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Conference thematic approach

Introduction

The context

The African continent is facing an escalating food crisis. The recent surge in staple commodity prices will hit many developing countries hard, and this is particularly the case for Africa, which will have to find the financial resources to pay for a commercial food import bill that, on average amounts to US$17 billion annually alone. Over 60 percent of this bill is accounted for by food staples. Moreover, terms of agricultural trade are worsening: agricultural net trade has been declining steadily passing from approximately US$3.3 billion surplus in the 1970s to a dramatic deficit of US$4.4 billion in 2004. At the continental level it is apparent that Africa has not been able to intensify agricultural production and generate intra-continental trade to feed growing cities or buffer the volatility of rainfed production. While Asia benefited from the effect of the Green Revolution that involved the development of irrigation, the use of seeds, fertilizers and pesticides, and the extensive and heavily subsidized rural electrification, the African continent did not embark on any similar trend in agricultural growth. Sub-Saharan Africa, in particular, has seen very low or even stagnant levels of yield growth in its rainfed subsector, and slow development of its irrigation subsector.

The food crisis trap that threatens the African continent is not only the effect of the neglect of the agricultural sector, and the lack of investments in water for agriculture, but also a product of the impact of variability of climate on the agricultural sector. Farming in Africa is largely rainfed and Africa s reliance on agriculture makes it singularly vulnerable to the vagaries of its climate. Rainfall is erratic and natural hazards such as droughts and floods are frequent. Africa has also experienced, over recent decades, growing environmental degradation such as deforestation, desertification, declining soil productivity, loss of biodiversity and depletion of freshwater. The United Nations Intergovernmental Panel on Climate Change (IPCC) predicted that climate change could cause crop yields in some African countries to fall by 50 percent by 2020, seriously threatening the continent s fragile food security.

Combined with the increased volatility of the price of the main agricultural commodities, Africa is facing a parallel increase in the price of energy, used as an input to food production. The upward trend of energy costs and concerns regarding the effects of climate change has reinvigorated the interest in alternative energy. Energy is fundamental to the achievement of each of the eight MDGs. Seventy-seven percent of households in sub-Saharan Africa are without access to electricity, and most rural households still rely on traditional fuels wood, dung, and agricultural residues that are strongly affected by climate variability, significantly compromising their opportunities for economic development and further entrenching poverty. Africa, however, has enormous potential for energy production, particularly hydropower, which will have to be exploited in the face of an economy that is placing increasing stress on water resources and is generating further energy needs.

High food and energy costs, notwithstanding the recent circumstantial drop in prices, provides further justification for the development of alternative sources of energy, in particular hydropower, and the development of a productive agricultural sector, which is expected to increasingly depend on expansion and improvement of irrigated production.

Objectives of the Conference

The principal aim of the Conference was to examine all aspects of water resources in Africa in the context of rapidly increasing demand from the agriculture and energy sectors and climate change. The Conference focussed on investment needs and management problems for the harnessing of water and irrigation at village level, the rehabilitation and expansion of large-scale hydro-agricultural works and the development and implementation of large water infrastructure and river basin projects, with a view to finding concrete solutions for the effective use and management of water and energy resources in support of growth and sustainable development in Africa. More specifically, it assessed the challenges faced by the agricultural and energy sectors in Africa in the framework of the global food crisis, examining how increased investment can achieve well balanced subsectors that would concurrently ensure food and energy security in all countries of the continent.

A key goal was to identify the financial mechanisms and steps required to promote and secure investment in the sector of water for agriculture and energy in Africa. The Conference represented a great opportunity to mobilize financial support within the framework of the Comprehensive Africa Agriculture Development Programme (CAADP) and ensured that investment commitments were made or confirmed by bilateral, regional and international financing institutions. For this purpose, relevant instruments for follow-up and monitoring of the implementation of commitments were defined.

Two time horizons were considered: one based on the CAADP projections for agricultural development investment needs by 2015, under current African population growth trends and food consumption demand, and the second looked at a longer-term perspective, 2030 and 2050, with an African population reaching 2 billion people; where climate change can have a greater impact and influence. Under the two scenarios, the focus was on concrete programmes and the assessment of their financing costs, both in terms of feasibility studies and implementation of works.

Organization of the Conference

The Conference preparation included the production of National Investment Briefs for all the African countries, in which investment needs for water control at the level of villages, extensive irrigation systems and major river basins, both for agriculture and for hydroelectric power have been thoroughly and precisely assessed in the short-, medium- and long-term. These programmes were reviewed during five regional preparatory workshops, which took place between October and November 2008 in which national and regional representatives from the water, agriculture and energy sectors participated.

At the conference, three working sessions were programmed to further discuss findings of the regional workshops and propose recommendations for decision-makers. These sessions attempted to address, in sequence, three main questions, the:

- prospect for food and energy demand by 2015 and the projections for 2030-2050;
- definition of the investment envelope for water for agriculture and energy to meet current and future food and energy demand in Africa; and

- financing mechanisms and implementation strategies for water for agriculture and energy in Africa.

The purpose of this background paper was to provide a framework for debate and guide discussions during the Conference s working sessions. It provided background information in support of the three themes, and suggested a series of key questions for discussion at the working sessions.

Theme 1: Prospects for food and energy demand by 2015 and projections for 2030-2050

Introduction

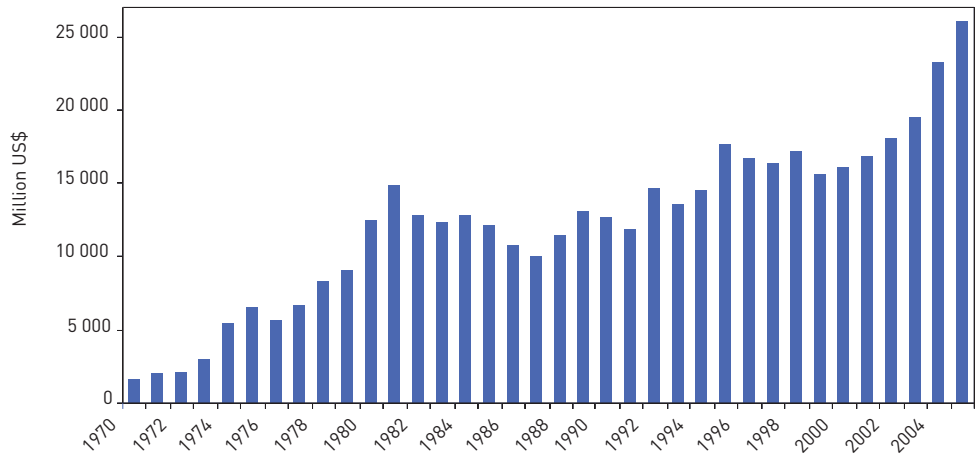
Rapid agricultural growth is urgently needed to face the severe crisis currently escalating in the continent notwithstanding the recent circumstantial drop in prices that has only partially alleviated the problem. The price of cereals has, however, shown variations of more than 100 percent over the last year, and the cereal bill for low income food deficit countries (LIFDCs) in Africa is projected to triple by 2030 under current trends putting heavy pressure on fragile national economies. Additionally, increases in energy demand put a direct burden on the energy bill of many African countries and there is a call for alternative solutions to energy supply. A worrisome implication of the increasing link between energy and food prices is the fluctuation of energy prices that are increasingly translated into food price fluctuations.

