A "Blue Revolution" for African Agriculture?

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1 Introduction

The 2005 report from the Commission for Africa rightly notes that agricultural performance is a driver of poverty trends in the continent. In terms of water for agriculture, the report focuses on the challenges of increasing spending on physical irrigation infrastructure and extending the area under irrigation to twice the current coverage (Commission for Africa 2005: 73). These are very significant issues in their own right, but fall short of providing a complete picture on the challenge posed by water management problems in Africa. The emphasis is largely on creating new infrastructure as opposed to looking at the social and institutional aspects of water management, or indeed on enhancing the potential of dryland agriculture. Since water plays a key role in enhancing both food security and agricultural production, this article asks whether Africa needs a "blue revolution" (cf Lipton 2001) and what this might entail. It does so by looking at the broad water resource picture and the links to food security and poverty, before narrowing down its focus to technological innovation and the accompanying legal, institutional and policy environment in water management.

2 The challenges: water and food security in African agriculture

Water is a crucial part of agriculture in Africa, accounting for some 85 per cent of all usage across the continent, though showing significant regional variation. Africa's share of the world's total water resources is only 9 per cent, or 4,050 km^3/year (UNEP and AMCEN 2002). In spite of some of the largest, most significant watercourses and natural storage reservoirs in the world, vast tracts of the northern and southern regions of Africa suffer from acute water stress. Fourteen out of the continent's 53 countries are defined as water scarce,[1] and an estimated 11 further countries in Africa will face water stress[2] by 2025 (Shiklomanov and Rodda 2003).

These statistics obscure intra-regional inequalities in water use and withdrawals as well as the human-induced aspects of scarcity (Mehta forthcoming). They are also silent on political questions concerning access to and control over water (e.g. water use for agriculture in Southern Africa is very skewed in favour of the land-owning elite, and in eastern and north-eastern Africa highly charged debates continue between countries over shared waters). Still, these figures indicate that, given growing competing demands around water from different sectors, the challenge of improving water management for agriculture in the face of variable rainfall, and recurring droughts and floods, must be met on several fronts in order for progress to be made towards long-term reliable food security.

This overall picture would lead many to agree that Africa needs a "blue revolution". However what this means is contested. The dominant view has promoted a narrow version, focused on expanding irrigation facilities (see e.g. Kay 2001). Clearly, irrigation provides a lot of scope for poverty reduction, enhancing food security and providing security against seasonal vagaries (Lipton *et al.* 2003). Consequently, the Comprehensive Africa Agriculture Development Programme (CAADP), established by the NEPAD (New Economic Partnership for African Development) Steering Committee with support from the Food and Agriculture Organization (FAO), has made a pledge to increase the cultivated area under "reliable water control systems" from 12.6 to 20 million ha, at an estimated cost of US$69bn (NEPAD 2002). The CAADP also calls for huge investments in agriculture, including some US$37bn in land and water investment up to 2015. The plan focuses in particular on small-scale irrigation initiatives, noting

IDS Bulletin Vol 36 No 2 June 2005 © Institute of Development Studies

that just 7 per cent of Africa's arable area is under irrigation compared with 33 per cent for Asia.

We believe that, while a "blue revolution" for Africa must certainly include some irrigation expansion, the irrigation sector is only one of the many answers to enhancing food security and agricultural productivity. An over-reliance on irrigation detracts from other important issues such as food commodity prices. Thus a range of options must be tackled which include both technological and informational issues as well as institutional and socio-political considerations that aim to improve the broader environment for investment in sustainable water resources development.

3 The "blue revolution" and technology

3.1 Enhancing water supply, timing, reliability and efficiency

According to Johan Rockström of the Stockholm Environmental Institute (*New Agriculturalist* 2004) the answer to improving agricultural water use lies not merely in the expansion of "traditional" irrigated agriculture; rather, rain-fed agriculture supplemented by irrigation should be the path to pursue. As it is, non-irrigated agriculture contributes 60 per cent of cereal production on 70 per cent of the global cereal area, illustrating its importance relative to irrigated agriculture. Furthermore, enhancing the productivity of rain-fed agriculture has the benefit of improving the lot of some of the world's poorest people (IWMI 2004). Hence, solving the water challenge of agriculture is not necessarily about providing more water, but rather providing it at the right time and in the right amounts. Employing simple-to-use, inexpensive technologies such as the "bucket and drip kit", treadle pumps, collector well technology and sprinkler irrigation to supplement rain-fed farming might be just what is needed (cf Lovell *et al.* 1996). Cropping techniques, such as that developed for the system for rice intensification (SRI), may hold much potential (Prasad and Basu 2005). Furthermore, effectively utilising Africa's floodplains covering an area of some 300,000 km^3 is also key. Floodplain agriculture protein yields are almost twice as high as irrigated agriculture, yet floodplains risk being converted into commercial irrigation schemes, even though cost-benefit analyses show that the expected profits from such large-scale projects do not merit the costs associated with the construction of the necessary infrastructure (Marchand 1987).

