RESPONSES TO WATER AND FOOD CHALLENGES

Climate change, water and agriculture must be priority issues for policy and decision makers in the coming decades. The 2008 World Development Report (World Bank, 2008) made this case very clearly, pointing out that 75 percent of the world's poor live in rural areas in developing countries. At the same time, only about 4 percent of official development assistance goes to agriculture, although it has been increasing over the last few years (WorldBank, 2007).

If a growing population is to be fed and the volatility of rainfed systems adequately buffered to maintain global food security, only the delivery of more water into the root zone of productive land can assure the required production. Socio-economic drivers and climate change impacts will condition where this can be achieved. In this respect rainfed systems will need to become more opportunistic, harvesting soil moisture where possible, and irrigated farming systems will need to become much more flexible in their use of limited water resource. It is at this point of competition for surface and groundwater resources that agricultural agencies will have to become much smarter and responsive to a broader array of socio-economic drivers.

Agriculture has always been the residual user of available water resources, but is still the largest user and the only productive user of water with a negotiable margin. Improvements in potable water supply management will still need to be made when raw water is scarce, but the volume of use will remain insignificant when compared to that of agriculture.

Policies and actions related to climate change, water and agriculture clearly need to be better incorporated into existing key development related processes. To a large degree, the drivers causing the problems, and therefore holding the potential solutions, are outside the immediate domain of the water using sectors. In the face of such uncertainty, water institutions will need to become more flexible, capable of anticipating changes in user behaviour and then implementing an intelligent mix of water resource use and regulation.

Below, some key policy and management responses are presented to prompt discussion. It is important to remember that economic sector responses to climate change many need to be extensive, ranging from specific field-level investments to major shifts in public policy support.

Access to information relevant for policy and management is a strategic issue

Having access to relevant information for policy making and for the development of management responses will be a fundamental prerequisite to better cope with and adapt to changes. Scientific data and state of art knowledge needs to be translated into policy and management relevant information that could be of direct relevance to decision making at various levels. The issue of scale will be fundamentally important. Overview maps, such as a recent example presented in Science showing potential hot-spots or broad-scale analysis to identify major areas of particular concern could be vitally important as tools to better communicate potential climate change challenges and impacts on regional and even local scales. Such hot-spots are not necessarily confined to regions suffering from direct climate-related challenges but could also be represented by regions with weak adaptation capacity or high impact risks. The provision of more relevant information will require:

An increased focus on how climate change interacts with natural climate related processes.

As an effect of direct impacts from changes in temperature or indirect effects through climate change impacts on water resources (and other parameters), other

drivers may exacerbate or reduce the overall climate change impact (positive and negative feed-back effects). Climate change will interact with important natural climate related phenomenon such as El Niño – Southern Oscillation (ENSO) and the North Atlantic Oscillation (NAO). This can either strengthen or weaken the climate change signal, but our understanding is still superficial. As events such as ENSO and NAO have substantial weather related impacts of direct interest to agriculture, better understanding of climate change impacts on such events will be essential for improved regional and local projection capacities.

An increased focus on knowledge transfer and capacity building at the user's level.

For a farmer, urban planner or water resources manager, projected global climate change averages are not of real practical use. The capacity to make projections at regional and local scales need to be strengthened, and further investments are required to improve information disbursement and to strengthen the capacity of users to interpret and use such information, from the individual farm level to more large-scale urban planning or sector management strategies. However, as stated by FAO (2007) "Improved access to knowledge is only theoretical for many in poor countries especially in rural areas" as long as efficient technologies, including the internet, are not available. A range of methods to share knowledge at user level would therefore be appropriate.

Tools to better assess current technological solutions from a climate change adaptation perspective.

Technology and infrastructure will be essential to efforts to adapt to and mitigate climate change. They also, however, present challenges. Arguably, reliance on technological fixes has made us more vulnerable to previously climate change. If technology and investment has enabled agricultural practice to be pushed into marginal lands, then increased resource use has pushed some regions and countries close to or even beyond their natural resource limits. Hence technological progress may encourage a false sense of security and even inhibit adaptation measures. Therefore an assessment of the styles of water investment that can result in positive adaptation is an obvious first step. For example, the scope for high intensity investments such as dam storage to buffer production risk may need to be compared with economic result of dispersed low intensity investments in groundwater development and management.

A focus on adaptation and mitigation strategies in agriculture that goes both deep and wide

The integration of climate change-related challenges with other drivers is essential. If interacting drivers are not appropriately considered, there is a risk that investments will be made in vain or even become counter-productive.

Land use changes, large-scale water diversions, economic development, changes in consumption and production patterns (agriculture, industry), changes in population and population dynamics will all influence water resources availability and quality. In many cases these socio-economic changes may eclipse the local-regional manifestation of short to medium term climate change. Reviewing such feedback systems needs a carefully measured application of science and economics, but a better understanding of such linkages forms the foundation for more effective policy interventions.

Shift the policy and management emphasis

The increasing focus on adaptation rather than risk mitigation is a positive step forward. But it is not enough. It will be essential to:

Increase focus on overall resilience building in all systems, particularly in the most vulnerable farming systems.

Moving from simply coping with impacts and managing risks to making well judged investments in adaptation and building long-term resilience needs sustained policy guidance. Ultimately, achieving improved resilience towards global changes, including climate change, needs to underpin more or less all planning and decision-making. In particular longterm and large-scale investments in water infrastructure and institutions need to be assessed in terms of their resilience.

Focus more on how the potential positive impacts of climate change can be harnessed.

Climate change will have beneficial impacts in some regions. Adaptation strategies also need to consider these implications in terms of local, national and international markets. For example, ensuring that agricultural production can increase in such regions in order to balance deficits elsewhere may require radical changes in food policy, particularly for countries that have cut back on their agricultural production capacity in recent decades.

Move beyond the sectors

Agricultural production and adaptation is clearly not just the mechanical application of bio-chemistry and water technology, and solutions to food-security challenges will need to be sought outside the water and agricultural disciplines. Macro-economic policies (notably those influencing social structures, market conditions and international trade), infrastructure development, and spatial planning will probably have the greatest impacts on demand for agricultural production and the capacity to adapt to changes. Thus, there are clear limitations to the adaptation measures that can be designed and implemented within the water and agriculture sectors. From a global food security perspective, influencing global trade policies on agricultural products, for example, may prove to be one of the

more important climate change adaptation strategies. Climate change may increase food production imbalances and such imbalances will need to be dealt with through increases in regional and global trade. Such approaches to adaptation can be politically complex, as was recently demonstrated by the failure of WTO Doha development' round (United Nations, 2008). Given this, introducing climate change adaptation perspectives within such a process may be optimistic. However, wider market mechanisms and marked based instruments (such as the Clean Development Mechanism) can be expected to play a fundamental role in shaping adaptation and mitigation.

It will be essential to encourage more integrated or 'joined-up' policy processes to obtain appropriately scaled responses to climate change. But incorporating the varied interests of agriculture, water and energy sectors as well as policy makers influencing actors in market development, trade and infrastructure will be a challenge. Therefore a focus on the development of integrated management and decision-making tools is recommended. This may require an assessment of existing economic and legal planning instruments, including adaptation assessment frameworks and more operational local/national management frameworks such as National Adaptation Programmes (NAPs).

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