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Viewpoint – The Right Irrigation? Policy Directions for Agricultural Water Management in Sub-Saharan Africa

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ABSTRACT: In July 2009, in the closing moments of the G8 meeting in Italy, President Obama responded to a question from the floor regarding investments in Africa to tackle food security and poverty. His answer (quoted below) included the phrase "the right irrigation". This opinion piece reflects on the phrase, places it within a policy debate and suggests that the development community can respond to Obama's call for the 'right irrigation' in sub-Saharan Africa by taking a comprehensive approach that utilises a mixture of technologies, builds on local capabilities, brings sound engineering know-how, is supported by a range of other services, and acknowledges other water needs within catchments. Cost-effectiveness and community ownership will be important.

KEYWORDS: Africa, irrigation, investment, food security, agricultural water management, policy

There is no reason why Africa cannot be self-sufficient when it comes to food. It has sufficient arable land. What's lacking is the right seeds, the right irrigation, but also the kinds of institutional mechanisms that ensure that a farmer is going to be able to grow crops, get them to market, get a fair price.

President Obama, G8, Italy, 10 July 2009.

In the quote above, taken from the 2009 G8 meeting in Italy, US President Obama used the term "the right irrigation". Soon after, Douglas Alexander, UK Secretary of State for the Department for International Development (DFID) repeated the same phrase. For those who follow policy statements on agriculture in Africa, the mention of irrigation was unusual but nevertheless, Obama's statement sounds like good news for the farmers and the agriculture-based economies of sub-Saharan Africa (SSA). While rain-fed agriculture will always constitute the bulk of agricultural systems in SSA, and rainwater harvesting holds some promise for boosting yields in certain limited circumstances, irrigation systems represent a chance to potentially replicate conditions that underpin the production gains witnessed in South Asia over the last 50 years. Irrigation, properly done, provides a control of water over space and time giving farmers a sufficiently predictable and secure crop-growing season to invest in labour, seeds, land preparation, agro-chemicals and harvesting technologies, thereby offering new crops and boosting yields by various means.

In this short informal opinion piece, I reflect on the use of the term and briefly outline the risks faced by donors as they size up new directions for irrigation support, particularly in the absence of a full appreciation of the complexities of successful irrigation or if they seek to replicate Asian irrigation without recognising SSA conditions (the two have different climates, floodplain types and histories). Although Africa was the geographical region mentioned by President Obama, this short analysis is aimed at semi-arid SSA rather than North Africa. In fact, I believe he probably had SSA in mind because one source of Obama's reference to irrigation was his 21 May 09 meeting with President Kikwete of Tanzania at the White House when the two discussed aid to African agriculture (the content of this meeting is given on news agency websites, e.g. The East African). Finally, this analysis does not compare

irrigation alongside the current promulgation of rainwater harvesting in SSA – though I have doubts about claims made for the latter's ability to drought-proof agriculture.

Policy directions for SSA irrigation have been debated for at least two decades (see selected literature sources at the end of the opinion piece). However, in the last 10 years, this debate has focussed on a dramatic scaling-up of irrigated area in order to promote food security and ameliorate rural poverty with recent grain price hikes upholding this concern. Setting aside questions of the ideal target growth rate or final area irrigated, and the sustainability of these targets, the debate has reflected on how this might be achieved. As discussed below, options classify into four types of technologies: simple technology micro-systems, small-scale smallholder-owned canal systems, pressurised irrigation systems built as donor- or government-sponsored smallholder schemes, and rehabilitated and/or newly-built large-scale canal systems as externally-funded smallholder schemes. As I outline below, we should reflect on these choices (selecting the right irrigation) before embarking on new investments for African agriculture. I believe that the donor and scientist community has been unnecessarily influenced by a mixture of fashion for smallness and fears about poor productivity of large-scale canal systems.¹

Yet it can't be that difficult to provide "the right irrigation"? I believe, as the risks outlined here and elsewhere in the literature show, it's the opposite. Moreover, the right irrigation has been so difficult to deliver that for the last 20-25 years donors have largely kept clear of funding irrigation infrastructure or have seen poor returns to millions invested. Costs have averaged out at an eye-watering \$10,000/ha yet performance gains have been often disappointing. Sometimes, local economies went into reverse as large areas of evapotranspiration took water from downstream towns and industries. With such a poor press, 'irrigation' has largely dropped out of development policy thinking. This has been matched by declining research and professional skills in the area; for example, UK postgraduate qualifications in irrigation management have shrunk from three full Masters degrees in the early 1990s to less than half a degree now (comprising at most two modules in two universities).