The World Bank, a major influence in global water management debates, is re-engaging with large infrastructure projects, arguing that water storage is a critical issue in helping achieve macro-economic stability in the many sub-Sahara African countries subject to highly variable rainfall regimes. The Bank's lending for hydropower projects decreased by 90 per cent over the last decade, largely due to the fact that such projects were viewed as high-risk ventures, especially concerning social and environmental impacts (World Bank 2003). The Bank's renewed promotion of large dams as a "solution" to scarcity and variability is controversial, even stirring *The Economist* (2004) to decry the "ominous revival" of large-scale infrastructure projects in development. While large dams definitely have enhanced food security in South Asia and elsewhere, they have also had profound social and environmental impacts which include increased evaporation, salinity, waterlogging, exaggerated economic benefits and most significantly, the forced resettlement of millions as reported by the World Commission on Dams in 2002. Although dams often contribute towards increased agricultural productivity for upstream users, gains may be offset by detrimental effects to downstream farmers, including reduced silt deposits and changes in flood ecosystems. Dams pose a further challenge in sub-Saharan Africa, where there are a number of major trans-boundary basins and rivers and some 50 are shared between two or more countries. A renewed emphasis on large-scale infrastructure projects in the absence of effective institutions for cooperation may increase political disputes between governments. This is why the World Commission on Dams calls for thorough options assessment before any new water development planning is initiated as well as a thorough assessment of the rights and risks of all stakeholders.

3.2 Making plants grow better under conditions of water stress

One of the main aims in terms of using water for agricultural production is to achieve more with less, or "more crop per drop". The main point is not to bring more water to the crops, but to make the crops need less water (IWMI 2004), and to reduce overall demand within the sector. In addition to the concepts of timing and reliable supply, which can be enhanced by early warning and resource monitoring systems, using the latest satellite and geographic information system technologies, the use of low-cost technologies, and better agronomic practices such as mulching

and zero tilling, spacing and plant management systems (such as SRI, see above), breeding through conventional or molecular techniques, all hold great promise for increasing crop productivity, including by increasing drought resistance and making plants less water consumptive and more tolerant of saline/low-quality water (IWMI 2004).

4 Institutional complexity and socio-political processes

Whether projects are large or small, technologies simple or sophisticated, attention towards scale and sophistication should not distract from critical issues of institutional process and local, national, and regional socio-political relations. This is particularly true for countries such as South Africa, Zimbabwe and Tanzania where the role of the state has been key in reforming the water sector and providing a conducive and enabling policy environment for the uptake of new technologies and practices, as well as for coordinated and sustainable management of water for national agricultural growth and poverty reduction. However, the principles underpinning reforms also draw either implicitly or explicitly on new development paradigms that have become entrenched within global water debates. We highlight some of the key policy narratives below and discuss their implications.

4.1 Integrated water resource management

At the heart of water sector reforms is integrated water resources management, which emphasises decentralisation of management, stakeholder participation, and the principle of "user pays". Its uncritical adoption in many African countries has been problematic. For example, new institutions of water management may not adequately address agricultural concerns of the region, particularly not among small-scale and communal farmers. This is partly due to the institutional complexity that the water reforms entail, and local struggles for control of decentralised institutions of water management. In Zimbabwe and South Africa, new institutions of water management are intended to provide an easy and locally accessible route to water for small-scale users as well as large-scale commercial farmers. Thus, they are institutional fora for representation and participation, as well as sources of information for water issues, but frequently a part of an ever-more complex institutional environment.

Research in Zimbabwe showed how many farmers spent a lot of time trying to gain access to the appropriate institution, often resulting in significant delays in the provision of water for irrigation, and with adverse impacts on agricultural crop production (Mtisi and Nicol 2003). Such institutions can also provide a focus for struggles for political control between water users. In Budzi and the then Lower Save sub-catchment councils, many commercial farmers viewed the access and use of water by small-scale, communal, and newly resettled farmers as leading to 'massive land degradation, siltation and disappearance of rivers'. This effectively put the agricultural concerns of these farmers and ways of benefiting from water reforms off the agenda of institutions of water management, and ensured that water management was locked into wider debates on land reform and land use. Policy environments in African agriculture are not historically neutral, and policies must take account of different conceptions of resource ownership and rights regimes at a local level to stand a chance of success. To ignore the local picture is to run the risk of failure, or, worse still, to introduce new bases for conflict between different users.