While it is apparent, at the continental level, there is unrealized potential for food and bio-energy production, many of the agro-climatic zones favourable for high-yielding irrigated production are constrained by soil and water limits. In any event, looking into the future for water management for agricultural and energy requires a consideration of economic demand. The demand for food is primarily a function of population and income. Relatively accurate estimates of future food demand are available in FAO s perspective studies for 2030 and 2050 (FAO, 2006b). Based on these studies, FAO estimates that food demands in sub-Saharan Africa alone will more than triple between 2000 and 2050 in response to increased population and improved diets.These rising trends in demand have to be set against the inherent spatial and temporal variability and increasing volatility of global food markets, as the last two years have demonstrated (Food Outlook, FAO). If the amplification of this variability under climate change is anticipated, meeting the predictable but rising demands in food and hydropower generation will become even more of a challenge.

While the demand for food is rising, overall production trends in the major cereals are generally flat, but with substantial inter-annual variations, due in large part to agro-climatic conditions that affect a predominantly rainfed production system.

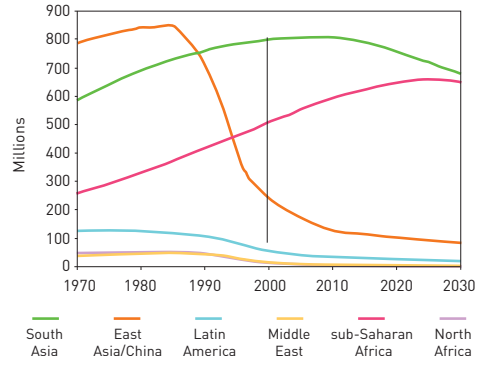
Africa is a net importer of food. Just looking at recent trends in rice imports shows how significant Africa s demand is in relation to global trade. When compared with production trends, despite the stability of irrigated production, imports are still some 60 percent of utilization. Figure 1 shows the increase in food import bills for Africa since 1961.

Figure 1: Food import bill for Africa (FAOSTAT, 2008)



A similarly alarming situation can be found in the energy sector. According to the Infrastructure Consortium for Africa (ICA, 2008), there is a chronic shortage of electricity supply in at least 25 countries in sub-Saharan Africa, and the entire generation capacity of the 48 countries of sub-Saharan Africa is no more than that of Spain. Despite abundant energy resources, the supply of energy in Africa is limited and unreliable, forcing many commercial consumers to invest in back-up energy supplies such as diesel generators. In sub-Saharan Africa, 526 million people live without access to power supply (2002) with the trend growing. In some countries, just 5 percent of the population have access, and in some rural areas only 2 percent. Sub-Saharan Africa is the only region where the absolute number of people without access to electricity is increasing, and it is expected that by 2030, this number will be 660 million (Figure 2). Yet, energy demand in Africa is expected to double, from 500 Mtoe in 2000 to 1 000 Mtoe in 2030. The limited coverage of public electricity grids is a particularly difficult barrier to business and trade promotion in rural areas. It is a major constraint to both diversifying agricultural production and to developing agro-processing facilities to add value to locally produced goods.

Figure 2: Number of people without electricity 1970-2030



Source: International Energy Agency

The main causes of this situation are many, including lack of long-term planning, insufficient investment, poor maintenance, corruption and the conflicts that affect several areas of the region and prevent investments. In addition, African borders limit market size through political and regulatory barriers to trade, hindering the siting of energy generation capacity at lower cost and greener locations, pushing up generation costs and prices, reducing margins and incentives for investment. Removing borders through expansion of international transmission lines, greater trade and stronger regional bodies would expand generating capacity and reduce overall capital and

operating costs. Regional power pools are improving cooperation and trading but progress is slow and they have not yet created the needed open competitive power markets.

The widening gap between food and energy demand and supply

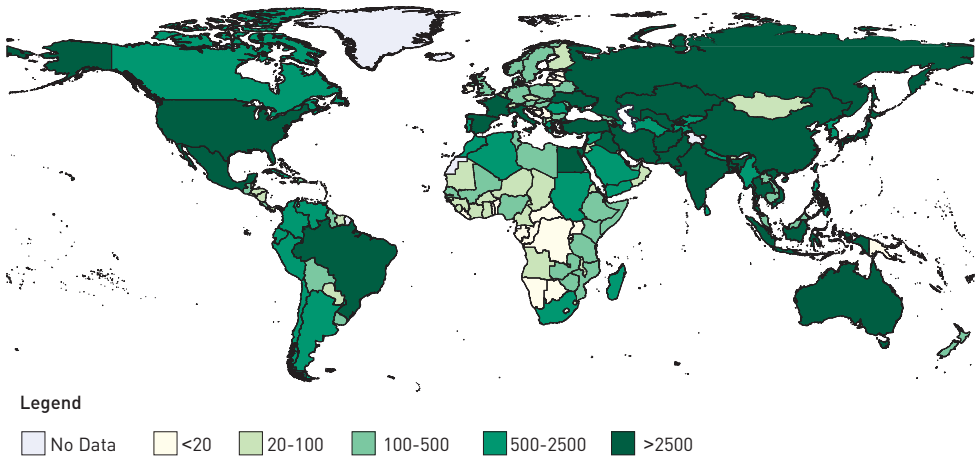
The basic drivers of demand are population and income growth. Demands for food staples and minimum levels of energy provision for heating, cooking, lighting and transport are essentially non-negotiable.

A recent diagnostic of infrastructure carried out by the World Bank (Foster *et al*. 2008) has highlighted the nature of the infrastructure gaps experienced in Africa in relation to water. These gaps have been signalled by NEPAD in relation to implementation of the CAADP and subsequent analysis for irrigation infrastructure (FAO, 2006a). The recent global surge in food commodity and energy prices has highlighted the inherent vulnerability of African economies to global price shocks and the limited capacity of Africa s agricultural base and related infrastructure to respond to market opportunities. The fall in the price of food staples on the international market, starting in July 2008, has only partially and circumstantially alleviated the problem. Whether future demands can be met by domestic production and regional markets in food and power or whether they will continue to be met by imports from outside the continent is a key question.

The priority of food staples needs to be emphasized. The state of food insecurity and poverty in Africa, particularly sub-Saharan Africa, is well established (FAO-SOFI reports) together with the unavoidable need to address agricultural production (NEPAD-CAADP, 2003). The state of the irrigated sub-sector has been comprehensively reviewed with a recent update for Africa (FAO, 2005c). A recent analysis of the implications of demand projections for irrigated production for sub-Saharan Africa (FAO, 2006a) has been undertaken as part of a collaborative programme with the World Bank, African Development Bank, IFAD and IWMI. The key findings are discussed below.

