

IRRIGATION DEVELOPMENT CHALLENGES FOR THE LEAST DEVELOPED COUNTRIES IN AFRICA



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International Commission on Irrigation and Drainage

Report of the ICID Task Force
On
Priority Issues of Least Developed Countries in Africa

Contributors

Er. I. K. Musa (Nigeria), Chairman, African Regional Working Group (AFRWG)

Mr. Moise Sonou, Member, Association for Irrigation and Development (ARID)

Dr. Sizwe Makhize (South Africa), Member, African Regional Working Group (AFRWG)

Dr. Hussam Fahmy (Egypt), Member, African Regional Working Group (AFRWG)

Er. M. Gopalakrishnan, Member, African Regional Working Group (AFRWG)



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International Commission on Irrigation and Drainage (ICID)

October 2010

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PRIORITY ISSUES OF LEAST DEVELOPED COUNTRIES IN AFRICA

PREAMBLE

The report is an outcome of debate and contributions from Stakeholders in Africa Region in the identification of the priority issues in irrigation and drainage practices that are critical to LDCs in Africa, and ways in which ICID can assist in building capacity to address them. The term 'Least Developed Countries (LDC)' describes the world's poorest countries characterized by endemic poverty, human resources weaknesses and economic vulnerability that is partly contributed by the instability of their agricultural production which is dependent on rainfed with its vagaries.

Out of the 51 countries classified as LDCs, 34 of the 54 countries in Africa are among them. They have predominantly agrarian economy with underdeveloped irrigation potentials, and faced with poor data management, inconsistent and poor policies, poor environmental stewardship, insufficient investment and high cost of irrigation development, non-inclusive and non-participatory governance, weak government agencies, threats of climate change, weak research capacity among several other challenges.

The priority irrigation and drainage issues were selected based on their relevance to these challenges as well as ways they impact on the majority of the citizens of LDCs who live below poverty line. Consequently, the following were identified as the most critical issues that ICID could assist through advocacy, capacity building, synthesis, dissemination of knowledge and facilitation:

- Improvement of database management and information sharing;
- Articulation of pro-poor irrigation and drainage policies;
- Participatory Irrigation Management and empowerment of farmers;
- Training and capacity building of all stakeholders;
- Increased technological learning, develop opportunities to interface between research and manufacturers with farmers.
- The International Executive Council (IEC) of the International Commission on Irrigation and Drainage (ICID) expressed its desire to benefit from the perspectives of Regional Working Groups from Asia and Africa on the priority issues of the Least Developed Countries (LDC) in the region. This document is the outcome of debate and contributions from Stakeholders in Africa Region in the identification of the priority issues in irrigation and drainage practices that are critical to LDCs in Africa, and ways in which ICID can assist in building capacity to address them. Obviously, this should ideally be preceded by the admission of the Least Developed Countries (LCD) into the ICID family to enable them to fully benefit there from. Important as it is, that feature is not elaborated here as it would require interaction with funding agencies with a propensity to support the cause given its strong relationship with 'Food Security'.

PREAMBULE

Le rapport est le résultat des débats et contributions des responsables de la région africaine pour identifier les questions prioritaires critiques dans les pratiques d'irrigation et de drainage des pays africains les moins développés, et les moyens par lesquels la CIID peut intervenir à les aider dans le processus de renforcement de la capacité pour traiter ces questions. L'expression « Pays les moins développés » désigne les pays les plus pauvres du monde caractérisés par la pauvreté endémique, la faiblesse des ressources humaines et la vulnérabilité économique attribuée en partie à l'instabilité de leur production agricole qui dépend des précipitations et de leur irrégularité.

Sur le total de 51 pays catégorisés comme les moins développés, 34 sur 54 pays africains sont parmi d'entre eux. Ces pays ont surtout une économie agraire ayant des potentiels d'irrigation sous-développés et une gestion inadéquate des données, des politiques inconsistantes et non adéquates, une pauvre gestion environnementale, des investissements insuffisants, les coûts de développement très élevés, la gouvernance non participatoire, des agences gouvernementales incompétentes, des menaces de changement climatique, et le pauvre talent en matière de recherche. Tout ceci s'ajoute à d'autres défis.