What are future directions for donor spending on agricultural water investment in Africa? It is first important to recognise that irrigation has expanded in recent decades via a combination of farmers' efforts and formal interventions. While working on the UK Government's Commission for Africa (CfA) (see footnote), I estimated recent growth of irrigation in SSA at nearly 2% per year, principally via farmer-owned systems. The question to ask is whether this rate of expansion can be greatly increased as the Commission for Africa set out to do and the US government seems to be suggesting. While it makes sense to build on the momentum shown by smallholders, there are several technologies that can form part of a sustainable and effective programme.

First in the policy queue are 'micro' technologies favoured by 'green Africa' alliances that see the smallholder central to agricultural production. Farmers buy or are provided with treadle pumps to use human power to lift water from streams or shallow aquifers. This might be combined with raised drum (bucket) kits to store water for drip irrigating 25-50 square metres of row crops such as tomatoes or onions.

Seen as attractive because of the 'smallness' of the technology, treadle pumps nevertheless should be seen as extremely risky for donors to engage with on a large scale, not least because they are best left to entrepreneurs or local NGOs to sell and for smallholders to judge. I believe it is not a technology to push; irrigating with treadle pumps requires the farmer to 'climb' the effort equivalent of 1000 metres each day to irrigate half a hectare. Humans ingeniously figured irrigation could be delivered by animal power (or better, gravity) more than 5000 years ago, yet policy organisations suggest thousands of less-than-well nourished Africans 'treadle out of poverty'. You and I might spend an hour on a step

¹ In 2005, I was fortunate to be asked to write the irrigation infrastructure section of the Commission for Africa (CfA) with terms of reference to explore how to double the area of irrigation in Africa within 10 years. I witnessed first-hand how advice that recommended a comprehensive framework of interventions to cover all types of irrigation (akin to the recommendations put here) was ignored largely in favour of one fashion; treadle-pump irrigation.

machine in an air-conditioned health club to experience such equipment, but to ask farmers to treadle all day each day in temperatures of over 25 °C?

Furthermore, while treadles and buckets might suit vegetable crops, the technology is less suited to field crops such as wheat and rice which are critical in tackling global, regional and urban grain prices and food security. Lest we are not persuaded, imagine thousands of treadlers now simultaneously supplying perishable vegetables to markets expecting a high price. Or try imagining many thousands of treadlers not impacting upon water supplies. It is not the smallness of the individual technology that keeps it from drying out streams – it is the cumulative area irrigated. In addition, the sums on \$300 bucket drip kits still come out at around \$8,000/ha – an excessive cost for donors to be contemplating.

In a second policy option, donors might rehabilitate traditional farmer canal systems, upgrading them from earth channels and wooden gates to concrete and metal. Known as 'irrigation improvement' and favoured across eastern Africa by donors, engineers and irrigating communities who assume they will see gains in productivity, this investment is not without risks. Improvements can weaken the underlying social glue provided by regular maintenance of earthen systems. It is also common that the new systems are simply a change in 'form' with changes doing little to revise the nature of the networks or division points of water distribution in order to transparently parcel out limited water to competing farmers. In addition, improvements often focus on the system being modernised rather than taking a total catchment approach; in other words, they run the risk of biasing water supply to the improved system while drying out downstream users. Irrigation systems can be modernised, but care is required. Knowing how to engage with different smallholder systems each with its own unique character and trajectory is the trick we have yet to fully learn. Specialists can also learn from how local artisans fix irrigation systems and build canals at a much lower price of around \$500/ha.