Intensification and diversification are expected to become the major sources of agricultural growth in the region, in which agricultural water will play a major part. The potential is, however, limited in areas with poor market access, particularly in the marginal arid and semi-arid areas. However, to date, sub-Saharan Africa has developed less agricultural water than any other region just 4 percent of the farmed area. Expansion of irrigation has been slow and until recently investments in agricultural water development have declined compared with levels in the 1970s. With the exception of the five North African countries and large areas of rice production in Senegal and Mali, irrigated sugar in South Africa and Swaziland and cotton in Sudan, Africa has seen relatively small areas of fully commercialized irrigated production (Figure 3).

Figure 3: Distribution of irrigation in Africa



Source: FAO, 2006, AQUASTAT

Projections indicate that the largest calorie deficiencies in sub-Saharan Africa will occur in cereal crops, notably coarse grains, rice, wheat and maize (FAO, 2006a). Together with sugar, these staples offer opportunities to scale up production to meet national and regional demand. However, sub-Saharan Africa produces only a fraction of these staples in relation to demand. The regional trends in food import bills continue to rise to unprecedented levels, seriously affecting the balance of trade of most countries in the region. The bulk of these bills are accounted for by staples.

The scale and mix of water control infrastructure has not matched demand. The structural mismatch between styles of production and the character of national and regional demand can be expected to seriously hinder efforts for regional integration. Transport and marketing costs are high and with very little value-added processing, and the scope for developing regional markets is limited.

The technically feasible hydropower potential of Africa is around 1 750 TWh which is about 12 percent of the global capacity. Only 5 percent of this technically feasible potential is exploited. While the demand for electricity in Africa grows at an average annual rate of 3.1 percent, the rapid exploitation of this enormous potential is hampered by dispersed population in the continent and the ever-increasing requirements. Thermal generation accounted for most of the region s total electricity supply in 2005 and is expected to remain the same through 2030. Coal-fired power plants, which were the region s largest source of electricity in 2005, accounting for 47 percent of total generation, are projected to provide a 32 percent share in 2030, as natural-gas-fired generation is expected to strongly expand from 22 percent of the total in 2005 to 50 percent in 2030.

Generation from hydroelectric resources and other marketed renewable energy sources is expected to grow slowly in Africa. As they have in the past, non-marketed renewables are expected to continue providing energy to Africa s rural areas; however, it is often difficult for African nations to find funding or international support for larger commercial projects. With

regard to the economics of hydropower, large hydropower plants (LHP) are characterized by high capital costs and low operational costs. In Africa, where financial resources are scarce, the high up-front costs of hydropower investment are a barrier to the development of this energy source. The intrinsic characteristic of investments in hydropower discloses the opportunities offered by small hydropower in matching supply with demand. Small hydropower (SHP) development is still unsatisfactory throughout Africa but it is anticipated that SHP will be part of the solution to the growing demand for rural electrification programmes on the continent. However, the growing population of Africa will also require the construction of medium and large hydropower plants to cover Africa s growing energy needs. Still, plans for several hydroelectric projects in the region have been advanced recently, and they may help boost supplies of marketed renewable energy in the mid term. Several (although not all) of the announced projects are expected to be completed by 2030, allowing the region s consumption of marketed renewable energy to grow by 2 percent per year from 2009 to 2030.

The regional contrasts

The different endowments in terms of water in the five African regions reflect on the different development of hydropower. Out of the 20.3 GW developed hydropower capacity, about 23 percent is located in North Africa, 25 percent in West Africa and the remaining 52 percent is distributed amongst the remaining regions (Hydropower & Dams, 2001). Countries with installed capacity of more than a 1 000 MW have a total installed capacity of about 13 GW comprising 65 percent of the total hydropower installed capacity of Africa. These countries are Egypt, the Democratic Republic of the Congo, Mozambique, Nigeria, Zambia, Morocco and Ghana (Table 1). The remaining 45 African countries account for 35 percent of the total installed hydro capacity.

Table 1: Countries with major hydropower developments

Country	Subregion	Installed Capacity (MW)
Egypt	North Africa	2 810
DR Congo	Central	2 440
Mozambique	Southern Africa	2 180
Nigeria	West Africa	1 938
Zambia	Southern	1 634
Morocco	North Africa	1 205
Ghana	West Africa	1 072
Total		**13 279**

Source: World Atlas on Hydropower and Dams 2001

Regional discrepancies are evident when considering the distribution of installed hydropower capacity; with Southern Africa accounting for more than 33 percent and North Africa for only 7.7 percent. The largest regional discrepancies, though, emerge when the potential of hydropower generation is considered: as shown in Table 2, the highest hydropower potential both in terms of gross theoretical and technically feasible potential is in Central Africa, particularly the development of large-scale hydropower concentrated around the Congo basin. West Africa represents a small percentage of the total African hydropower potential, since most future development will focus on small hydropower, which is still greatly unexploited, while North Africa generally does not rely on hydropower, apart from Morocco and Egypt (here considered as part of East Africa), and its hydropower potential is almost exhausted.

Table 2: Hydropower potential and installed capacity by region				
Region	Gross Theoretical HP Potential GWh/year	Technically Feasible HP Potential GWh/year	Installed HP Capacity MW	Planned Hydro Capacity MW
North Africa[1]	13 000	4 950	1 549	1 170
East Africa	703 500	97 822	4 537	2 001
West Africa	117 026	95 936	3 969	6 168
Central Africa	1 771 150	921 950	3 448	43 806
Southern Africa	644 207	389 255	6 670	23 389

[1] Excluding Egypt which is considered here as part of East Africa.
Source: World Atlas on Hydropower and Dams 2001

Also the irrigation sector shows significant contrasts between the five North African countries (Morocco, Tunisia, Algeria, Libya and Egypt) and those grouped in sub-Saharan Africa are significant (Table 3). The North African countries have developed land and water resources to the limit and further development of the subsector will hinge on adding value through agro-processing (World Bank, 2006). With the exception of the Republic of South Africa, irrigated production and associated infrastructure in sub-Saharan Africa has lagged far behind, showing negligible growth over the past decade.