Les questions d'irrigation et de drainage d'ordre prioritaire sont retenues selon leur pertinence à ces défis, et la manière dont elles exercent un impact sur la majorité des citoyens des pays les moins développés qui vivent au niveau de pauvreté le plus bas. Ainsi, les questions suivantes ont été identifiées comme les plus critiques, et la CIID peut apporter sa collaboration pour les résoudre par voie des expertises, de renforcement de la capacité, de synthèse, de diffusion des connaissances etc. :

- * Amélioration de la gestion de la base des données et partage des informations
- * Intervention des politiques d'irrigation et de drainage qui favorisent les pauvres
- * Gestion d'irrigation participatoire et d'évolution des pouvoirs aux fermiers
- * Formation et renforcement de la capacité de toutes les parties prenantes
- * Enseignement technologique avancé et interface des fermiers avec les chercheurs et les fabricants

Le Conseil Exécutif International (CEI) de la Commission Internationale des Irrigations et du Drainage (CIID) a exprimé son désir de bénéficier des avantages des perspectives des Groupes de Travail Régionaux Asiatique et Africain sur les questions prioritaires des Pays les Moins développés (PMD) de la région. Ce document est le résultat des débats et des contributions des responsables de la région africaine pour identifier les questions prioritaires critiques dans les pratiques d'irrigation et de drainage des pays africains les moins développés, et indique les moyens par lesquels la CIID peut les aider dans le renforcement de la capacité pour traiter ces questions. Evidemment, ce processus doit suivre l'adhésion des Pays les Moins développés (PMD) à la famille CIID pour leur permettre de bénéficier de ces avantages. Aussi important soit-il, cet aspect n'est pas élaboré ici.

INTRODUCTION

The term 'Least Developed Countries (LDC)' describes the world's poorest countries with the following three criteria:

- **Low-income criterion** - based on a three-year average estimate of the gross national income (GNI) per capita (under US\$ 750 for inclusion, above US\$ 900 for graduation);
- **Human resource weakness criterion** - involving a composite Human Assets Index (HAI) based on indicators of: (a) nutrition; (b) health; (c) education; and (d) adult literacy;
- **Economic vulnerability criterion** - based on indicators of the instability of agricultural production; the instability of exports of goods and services; the economic importance of non-traditional activities (share of manufacturing and modern services in Gross Domestic Product (GDP)); merchandise export concentration; and the handicap of economic smallness.

Of the 53 African states, the 34 as shown in Table I are Least Developed Countries (LDC). Of the remaining 17 LDCs, 14 are in Asia/Pacific (Oceania) region, 1 in the Middle East (Yemen) and 2 in the Caribbean/Latin America (Figure 1).



Figure 1. Least Developed Countries (LDCs) in the world

Table I. The Least Developed Countries (LDC) in Africa

<i>Angola</i>	Benin	<i>Burkina Faso</i>	Burundi
Cape Verde	Central African Republic	<i>Chad</i>	Comoros
Democratic Republic of Congo	Djibouti	Equatorial Guinea	Eritrea
Ethiopia ¹	Gambia	Guinea	Guinea-Bissau
Lesotho	Liberia	<i>Madagascar</i>	<i>Malawi</i>
Mali	Mauritania	<i>Mozambique</i>	Niger
Rwanda	<i>Sao Tome and Principe</i> ³	<i>Senegal</i>	Sierra Leone
Somalia	<i>Sudan</i>	<i>Tanzania</i>	Togo
<i>Uganda</i> ²	Zambia		

1 **Bold**- Active member; 2 *Italics* – Deemed to be inactive;

3 **Bold and Italics** – Admitted but not joined as yet

All of the above criterion point at poverty as the most critical challenge of the LDCs. The poverty and indeed economic vulnerability of the LDCs is contributed in part by the instability of their agricultural production. Agriculture employs the majority of their citizen. Irrigation is among the solutions advanced as critical for poverty alleviation especially in LDCs in Africa.