4.2 Water as an economic good?

Since the 1990s a paradigm shift in global discourses on water management has been the conceptualisation of water as an economic good (Gonzalez-Villarreal and Solanes 1999, Mehta 2003). The premise is that paying for water will induce effective and efficient ways of water management among users. In many African countries these ideas are now embedded in policy processes that are at implementation stage.

The idea recognises the need to emphasise demand management rather than relying on augmenting supply. But while this may help to conserve supplies, pricing has so far failed to adequately cross-subsidise technological innovation to the benefit of the poor water users. In practice, it is also difficult to implement since it runs parallel to the political promises of many Southern African governments to their respective electorate, and to the expectations of poor farmers who may neither be willing or able to pay for water for agricultural use.

The notion that water is an economic good is still very controversial in the developing world and there are many who believe that water should not be viewed as a commodity but instead should be seen

as a human right (South Africa's free basic water policy is a step in this direction – it is the only country that recognises that right to water in its constitution). Still, rights-based approaches to water are often hindered by parallel attempts to recover costs, which are in keeping with international donor discourses (Mehta and Ntshona 2004). Moreover, the free basic water policy is largely restricted to domestic water and has been criticised for not paying attention to the needs of subsistence farmers who could use basic water to meet their food and livelihood needs.

Their interests are ostensibly addressed through South Africa's National Water Act 1998 where emphasis is placed on crafting institutional frameworks, whereby water users are issued with formal water rights in the form of temporal licences. As in Tanzania and Zimbabwe, the logic is that paying for water rights will induce more judicious water management among water users, and that having a registered, formal right will increase security, which in turn could lead to farmers investing in new technologies to improve efficiency. However, it is not necessarily the case that the implementation of formal rights is the answer to improving efficiency of water use in agriculture. Research being undertaken by the Natural Resources Institute, in collaboration with the International Water Management Institute (IWMI), Sokoine University, and the University of Zimbabwe is unveiling the difficulties relating to the existence of legal pluralism in water law, and its consequences for efficient water use (Van Koppen *et al.* 2004).

4.3 Participation and stakeholder involvement

The water reforms seek to actively promote the development of small-scale and commercial agriculture. However, the reality is that water reform has not, in practice, opened up access of water to new stakeholders. If the water reforms are to lead to significant agricultural development among small-scale and communal farmers, the reforms have to confront and take cognisance of the historical legacies that define much of Southern Africa, particularly in Zimbabwe, South Africa and Namibia, where the legal and administrative frameworks governing ownership, access, control and use of water favoured elite – often racially defined – interests (Mtisi and Nicol 2003). With such skewed access typifying past arrangements, recent water reforms hold little promise for African agriculture, particularly if the reforms are implemented in a context of structural inequities of ownership and access to land. One of the chief problems in water and agriculture debates in Africa is paradoxically, perhaps, the intense focus on the resource base itself and the lack of attention paid to the institutional environment in which small farmers make decisions on production patterns, investment opportunities and whether or not to leave the sector altogether and shift to urban livelihoods. If sustainable improvements to the water environment of African agriculture are to take place then they have to begin with an institutional environment that can adopt and assist farmers in utilising new technologies, in achieving access to credit and markets and, crucially, interpreting the meaning of new policy directions at a local level.

5 Conclusion

Does Africa need a "blue revolution"? This article has argued that appropriate water management can both enhance food security and agricultural use and productivity. Thus a "blue revolution" could shake up African agriculture. However, this "blue revolution" cannot merely be restricted to expanding Africa's irrigation potential or solely endorsing global policy narratives around integrated water resource management or "user pays" principles without taking into consideration the diversity of Africa's socio-political make-up. This should be reflected in the emergence of locally appropriate institutions that are capable of delivering assistance to African farmers. African agriculture needs a "blue revolution" that meets the principles of equity and sustainability, which draws on technologies that are locally appropriate and affordable, and that also prioritises dryland systems since this is where the bulk of food is produced for Africa's poor people. Moreover, the "blue revolution" must shy away from glib endorsements of global policy narratives that are often blind to local institutional complexity and historical legacies of unequal access and control. The Commission for Africa and its supporters would do well, therefore, to take forward the policy discourse at a local level and to build on the experience of recent water policy reform processes within sub-Saharan Africa. Without the local knowledge and experience to assess the impact of new reforms, the future pattern of policy development in Africa's water sector may remove rather than provide a basis for water to play a substantial role in enhancing African food security and long-term poverty reduction.

Notes

1. Commonly defined as having less than 1,000 cubic metres per person per year.
2. Defined as having less than 1,700 cubic metres per person per year.

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