Table 3: Regional distribution of irrigation across Africa			
	hectares	Technically Feasible HP Potential in % of total	in % of cultivated land
Northern	6 339 756	47	22.6
Sudano-Sahelian	2619 950	20	6.8
Gulf of Guinea	565 257	4	1.0
Central	132 439	1	0.6
Eastern	616 143	5	2.0

Source: FAO, AQUASTAT, 2005

Why linking energy, agriculture and water strategies is an imperative

Agriculture and energy are two highly interconnected sectors but at present these linkages are not fully taken into account in policy-making. The way energy is produced, distributed and consumed affects the local, regional and global environment. Agriculture is a key sector where the spillovers of energy production and consumption are pronounced. On one side, any further growth in the rural space will necessarily increase demand for energy and will be competing with the industrial and urban centers already at the limit of thermal generation and are under pressure from the impacts of high and still increasing oil prices. On the other side, accelerating access to electricity for the rural poor offers new opportunities for agriculture, including access to a cheap source of energy for water pumping. If access can be improved, and energy needs for agriculture anticipated and met, then a potential roadblock to agricultural growth can be avoided. Rapid growth in agricultural production could then stimulate rural and overall economic development. The objective of food security could come closer to reality, and exports of agriculturally-based products could improve the regional trade balance.

On the positive side, Africa has a vast, largely untapped potential of both renewable and non-renewable energy sources. In particular, Africa s large hydropower potential appears an attractive option for meeting energy needs. Acceleration of hydropower development is already apparent both in the Nile and Congo basins and it will continue to increase, together with the establishment of regional power grids and energy markets. In many cases, hydropower dams are also promoted as being suitable for multi-purpose functions, such as supplying water for irrigation and drinking water.

Getting the right structure of production to match food demand

Beyond the operational and local political considerations, most countries in Africa are looking at a range of rainfed and irrigated production systems. The macro-economic purpose of both systems is and will remain important. It is the right combination and effective management that makes the difference. If lower yielding and extensive rainfed production can reliably meet demand in food staples, then stabilizing rainfed production should be the most economic means of achieving food security. However, low input systems can be high risk under climatic regimes. Hence, if the volatility of rainfed production becomes intolerable, irrigation of staples, whether promoted through economic incentives or structural planning or a combination of both, becomes necessary.

Irrigated production is a small contributor to Africa s overall food production, but plays an important role in wheat, rice, horticulture, sugar and cotton production. Generally, current irrigated production is characterized by low productivity. Irrigated cereal yields are mostly low by global standards having improved only slowly in recent years. However, on a few large, well-managed schemes, yields have reached levels comparable with Asia. Irrigated production of higher value crops with good market access has proved profitable. Where yields are good and investment costs not too high, irrigated rice cultivation is profitable, at least for the local market. Other irrigated cereals have been less profitable, particularly with continuing declining world prices. Irrigated horticulture is fast growing, especially around cities or even within them, and is driving profitable investment in irrigation. Low productivity clearly correlates with unreliable water supplies, poor water management, low input use and difficulty in accessing profitable markets, therefore investments in water control are fundamental to overcoming these barriers to production and ensuring an increased level of food security in the African continent.

Improved agricultural water use in irrigated and rainfed agriculture will have a direct impact on local and regional water demands. Irrigated agriculture will need to be re-thought in order to close gaps in food needs while also making room for transfers to other uses where needed. Such reform will involve a shift in approach from a supply, or input-driven activity, to a much more demand responsive activity. To achieve this goal, irrigation institutions need to adopt a service orientation and improve their performance in different areas, including the adoption of new technologies, modernizing infrastructure, application of improved administrative principles and techniques and promotion of active participation of water users. Irrigation sector institutions need to link their central task of providing irrigation services to agricultural production services and to integrate water resources management at basin level.

Adapting to a future with increased climatic variability

Africa has contributed the least to climate change but is likely to suffer the most. Increased climate variability already affects its water resources, land, forests and biodiversity, and these impacts are likely to worsen over time. According to the Intergovernmental Panel on Climate Change (IPCC), the cost of adaptation in Africa could be as high as 5 10 percent of the continent s GDP. Agricultural production and food security in many African countries are likely to be severely compromised by climate change and climate variability, and projections indicate reduced yields of up to 50 percent in some countries by as early as 2020, with small-scale farmers being the most affected.

These trends, if not blocked, will inevitably further impact the food import bill of many African countries. Such an increase in cereal trade, coupled with the economic and environmental costs of food transportation over long distances on poor infrastructural networks, are likely to cause further increases in food prices. Climate change will affect the African continent in several ways:

1. **Increased water stress:** even small reductions in rainfall could cause large declines in river water. It is estimated that between 75 and 250 million people could be exposed to significant water stress due to climate change by 2020. Water stress is expected to hit harder in already water scarce areas of North and Southern Africa.
2. **More severe land degradation:** the agriculturally unfavourable dry semi-arid areas with severe land degradation, prohibiting the use of rainfed agriculture, will increase by 10 percent, affecting the 180 million people who live and rely on agriculture in such areas for their livelihoods. Moreover, the projections for climate change show that rainfall will be more variable, with an increase in the frequency of extreme events. Heavy storms will negatively affect the soil, leading to a rapid increase in erosion and desertification.
3. **Reduced food security:** recent estimates show that each 1˚C rise in average temperature will reduce dryland farm profits in Africa by nearly 10 percent. The length of growing seasons, the area suitable for agriculture and the yield, are expected to decrease, hence endangering the food security achievement.
4. **Growing competition for natural resources:** several currently populated areas are expected to become less desirable or uninhabitable due to climate changes, opening the way to massive migration. Drought and other climate-related shocks will lead to greater water interdependence and competition for both water resources and farmland.
5. **Negative impacts on the energy sector.** Many African countries rely on biomass and hydropower, energy sources that are sensitive to climate change. Changes in precipitation, in fact, can be felt through variations in runoff, increased siltation and impacts on fuelwood and charcoal production.

The implications for Working Session 1

Working session 1 attempted to tease out some of these issues to focus on the prospect for food and energy demand by 2015 and the projections for 2030-2050, implications for agriculture strategies and the energy sector, and possible impact of climate change. Key questions included:

a. How do countries cope with the prospects of rapid increase in food and energy demand by 2030 and 2050?

b. How do current water infrastructures perform in response to increasing demand? What are the constraints to improved performance of these infrastructures and how could countries respond?
c. What is the relative contribution of rainfed production, small-scale irrigation and large-scale irrigation in terms of food security are they complementary or do they compete for financial resources?
d. How does climate change affect projections for 2030 and 2050, and do current adaptation strategies satisfactorily address climate change related challenges?

Theme 2: Defining the investment envelope

Introduction

It is clear that accelerated investment in infrastructure are needed to break down the internal barriers that hold Africa s productive potential back and to increase the capacity of African farmers to produce and market their products. Numerous studies (World Bank, 2005; World Bank, 2007; UNCTAD, 2008; Commission on Growth and Development, 2008) have demonstrated that infrastructure investment is essential to increasing farmers access to input and output markets, stimulating the rural non-farm economy, building the economic base of rural towns, increasing rural consumer demand and facilitating the integration of rural areas into national and international economies. If it is accepted that agricultural water and rural infrastructure have not been comprehensively coupled with active markets, certainly in sub-Saharan Africa, the synergies that could be expected have not been realized. In addition, these synergies can be expected to spread beyond the immediate farm to market chain into the wider economy.