With an average of about 70% of the population living in rural areas and about 45% of the population living on less than \$1 per day, the role of agriculture and indeed, irrigated agriculture is essential if not critical in the eradication of poverty and food insecurity in LDCs. Agriculture, accounts for between 30-60% of the GDP, employs as much as 70%. Irrigation has potentials to enhance opportunities to generate income and reduce poverty, both directly and indirectly. Some of the direct effects include: higher incomes (through higher yields, cropping intensity and diversification towards higher value crops); higher rural employment; and lower food prices (for the net food purchasers especially the urban poor). Furthermore, the 2008-09 cereal price rise, especially rice provided opportunities for poverty reduction in the LDCs. The price hike of rice in Senegal made its local production economically attractive to the peasant farmers and relatively competitive compared to imported brands. This provided incentive for local production. On the other hand irrigation often considerably reduces the seasonal price hike by way of providing steady production of food crops. The indirect effects comprise of: higher production, consumption and labour demand in the surrounding upstream and downstream non-farm economy. This lend credence to the growing realization that irrigation is one of the better investment alternatives for poverty reduction. This should not, however, be misconstrued to mean that improved education, better health, clean water and better roads are less important or are inappropriate investments; but rather that they are not sufficient to generate rural incomes, which are key to poverty reduction.

Irrigation is critical for moving LDCs' agriculture out of the extensification-based-growth, and therefore, out of poverty. Irrigation is the key for agricultural intensification. Irrigation opportunities should, however be explored from a broader perspective that includes a wide spectrum of agricultural water management types (Figure 2).

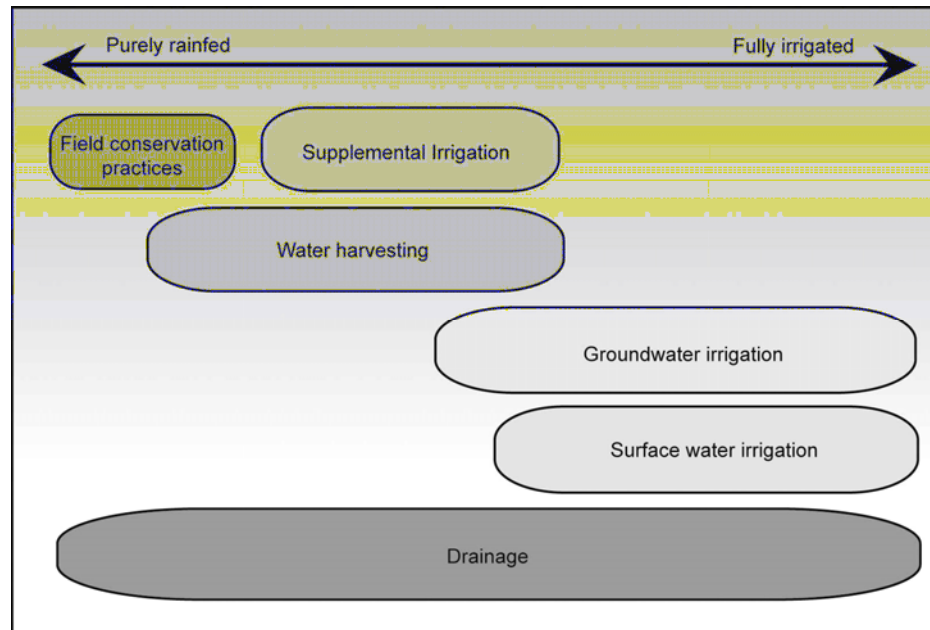


Figure 2. Spectrum of Agricultural Water Management (International Water Management Institute {IWMI}, 2007)

METHODOLOGY

At the 53rd IEC meeting and 18th Congress held in Montreal, it was resolved that the International Commission on Irrigation and Drainage (ICID) should pursue a proactive strategy of paying greater attention to the weakest link - the LDCs and advancing ways in which the organization could assist them. Accordingly, two Task Forces were created chaired by the then Chairmen of the Regional Working Groups for Africa (Engr. I. K. Musa) and Asia (Dr. S. Taniyama).

