to guide sustainable investments that rehabilitate or preserve the watershed in order to protect downstream water resources. In most cases, a "hot spot" approach can be used to identify highly degraded areas or highly impactful areas for watershed rehabilitation.

(iii) Assess the level of organization of targeted beneficiary communities. The key to successful agricultural water management projects is investing in people and their institutions at the local level, requiring longer-term strategic commitment and complex relationship-building. Existing institutions may require strengthening to better handle and manage the change that the project will bring. In some cases, new institutions may need to be built.

(iv) Facilitate the analysis of options and the design of specific interventions with the beneficiary communities. Projects that involve communities from identification through implementation have a greater success rate than those planned using a top-down approach. Technology choices should allow multiple uses, if required by the communities, and enable water re-use.

(v) Ensure the projects have support systems that enable access to markets and financial services.

Private-sector involvement. Infrastructure development and provision of management and institutional capacity for irrigation projects through partnerships between the public sector, the private sector and water users could be the way of the future. IFAD-financed programmes can leverage the skills, knowledge and finance of the private sector for the design, construction and O&M of irrigation and market. New models of sharing design, construction and O&M responsibilities with the private sector are emerging. An example of this can be found in Sierra Leone, where capable private service providers were created to work with farmers' associations, such as the Inland Valley Swamps Associations (IVSAs), on a systematic contract basis, and the use of youth contractors selected by the IVSAs among their young members was successfully introduced.

In its support to projects, IFAD should strike the right balance between the development of physical infrastructure and the organizational structures necessary for improved water management, with a focus on increasing on-farm agricultural productivity and income.

Knowledge generation and sharing

Learning from "what works" is critically important before embarking on new investments, particularly where capital costs are high.

All water governance policy engagement should be informed by lessons learned from local experience, which means that effective knowledge management is critical as a feedback loop between projects and policy engagement. An example of this is IFAD's support for micro-irrigation within the Orissa Tribal Empowerment and Livelihoods Programme in Orissa State of India, which led to the promotion of pro-poor micro-irrigation at the federal level; in this regard, International Development Enterprises-India was instrumental in assisting the government to set up a national subsidy policy for drip irrigation in India. Likewise, Agronomes et Vétérinaires Sans Frontières, IFAD's implementing partner in the Scaling Up Micro-Irrigation Systems (SCAMPIS) project[4] in Madagascar, decided to mainstream the micro-irrigation business proposition into its corporate operations related to micro-irrigation.

Knowledge partnerships with CGIAR and other Agricultural Research for Development (AR4D) institutions complement learning from the field, while pro-poor advocacy on farmer-led water governance has been introduced in major international events. Furthermore, communities of practice are being supported by IFAD and partners.

Providing knowledge and best practices as a precursor to project design and policy engagement is critical to a scaling up agenda that builds on what works. However, a substantial contribution to the knowledge agenda will also come from project implementation itself, and the flexibility that projects will have to stimulate adaptation and learn while doing from traditional practices and local solutions.

Key drivers for scaling up

Agricultural water management gives sustainable results in an environment where complementary services – such as access to extension services, markets and inclusive rural finance – are accessible. Clear delivery mechanisms and institutional arrangements with specialized agencies reduce complexity (IFAD, 2009). There are some critical "spaces" that provide fertile grounds for the scaling up agenda to unfold, which are outlined below.

Financial and fiscal spaces

A major obstacle to scaling up is the limited financial space for farmers to invest in appropriate technology combined with the high capital cost of infrastructure investment. However, with the renewed interest of other international financial institutions and the private sector in funding agricultural water management interventions, IFAD has a great opportunity to develop partnerships that build on its comparative advantage and make use of its strong capacity in institutional analysis, social empowerment, value chains and environmental aspects to propose technically adapted solutions.

Most water control infrastructure have not been sustainable due to poor O&M. The latter is due to a number of reasons, which include: (i) farmers' expectations of the level of service are not met and they have little incentive to pay for the service; (ii) low farm-level productivity and poor access to markets resulting in inadequate income to finance O&M; (iii) weak organizational capacity of farmers to mobilize technical and financial resources for O&M; and (iv) inadequate funding from governments for government-managed systems. A scaling up strategy should aim to address each of these issues.

[4] SCAMPIS reached out to 30,000 households in Guatemala, India and Madagascar, and established national supply chains of drip irrigation equipment adapted to poor smallholder farmers.

Institutional space

Participatory approaches that lead to farmer-managed irrigation schemes require government departments to hand over the responsibility of developing and managing water infrastructure to beneficaries and to involve the private sector in their development, operation and management. This is different from the top-down and infrastructure focused approach used by most government departments. In most countries, there is a need to reform government departments.

The opportunity to set the scaling up agenda lies not so much in more and bigger projects, but rather in an approach that links water management with market opportunities/value chains and natural resources management. Development of new or rehabilitation/upgrading of existing water management infrastructure, particurlary in irrigation, should be balanced by investments that build the capacity of farmers to develop and implement effective strategies that increase the farm fiscal space through access to high-value markets. This balance between investment in physical and soft assets is important for the sustainability of water infrastructure.

Developing an understanding of the role of institutions (public, private and producer-related) and the right level of delegation of authority (subsidiarity principle) will be critical to a scaling up agenda. The institutional space is linked to policy convergence and the ability to clearly assess the level of government commitment towards an agenda that may require to squarely address rent-seeking situations and elite capture. Institutions and institutional linkages may be more important than money in paving the way to a sustainable scaling up strategy in water management.