Growth will be boosted by accelerated investment in agriculture, particularly water and energy infrastructure from small-scale irrigation to larger hydropower facilities. Such investments contribute to agricultural growth and poverty alleviation by permitting intensification and diversification, increased farm outputs and incomes; increasing agricultural wage employment; and reducing local food prices, thus improving real net incomes in rural areas.

Investment in agriculture has, however, experienced a continuous decline since the 1970s. The drop-off in investment in agricultural water was mainly driven by the perception of the decline in rate of return, compared to alternative investments in other sectors but the recent surge in food prices and degradation of the food security situation show the limits of such short-sighted strategies. Indeed, the fact that the return on capital invested in agriculture rarely matches that in industry and urban services does not capture the multiplier and social benefits from rural investment, beyond the direct impacts on food security.

The consequences of low and declining investment are manifest in the comparative state of Africa s agricultural infrastructure. The world area under irrigation amounts to about 20 percent of the arable land area, while in Africa only 7 percent of arable area is irrigated (4 percent in sub-Saharan Africa). Moreover, there is a correlation between Africa s under-capitalization and its lack of competitiveness on global markets. This insufficient attention to agricultural infrastruc-

ture and the rural economy in general manifest in falling investment in water control, mechanization, fertilizer and other inputs which has had serious consequences for Africa where, in most countries, the agricultural output per capita keeps falling. Part of the solution will be investments in agricultural water and in the commercialization of production, but equally important is providing support to effect transitions from inherently vulnerable subsistence agriculture to more commercially oriented farming.

While public investments are needed to support growth, it is important to recognize that a substantial share of investment in agriculture is private: farmers across the continent invest a large share of their resources in their land. Indeed, statistics show that Africa is the only continent where agriculture has a positive net taxation rate on agriculture, while all other continents subsidize their agriculture. The 2008 World Development Report has clearly indicated that public investment in agriculture is badly needed to reverse the current declining trend in investments. The commitment of the 2003 Maputo Summit, to allocate within 5 years 10 percent of the national budget to agriculture, responds to this concern, but while some progress has been registered, the average allocation of all the African Union member countries is still far from reaching the agreed target.

Investing in water for agriculture and energy production is not a trivial exercise. For water management, the two principal initiatives out of NEPAD to put together domestic and the traditional ODA and FDI sources are the Comprehensive Africa Agriculture Development Programme (CAADP) and the Infrastructure Consortium for Africa (ICA). Both are supported by MDG Thematic Working Groups and specific networks such as AgWA and are nationally endorsed initiatives through which multilateral and bilateral support can be channelled with the help of the African Development Bank and the World Bank.

Demand for investment

While attempts to quantify the demand for public investment in water for agriculture and energy in Africa remain a difficult exercise, the available estimates concur in showing that current levels of investment remain much below targets. Projections of future investment in irrigation by 2050, based on FAO s Agriculture towards 2030/2050 indicate that the level of investment in irrigation, which will take place in Africa (excluding South Africa) on the basis of current trends, will be around US$56.4 billion including new build and rehabilitated systems. Such level of investment, however, will not be able to prevent current trends towards increased imports of major staples and therefore constitutes a baseline figure against which efforts towards improved food security should be measured. The NEPAD-CAADP (NEPAD, 2003) had estimated at US$37 billion the total investments needed between 2002 and 2015 in land management and water control in Africa. A similar figure, but for sub-Saharan Africa only, was obtained by the International Food Policy Research Institute (IFPRI) in a recent study on irrigation investment needs (IFPRI, 2008). A recent FAO/IFAD study (FAO, 2008) estimates as high as US$85 billion the total cost of water infrastructure that could be developed in support of rural poverty reduction in sub-Saharan Africa. In terms of energy needs, ICA estimates that to achieve 35 percent electricity access by 2015, sub-Saharan Africa (excluding South Africa) would require a total estimated cost of US$47.8 billion each year (shared almost equally between investment and operations) equivalent to 6.7 percent of sub-Saharan Africa s GDP, which is more than double the current spending on power (although only a fraction of these investments would be for hydropower).

The preparatory work to this Conference allowed new estimates to be produced for investment needs at national, regional and, finally, continent level. Concrete projects and programmes for water for agriculture and energy at different stages of implementation, (recently implemented, ongoing and pipeline), have been compiled for each African state and aggregated at continent level. Compiled project portfolios have been reviewed and validated by governments representatives on the occasion of the five regional workshops held prior to the Conference.

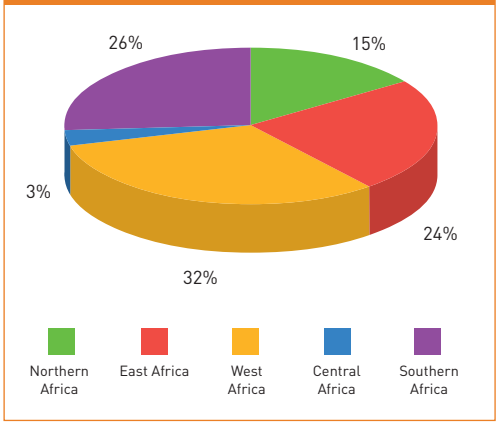
This exercise has shown that the cumulative amount of investment for ongoing and pipeline projects in water for agriculture and energy on the continent, excluding major hydraulic storage works, is US$64.6 billion (Table 4). The highest proportion of the cost is allocated to large-scale projects, including large-scale irrigation schemes development and hydropower projects. Similarly, 56 percent of the total investment envelope is expected to be exhausted in the medium term, showing a need to enhance planning for investments in the long term to ensure sustained and permanent growth in the agriculture and energy sector to meet food and energy security goals.

Table 4: Estimated investment envelope for Africa (in million US$)

Time Frame/Size of Project	Small scale water control	Rehabilitation of irrigation	Large Scale	Total
Short-term	2 385	778	7 818	**10 981**
Medium-term	7 041	3 509	28 207	**38 758**
Long-term	1 491	1 329	12 042	**14 862**
Total	**10 917**	**5 616**	**48 067**	**64 600**

The exercise demonstrated West Africa accounts for 32 percent of the continental investment envelope. Southern Africa, East Africa and North Africa have a share of 26, 24, and 15 percent respectively of the African envelope, while the residual of 3 percent is the share of Central Africa, indicating that more effort should be made in the region to undertake project formulation and feasibility studies in the water sector, particularly considering the as yet unexploited enormous hydropower potential (See Figure 4).

Figure 4: Regional contribution to the African investment envelope



Defining investment targets

Defining investment targets is rarely a clean exercise in planning, and not all countries have established plans and processes for their implementation. A statement of macro policy targets; with respect to food and energy security, poverty alleviation and growth, should be clear from the outset. Given the instrumental role of water in food security, the linkage with Poverty Reduction Strategy Papers (PRSPs) needs to be explicit and direct financial support to vulnerable groups should be clarified when an economic case for investment cannot be made.