Third, a common argument is to promote pressurized sprinkler and drip systems (seen, for example, in parts of the Mediterranean). While this has worked relatively well on commercial estates (e.g. sugarcane in Swaziland), there are places where smallholders have not kept up with electricity payments or shared the maintenance costs of repairing this type of technology (for example, in the Makatini system of the Pongola river in South Africa). Because farm sizes tend to be much smaller than irrigation blocks, water scheduling to meet the water needs of individual farmers within larger groups has been problematic. Moreover, in a low-carbon world perhaps we should be cautious about promoting pressurised systems.

Fourth, one might build anew or rehabilitate large-scale smallholder canal systems (>2000 ha) supplied by either pumped groundwater, run-of-river flow (without storage) or by building new dams. There are plenty of places where land can be irrigated in this way using gravity to distribute canal water. However, newly-built and/or rehabilitated systems are potentially expensive and there is evidence to show that once commissioning is over, systems start to degrade and community leaders are unable to impose water rationing or cope with rival farmers demanding water out of turn.

Donors, governments and communities face other issues in addition to the choice of technology: competition for water between distant sectors and between neighbouring farmers within a system; a relative lack of water management expertise within communities; a tendency for designers to select highly engineered solutions rather than utilise local artisanal skills; the expense of maintaining and replacing equipment; uncertain markets and related barriers; and the vagaries of sub-Saharan African weather – drought and flood. Other questions are waiting in the wings: should policy incorporate the idea that farmers pay for water? How can farmers be encouraged to genuinely own their systems, meet regularly to discuss water and hire in expertise? How can irrigators be persuaded to release water for downstream wetlands? Which NGOs should be involved? (There is no irrigation equivalent of WaterAid). Who will provide assistance to maintain the institutional arrangements that can support farmers with the complex task of managing water either within an irrigation system or between systems in a catchment? How might host and donor countries including China adopt a coherent approach to these infrastructural and institutional issues?

So with 40 years of lessons, what does "the right irrigation" mean? I believe it comprises a mixed approach that is technologically selective, comprehensively delivered, locally contextualised, institutionally sound, appropriately engineered and professionally supported. Moreover, it would put communities of smallholders, not individual smallholders, at the centre. This subtle shift moves us away from an excessive emphasis on 'atomised' treadle pump and micro-kit solutions and towards the notion that the institutional and organisational challenges of managing water as a common property are paramount. Accordingly, the policy would have to find ways to address local and non-local (catchment) problems, and bring together the benefits of local ownership and lower costs with engineering that serves the complex task of apportioning water over large irrigated areas and between upstream users and downstream needs. In addition, I favour the deployment of a local conditionality framework that would fund new technologies (and, if genuinely applicable, expensive storage) and support services against evidence of progress by water users in establishing water user groups, adopting financial accounting systems, resolving conflicts and sharing water.

Interventions may be expensive because of the scale of the challenge and at all stages planners will have to cut costs. To add, rehabilitate or modernise 10% of the current 7.2 million irrigated hectares in SSA at 10,000 US\$/ha would be a prohibitive bill of \$7 billion. We should aim to manage irrigation at less than 1000 US\$/ha. By sharing costs with farmers using income from cropping, and spending a higher proportion on institutional support at the system and catchment level we should meet sustainability objectives. There are irrigation success stories in SSA – scientists and users can learn about them but be wary of replicating them elsewhere without understanding site-specifics or neglecting to meaningfully help new and existing irrigators over the long term.

Obama is perceptive though. He used the term "the right irrigation" rather than 'modern irrigation', 'micro-irrigation', 'new irrigation' or 'small-scale irrigation'. It's the right start.

FURTHER READING

African Ministers Council on Water (AMCOW). 2003. *African water facility: Establishment and implementation plan*. African Ministers Council on Water.

Cai, X. and Rosegrant, M.W. 2003. World water productivity: Current situation and future options. In Kijne, J.W.; Barker, R. and Molden, D. (Eds), *Water productivity in agriculture: Limits and opportunities for development*, pp. 163-178. Wallingford, UK: CAB International.

Commission for Africa. 2005. Our common interest. Report of the Commission for Africa. 11 March 2005 London.