The private sector, through public-private-producers partnerships, can help in leveraging available skills, finance and networks for the development and O&M of water infrastructure in a manner that reaches out to more people and regions.

Partnership

Challenges to policy, projects and knowledge dimensions can only be overcome by increased partnership, starting with the research and knowledge communities (e.g. CGIAR, universities, think tanks) to increase access to documented knowledge. UN-Water, of which IFAD is a founding member, has proved to be a solid partner and suitable platform to lobby for investments in knowledge and innovations on water. Diversifying relations to include non-traditional partners, including unions, parliamentary commissions on land and water, chambers of commerce, insurance companies and other development agencies such as the private sector and major foundations, would inspire and allow for “outside-of-the-box” cross-fertilization. The agriculture water agenda is complex and cannot be addressed by a single agency. Scaling up will only be possible by leveraging resources and expertise through increased partnership.

Climate change

Adaptation to climate change impacts will require responses from governments, farmers and other stakeholders in the following areas: (i) better water resource management policies, legislation and regulations that mainstream adaptation to climate change; (ii) research in irrigation water requirements for key food security crops such as maize, rice and wheat, and dissemination and adoption of new technologies; (iii) assessments of vulnerability of these crops to climate change scenarios, long-term droughts and water deficits; and (iv) review of existing and development of new guidelines for the design and adoption of water technologies and practices for both rainfed and irrigation agriculture.

Monitoring and evaluation

Monitoring and evaluation (M&E) is a core part of a scaling up strategy, supporting the understanding of how different pathways and spaces interact and where targeted action is possible. To complement the Results and Impact Management System indicators already used for RB-COSOPs and projects, the M&E goes beyond the existing tracking of government support to favourable policies to include natural resources management (land and water) indicators in the performance-based allocation system subsector scores. Table 1 gives a non-exhaustive list of possible additional indicators.

An M&E system for water management programmes should recognize that most of the outcome and impact objectives are only realized after project completion, making it essential to keep track of process milestones along policy engagement, project implementation, and knowledge capture and development pathways.

Table 1: Non-exhaustive list of possible additional indicators for measuring scaling up of agriculture water management

	Water management in rainfed farming systems	Participatory, community-driven irrigation (with access to markets)
Policy	Watershed management policy, guidelines and regulations (mainstreaming climate change) in place	Policy dialogues and development achieved on: • Water and land security of tenure • Irrigation management policies • Irrigation equipment trade restrictions • Financing of irrigation • Country legislation related to water resources reviewed and improved (FAO, 2007)
Project	• % increase in area under soil and water conservation practices • Customary agreements documented, adapted and recognized in national legislation • % increase in number of people benefiting from improved rainfed water management	• % increase in number of people with access to benefits from irrigated agriculture (direct and indirect) • % increase in income from irrigation • % increase in use of water-efficient irrigation technologies • % reduction in cost of installation, repair and maintance of irrigation equipment • % increase in successful intermediate means of transport
Knowledge	• % increase in people aware of technologies for improved water management in rainfed agriculture • Workshops, presentations • Stories from the field written • Case studies published • Videos produced	• Analysis available on documented project experience • Partnerships developed • Workshops, presentations • Stories from the field written • Case studies published • Videos produced

A successful M&E system functions as a decision tool in the management process. To achieve this, the system needs to be designed with a focus on usability without overemphasizing exactness. Bias towards monitoring the physical progress, and not outcomes and impacts, should be avoided. Good quality and timely baseline information should also feed into progress monitoring. For effective scaling up, the sustainability and outreach of the M&E system itself also needs to be considered, taking into account the manner in which results affect key stakeholders and how this might reflect on sustainability after the project comes to a close.

Key messages

- Strong rural institutions are an important ingredient in sustainable scaling up of agricultural water management impacts.
- A watershed management approach is the foundation for planning and implementing holistic agricultural water management interventions. Climate change will affect the way that watershed management will be carried out, which possibly will involve the development of complex water allocation systems and provision of incentives to save water in the era of economic and/or physical water scarcity.
- A conducive policy environment and the right institutional set-up is key, particularly with respect to the involvement of water users in O&M.
- To assist farmers in developing medium- and large-scale irrigation systems, IFAD will need to partner with other investors (governments, international financial istitutions, the private sector) and the farmers themselves, as it does not have the financial capacity to fund the development of bulk water supply infrastructure.
- IFAD's comparative advantage lies in downstream undertakings, such as the development of irrigation, capacity-building of the rural poor and their organizations and institutions, and improving access of farmers to markets and financial services.
- The importance of technology choices should not be understated. Such choices should be tailored to the needs and capacities of the users and depend on the physical characteristics of the area, scale of the project, and preferred ownership and operation arrangements. Technology choices should be flexible enough to allow for conjunctive and multiple uses of water.
- With a watershed management approach, projects are about collective action and managing externalities. Putting in place the right incentives for losers and winners to act towards a common goal is paramount so as to avoid free-riding and rent-seeking. Representation of the users and delegation of authority to the appropriate local level are two critical aspects to factor in when considering scaling up pathways.
- Making sure that more secure access to water leads to higher productivity and income is a multidisciplinary endeavour. It requires better coordination between the ministries of water, of irrigation and of agriculture, providing better integration into value chains and market opportunities, access to credit, technical assistance, and private sector involvement. It also means a better handle on the economics of water use and awareness of whether government subsidies skew incentives towards suboptimal use of water.

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