It is important to appreciate the initial starting conditions. The state of the existing assets, their institutions and the policy context will influence further development. A comprehensive typology of current and future investment targets needs to be established and, if public money is to be used, a transparent inventory of public and private assets that use publicly administered water resources for productive use be created.

The state of existing institutions that allocate water, govern its use and operate and maintain infrastructure the software is of fundamental importance. Projections of investment requirements must include an evaluation of public and private capacities to absorb an increase in financial support and improve their performance in delivering regulatory and operational services. The functioning of public regulation, local government services, water user associations, catchment boards and public turnkey operations for bulk infrastructure are equally important. The value of new assets cannot be realized without them.

The link between national and regional initiatives

Attempts to compile the briefs for planned investments in water for agriculture and energy at the regional level have revealed a broad range of investment initiatives and a high degree of variability between neighbouring countries. This may well be an indication of inherent physical and political diversity, but it may also indicate where opportunities exist for trade, benefit sharing and the development of joint markets. There are three concrete fields in which regional integration is needed and can help enhance the viability of investments in water for agriculture and energy on the continent: river basin management, agricultural markets and electricity grids.

River basin management, as transport and trade corridors presents such opportunities and is well recognized as such (Sadoff and Grey, 2005). Most countries in Africa share transboundary rivers with their neighbours. As water resources develop, the need arises for better integration of national plans within a river basin management framework. Inter-basin transfers, when justified, require regional cooperation mechanisms. The development of regional markets for agricultural commodities can go a long way in improving the continent s capacity to feed itself while reducing the cost of food. Improved interconnectedness between countries, in terms of electricity provision through regional power grids, would translate into scale economies and subsequent reduction in the cost of electricity.

Prioritizing and phasing investments

The original CAADP document (NEPAD, 2003) recognized that the scale and phasing of water control and rural infrastructure were related, namely: (a) water control: short-term (water harvesting and micro irrigation), medium-term (rehabilitation of irrigation infrastructures) and long-term (continuation of medium-term initiatives and water basin management programmes and transfers); and (b) infrastructure development: rural infrastructure, storage facilities, markets, slaughterhouses, ports, etc. The short, medium and long-term priorities, as identified in the AfDB/FAO CAADP update, are expected to remain relevant, certainly for most of sub-Saharan Africa. For sub-Saharan Africa, what is now being selected as a programmatic focus is the rapid commercialization of key strategic crops at scales that are commensurate with the volume of regional demand, as identified by FAO (2006).

Given any set of policy directions, the development of a project or programme pipeline to be effective will need to be prioritized and graded. Not everything can be done at once and methods for screening both supply driven and demand driven initiatives according to financial, economic, social and environmental criteria will need to be applied. Further, since initiatives will generally be chasing scarce financial resources, some means of phasing investment to match finance availability needs to be anticipated. None of this has to amount to a master-plan approach, but can be done in an iterative and consultative fashion in consideration of realistic natural and human resource limits. The purpose of prioritization and phasing is to build in some measure of equity, certainly with respect to public expenditure and regional balance, and to avoid dilution of investment where only periods of concentrated investment such as building dams during dry seasons will bring results.

To this extent the CAADP approach to scale and phasing of investments remains relevant, but at the national level the generation of nationally owned recurrent and capital expenditure plans need to be adept at defining priorities and matching these with the various finance sources. It is suggested that an investment framework approach can help resolve confusion and duplication in water related investments.

Towards an investment framework approach

Simply stated, an investment framework is a method for combining sectoral typologies (such as irrigation schemes or power generation facilities), development objectives and time horizons in a way that facilitates strategic planning and the establishment of cost envelopes, and which can be applied at any hierarchical level within a sector and at any level of detail. As such, investment frameworks can be thought of as providing the space within which investment decision-making is both responsive to local needs and priorities and subject to cross-sectoral regulation, including natural resource management and environmental impact.

An investment framework translates specific policy measures in terms of programmes, projects and budgets, considering institutional, regulatory and legal as well as infrastructural measures, all of which can be clustered in terms of civil administrative or hydrological entities. For the investment framework to be effective it must define, in general terms, what needs to be done to achieve the objective in question. Guided or (where appropriate) constrained by the framework, decision-makers, beneficiaries and the development partners can then identify, select, prepare, finance and implement specific interventions that respond to those needs in a policy compliant fashion. Such an investment framework therefore has a regulatory aspect, and helps focus investments on the achievement of stated goals.

Irrespective of the sources of finance and the coherence of specific sector support, in the spirit of the Paris Declaration, it is important for individual countries to be clear about investment needs in water for agriculture and energy to address food security, poverty alleviation and to promote growth. An investment framework is necessary to make a sound quantification of overall finance needs in relation to specific policy targets. Over time such frameworks can be used to monitor the rate and balance of investment to determine whether a better structured sector or subsector is evolving and whether policy targets need to be modified or changed. This does not preclude the formulation of detailed projects but it does recommend that individual projects are recognized

and evaluated within the investment framework along with more programmatic demand led investments that may have shorter investment cycles. Such frameworks can also set the basis for reciprocation between governments and donors ensuring that the investment envelopes are both mutually credible and eligible.

The implications for Working Session 2

Working Session 2 will examine current investment portfolios, based in part on the results of the regional workshops, and discuss them in relation to stated development targets. Key questions may include:

a. Are current trends and investment projections in water for agriculture and energy in line with expected demand for food and energy?
b. How are priorities defined and applied to existing project portfolios? How do they match the need for efficiency and equity and how can public and private investments be better prioritized and programmed?
c. Do approaches to planning vary according to the nature of investment target (for example, poverty reduction or expanded commercial production)?
d. How can the demands for low intensity but highly distributed investments be calculated (as opposed to high intensity public infrastructure such as dams and conveyance canals) and how can their impact be assessed in terms of poverty reduction and economic growth?

Theme 3: Financing mechanisms and implementation strategies

Introduction

The purpose of the Sirte Conference is to examine ways to open up the policy and investment space for water for agriculture and energy in securing food and energy supplies in the face of increased competition for natural resources and climate change. The current and projected gaps between demand and domestic supply of food and energy production will not be closed if current trends and investment responses continue. The use of pro-active investment frameworks is needed to set out the investment requirements in water infrastructure and management and monitor the impact of investments. Such frameworks are seen as one way of integrating the interests of the diverse economic sectors at the national level and matching these with capital and recurrent government budget allocations of and the eligibility requirements of development banks and bilateral donors. The frameworks also allow explicit recognition of private investment from individual farmers, Foreign direct investment (FDI) and other sources. Crucially, on a continent dependant upon shared water resources, the frameworks can offer a transparent means of appraising joint investment opportunities. The hope is that investments can be geared towards sustainable development of water resources, recognizing comparative advantage and identifying shared benefits.