Dargouth, S. 2004. Overview of the collaborative programme "Investing in Africa's Water Future". Presented at the seminar of the Comprehensive Assessment of Water Management in Agriculture there are, World Water Week, Stockholm, 20 August 2004.

Food and Agriculture Organisation. 1995. *Irrigation in Africa*. Rome: Food and Agriculture Organisation.

Foures, J.M. 2004. Demand for products of irrigated agriculture. "Investing In Africa's Water Future". Presented at the Comprehensive Assessment seminars held during World Water Week, Stockholm, 2004.

Inocencio, A.; Kikuchi, M.; Tonosaki, M.; Maruyama, A.; Merrey, D.; Sally, H. and de Jong, I. 2007. *Costs and performance of irrigation projects: A comparison of sub-Saharan Africa and other developing regions*. IWMI Research Report 109. Colombo, Sri Lanka: International Water Management Institute.

Jones, W.I. 1995. *The World Bank and irrigation*. Washington, DC: The World Bank.

Kay, M. 2001. *Smallholder irrigation technology: Prospects for sub-Saharan Africa*. Knowledge Synthesis Paper No. 3, International Programme for Technology and Research in Irrigation and Drainage (IPTRID). Rome: Food and Agriculture Organisation.

Lankford B.A. and Beale, T. 2007. Equilibrium and non-equilibrium theories of sustainable water resources management: Dynamic river basin and irrigation behaviour in Tanzania. *Global Environmental Change* 17(2): 168-180.

- Lankford, B.A. and Mwaruvanda, W. 2007. A legal-infrastructure framework for catchment apportionment. In Van Koppen, B.; Giordano, M. and Butterworth, J. (Eds), *Community-based water law and water resource management reform in developing countries*, pp. 228-247. Comprehensive Assessment of Water Management in Agriculture Series. Wallingford: CABI Publishing.
- Lankford, B.A. 2005. *Rural infrastructure to contribute to African agricultural development: The case of irrigation*. Report for The Commission for Africa, School of Development Studies. Norwich, UK: University of East Anglia.
- McCartney, M.P.; Lankford, B.A. and Mahoo, H.F. 2007. *Agricultural water management in a water stressed catchment: Lessons from the RIPARWIN project*. Research Report 116. Colombo, Sri Lanka: International Water Management Institute.
- Movik, S.; Mehta, L.; Mtisi, S. and Nicol, A. 2005. A "Blue Revolution" for African Agriculture? *IDS Bulletin* 36.2.
- New Partnership for Africa's Development (NEPAD). 2002. *Comprehensive Africa Agriculture Development Programme (CAADP)*. Rome: Food and Agriculture Organisation.
- Rosegrant, M.W. and Perez, N.D. 1997. Water resources development. In *Africa: A review and synthesis of issues, potentials, and strategies for the future*. EPTD Discussion Paper No. 28. Washington, DC: International Food Policy Research Institute, Environment and Production Technology Division.
- Ruotsi, J. 2005. *Financing irrigation development and private sector initiatives. With special reference to sub-Saharan Africa*. Rome: Food and Agriculture Organisation.
- Sally, H. and Abernethy, C.L. 2001. *Private irrigation in sub-Saharan Africa. Regional seminar on private sector participation and irrigation expansion in sub-Saharan Africa*. Accra, Ghana: International Water Management Institute.
- Sandford, S. 1983. Organisation and management of water supplies in tropical Africa. LCA Research Report No. 8. Addis Ababa: International Livestock Centre for Africa.
- Sharma, N.P.; Damhaug, T.; Gilgan-Hunt, E.; Grey, D.; Okaru, V. and Rothberg, D. 1996. *African water resources: Challenges and opportunities for sustainable development*. World Bank Technical Paper No. 331, Africa Technical Department Series. Washington, DC: The World Bank.
- Tafesse, M. 2003. Small-scale irrigation for food security in sub-Saharan Africa. Summary Report and Recommendations of a CTA Study Visit. Ethiopia, 20-29 January 2003. CTA Working Document No. 8031. Wageningen: Technical Centre for Agricultural and Rural Cooperation.
- World Bank. 1981. *Accelerated development in sub-Saharan Africa: An agenda for action*. Washington, DC: The World Bank.