It is stressed that policy alignment, public and private institutional capacity, and an enabling environment that can attract and implement much larger proportions of investment in agriculture and energy production are prerequisites. If investment targets can be identified and prioritized with a sufficient degree of precision, then this aspiration has to be set against the fact that African agriculture and related infrastructure is under-capitalized in relation to its economic importance. Equally, penetration of energy services into the rural economy has lagged and the opportunities to boost agricultural productivity through mechanization and processing are not sufficiently distributed.

The evidence from analysis of domestic finance, Official development assistance (ODA) and FDI shows a declining trend over the past 30 years. However, there are signs of new sources of financing through non traditional donors and foundations like the Alliance for a Green Revolution in Africa (AGRA) and the Gates Foundation, and agricultural joint ventures with countries keen to secure food and industrial crop supplies. The role of countries such as Brazil, India and China is becoming more prominent (World Bank, 2008b) along with the interest of some of the Gulf countries.

Projects/programmes?

Choices between project-based and programme-based planning need not be mutually exclusive. Investments in agricultural water are always going to implicate other economic sectors and involve water allocation and environmental trade-offs. For this reason, it may be wise to adopt a programmatic approach, rather than re-negotiate water allocations on a project by project basis.

In recent years, political and fiscal devolution has shifted much of the decision-making and financial responsibilities for providing services to local levels of government. This has raised two major questions. First, does this level of government have the capacity to undertake the planning and construction of the physical infrastructure and its management at the level of service demanded by customers? Second, given the limited available public finance and foreign exchange risks associated with some loan arrangements, how can this level of government fund the needed investments? There is growing recognition that mobilizing capital from local financial markets to tap domestic savings is essential to financing viable infrastructure services. Equally, the need to improve the capacity of this level of government to develop and use asset management plans and to optimize the choice of funding mechanisms for new investments, rehabilitation and maintenance is crucial to the successful provision of rural infrastructure.

In the past project design and implementation has been largely supply driven and publicly financed. Recent participatory approaches are producing more responsive, demand driven results. Key areas for improvement are to ensure that viability and profitability are targeted throughout, that users are genuinely empowered, and to improve overall management and supervision processes in adding value.

Financing mechanisms opportunities in local and regional development

The role of public funding in the provision of water and energy services has been dominant and will remain important. However, alternative approaches including forms of decentralization have evolved. Decentralization is a means of developing effective, responsive, demand-led services and, in particular, making government services more locally accountable. It could enhance the development impact of agricultural water investments, but achieving a balanced mix of local small-scale and larger investments presents a complex political, technical and administrative challenge demanding strong management capacity at both local and central levels. For instance, in Tanzania s Agriculture Sector Development Programme, the creation of a district level investment fund, to be blended or combined with a national irrigation development fund, is seen as one way to reconcile local needs with larger-scale national priorities. The use of public funds to develop access and power supplies to large blocks of agricultural land for commercial development is another approach that has been used by other countries such as Zambia and Namibia.

The role of private funding: where government revenues are not strong enough to generate capital expenditure programmes, and cope with operation and maintenance, public-private finance initiatives are starting to play prominent roles where long-term returns to capital can be assured. Even privately-funded investment such as Kenana Sugar in Sudan has shown that long-term planning and implementation in particular crop sectors can succeed where scale and quality of production can be assured.

The role of International Financial institutions (IFIs) (mainly the World Bank, AfDB, IFAD and subregional banks) will remain fundamental in supporting macro-economic approaches, alongside traditional bilateral and emergent donors. Country Water Resource Assistance Strategies (CWRAS) were designed as a means of integrating World Bank assistance for all the water-related subsectors within an integrated water resource management approach. As such, it is a prime instrument for linking irrigation sector strategy and investment needs to the PRSP and the overall country assistance strategies (CAS) and could ensure that agricultural water is adequately represented in CWRAS, the PRSP and the CAS.

Finally, global and regional programmes in finance initiatives are showing signs of convergence: the two main umbrella programmes that implicate water management, and are applicable to agriculture and energy, are the NEPAD-CAADP and the G8-led Infrastructure Consortium for Africa (ICA). One tool that will be used to provide support to the CAADP processes is the Multi-donor Trust Fund (MDTF) being established at the World Bank with support from several development partners (USAID, DFID, the EC and others) to support the CAADP processes at country and Regional Economic Communities (RECs) levels.

Strategies to accelerate investment flows toward priority targets

The great need for infrastructure has motivated regional economic organizations to push for an ambitious programme of private participation. However, beginning to solve Africa s infrastructure investment problems will need greater financial commitments from governments and donors along with a progressive policy and institutional reform agenda as part of an enabling investment

environment. In agriculture, three principal areas of policy and investment intervention can be identified:

- At micro level, individual farmers and households need to be assured stable engagement with land and water resources. Systems of land tenure and water use rights need to be flexible to promote the realization of comparative advantage in food staples and cash crops. However, they need to be matched by access to rural credit and finance that suits specific agricultural systems and are not just linked to annual repayment or harvest production, but allow longer-term finance of farm inputs. Such initiatives will have to be complemented by the dissemination of technology and good practices in water control and agricultural productivity.
- At irrigation scheme level, a focus on rehabilitation that includes modernization and management transfer, offers tangible scope for extracting the full value out of sunk costs and reducing pressure on public funds. Such programmes are essential before longer-term investments in new-build can be evaluated.
- At macro level, government policy and investments need to be aligned to allow local markets for agricultural produce to become more effective in meeting local demands. This will require investment in the key public goods such as roads and storage but will also involve a more progressive role for large-scale private investment. Creating these conditions while also guaranteeing allocation of sovereign resources through negotiation of shared water resources, for instance, are key considerations.

In terms of prioritization and phasing of investment, the following can be anticipated:

(a) Short-term: focus on small-scale water control in (water harvesting and micro irrigation).
(b) Medium-term: focus on rehabilitation of irrigation schemes and new build of medium sized schemes.
(c) Long-term: continuation of medium-term initiatives and the inclusion of larger scale water basin water management programmes and transfers.

At the international level, any attempt to accelerate investment for food and energy security must remain coherent with the principles of the Paris Declaration on Aid Effectiveness and the Accra Agenda for Action, and therefore build on available funding mechanisms. Examples exist of vertical funds to address specific issues at regional level. IFAD, for instance, is discussing its eighth replenishment seeking a substantial increase in resources to support smallholder agricultural development. An African Fertilizer Financing Mechanism, hosted by ADB, designed to lower unit costs of fertilizer throughout Africa, was recently established but is not yet adequately funded. The question as to whether such vertical funds should be promoted, or existing financing mechanisms should be scaled up to accommodate the additional financing is worth considering.

The implications for Working Session 3

Working Session 3 discussed financing and implementation approaches in relation to national and regional priorities for acceleration of investment programmes in water for agriculture and energy in Africa. Key questions including:

a. What types of financing mechanisms will suit short-medium-and long term investments?
b. What is the potential for public/private partnership in investment and management of water infrastructure for agriculture and for energy? Are there differences between the two

sectors? What conditions must be met to promote private investments?

c. What implementation strategies are needed at regional, national and local levels to ensure the viability of proposed investments? In particular, what institutional, policy and capacity-building reforms are needed to boost and secure return from investments in water for food and energy security?
d. What is the scope for vertical funds in support of water for food and energy security, and relation with existing funding mechanisms (ICA)?
e. What is the scope for enhanced regional integration in response to increased food and energy demand on the continent?

Conclusions

The overall economic and agricultural growth performance has improved among African countries over the last ten years. Despite this positive growth trend and Africa s potential, the continent is lagging behind in terms of energy and agricultural productivity, with serious implications for development and trade balance, making Africa more vulnerable to rising/fluctuating food and energy prices. On the other side, Africa has a vast potential of water resources for agricultural expansion and renewable energy production that could be exploited.

Agricultural and energy underperformance in Africa is directly linked with under-investment in both sectors. Although the agriculture sector is the main engine for the economy in most of the African countries, it has consistently received less than 10 percent of the national budget in most countries, yet its contribution to gross domestic output is between 20 and 50 percent for most African countries. In the case of Africa, agricultural spending, as compared to total government spending, declined by a third in this period. Moreover, development aid for agriculture dropped from 18 percent in 1979 to just 2.9 percent in 2006. From 1993 to 2003, international aid for irrigation and drainage and for hydropower also declined substantially. Based on publicly available data on foreign aid to African agriculture by Organization for Economic Co-operation and Development (OECD) countries, the share of total overseas development assistance to the sector is shown to have steadily declined (bilateral and multilateral combined) from a high of about 26 percent in the late 1980s to under 5 percent by 2005. All top six bilateral donors to the region have also witnessed declining shares of aid resources allocated directly to agriculture. Therefore, the positive growth trend will be sustained and boosted by accelerated investment in agriculture, particularly water and energy infrastructure, from small-scale irrigation to larger hydropower facilities.

Substantial progress has been made in terms of national, regional and international commitments. In 2002, NEPAD s Comprehensive African Agriculture Development Programme (CAADP) offered a framework for investment in agriculture in Africa, with special emphasis on land management and water control. At the UN Conference on Financing for Development, at Monterrey in 2002, governments and agencies committed themselves to increasing their aid by 25 percent, which would raise an extra US$12 or so billion a year. In Maputo, in 2003, the Heads of State and Governments of the African Union committed to allocating at least 10 percent of their national budgetary resources for agriculture and rural development. In 2004, the Sirte Declaration

focused on ways to implement integrated and sustainable development of agriculture and water in Africa. In 2005, the Report of the Commission for Africa titled Our Common Interest highlighted the need for investment in water and energy infrastructure. In the context of soaring food prices and after the High Level Conference held in Rome in June 2008, several countries and organizations announced their contributions to help overcome this crisis totalling US$10.8 billion which, added to the funds pledged at the beginning of the year 2008, gives a sum of US$22.26 billion.

Unfortunately, progress remains too slow. Estimates indicate that about a dozen countries have reached or exceeded half of the Maputo budget target, but only a handful have achieved it. Achieving such growth rates not only calls for high levels of expenditures but also greater efficiency in planning and executing these expenditures. On a positive note, the climate for official aid is now better than for some years, and with the new commitments made, one can look forward to a reversal of the recent downward trend.

What is necessary for African countries to do is to learn from the successes/failures of the last ten years and undertake the necessary policy and investment measures to accelerate and broaden the growth process. Greater impulse should be given not only to create new commitments to investment in water for agriculture and energy in Africa, and renew those already agreed upon years before, but also to establish effective measures to bring these commitments into a timely-set implementation. Just as African countries have to make greater progress towards meeting the Maputo budget target, development partners will need to increase investment in the sector to help broaden and accelerate the recent economic and agricultural growth recovery process. Food security and poverty reduction cannot be accomplished without substantial donor support for agricultural water development and management.

The Sirte 2008 Conference brought together the Governments of all the African Countries, international development organizations, bilateral and multilateral donors, representatives of the civil society and research organizations. All these institutions are pooling their knowledge and efforts to increase investments in water development for agriculture and energy in Africa.

The Conference, with its clear action-oriented vision, went beyond stocktaking of the major issues regarding water for agriculture and energy and the impacts of climate change. It indeed, offered reasonable estimates of investment needs for water for agriculture and energy in each African country and at regional level, assessing concrete projects and programmes in the short, medium and long term. The Conference served as a formidable platform to boost investments in water, promoting a strong and univocal re-commitment by the Governments of Africa and development partners to engage in a long-term investment programme for water development in support of agriculture and energy and facilitated Partnership Agreements for food and energy security in Africa. A declaration and plan of action for the short, medium and long term followed the decisions made and concrete mechanisms were adopted to guarantee an adequate follow-up of the agreed action plan.

The success of the Sirte 2008 Conference and the accomplishment of its ambitious objective to boost financing for water for agriculture and energy in Africa rely on the approach adopted both in the preparatory and in the follow-up process. The Conference, with its focused, outcome-oriented Action Plan offers the potential to accelerate progress in the African continent, based on five key strategic elements:

1. **First**, the country based model remains at the center of the efforts to boost development outcomes through the enhancement of water control in Africa. The innovative approach adopted by the Conference will, however, integrate the country based view into a wider river basin approach, identifying the scope for synergic actions at both levels.
2. **Second**, the process is characterized by a markedly country-driven, bottom-up approach. The National Investment Briefs, prepared in close collaborations with the National Governments, will guide dialogue and thinking for country strategies and the efforts will concentrate on areas that respond to emerging demand from countries. The investment needs estimated, based on concrete projects and programmes, will be prioritized accordingly with the National time-bound targets to achieve results.
3. **Third**, the effort will be directed to increasing and sustaining the flow of funds towards water management while enhancing the quality of the interventions. This will be achieved through the formulation of overall water management policies and action plans, based on joint options analysis and country/regional priorities.
4. **Fourth**, the harmonization of partner programmes and approaches is critical to capturing synergies, taking advantage of complementarities, avoiding duplication of efforts and, ultimately, enhancing development impact and sustainability of investments. Therefore, the Conference approach will permit the alignment of policy dialogue (amongst groups of donors) and of project implementation arrangements with the objective of developing a programme approach and co-financing for water for agriculture and energy.
5. **Fifth**, as a response to the poor performance of investment operations often shown by the agricultural and energy subsectors, several countries have started implementing innovative operations that aim to address some of the past weaknesses. However, limited information sharing at regional and national levels restricts knowledge, adoption and scaling up of successful innovations and best practices. Thus, the Conference will concretely strengthen national and regional Information and Development associations and networks and enhance the quality of information transfer concerning the management of water resources.

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