The Task Force¹ on Least Developed Countries in Africa (TF-LDCsAF) convened its first meeting during the 55th IEC meeting in Moscow in 2004, the second meeting was held during the

¹ The membership included Engr. I. K. Musa, Chairman (Nigeria), Mr Moise Sonou (ARID), Dr. Sizwe Makhize (South Africa), Dr. Hussam Fahmy (Egypt), and Er. M. Gopalakrishnan, Secretary General (ICID).

57th IEC meeting in 2006 in Kuala Lumpur. At the second meeting a sub-committee comprising Messrs Sonou and Mkhize was given the responsibility to prepare and distribute a suitable questionnaire to the LDCs of Africa, with a view to receive the response well in advance of the 58th IEC meeting in Sacramento (October, 2007) where the third meeting of the Task Force was scheduled. Unfortunately, no response was received. It was then decided that the Chairman should collect primary data pertaining to the LDCs in Africa from FAO (1995) Water Report No.7: 'Irrigation in Africa in Figures'. The draft report was presented at a special session organized during the 2nd African Regional Conference held 6-9 November 2007 in South Africa. Various papers and presentations at the Conference also provided valuable inputs. Furthermore, several comments and inputs were received which enabled the Chairman to prepare the draft report, which was circulated to all stakeholders for comments and observation preparatory to the joint special session with TF-LDCsAS in Lahore, Pakistan during the 20th ICID Congress. Group could however interact in the sidelines of a FAO organized High Level Conference on "Water for Agriculture and Energy in Africa: The Challenges of Climate Change" in December 2008 in Sirte, Libya. Many other country members were also available for consultation and Secretary General, ICID too participated. The final joint report of LDCs was to be presented at the 60th IEC meeting and 3rd African Regional Conference to be held in 2009 in Abuja, Nigeria. However, with a change of venue for the IEC, it was not possible to convene the meeting in Abuja as envisaged. The 60th IEC meeting took place in New Delhi where Dr. Adama Sangare chaired the proceedings.

THE BACKGROUND AND CONTEXTS

The irrigation potential of the continent is estimated at more than 42.5 million ha. Only about 13.4% is under irrigation (FAO a, 2005). Issues which have hindered expansion and development include amongst other things, weaknesses in basic infrastructure (e.g. transport, utilities and communications) and the management of irrigation scheme and water distribution which is usually under public control. Institutional capacity for research and extension is weak. In order for agriculture to develop, there is a need for a renewed emphasis on policies and on building appropriate institutions (FAO, 2007).

BASIC FACTS ON IRRIGATION DEVELOPMENT

Irrigation got introduced to almost all LDCs in Africa relatively recently, with the notable exception of Sudan and some Nile countries. Population growth, urbanization and the resultant growing demand for rice and wheat have increased the demand for irrigation; but deteriorating economic conditions and declining public investments by donors and private financing have dampened irrigation development.

Box 1: FACTS, PERSPECTIVES AND IMPACTS:

- over the last 4 decades, only 4 million ha of new irrigation was developed in Sub Saharan Africa (SSA) as compared to China that added 25 million ha and India 32 million ha; which translate to least irrigation development in SSA than in any other region of the World;
- out of the 62 million hectares potential, only 4.0 million hectares (or 6.5% of the potential) have been equipped for irrigation (this is about twice the irrigated area of Mexico, and about the irrigated area of Iran alone);
- Water withdrawals for agriculture accounts for 4.0% of total renewable water resources, even if all land suitable for irrigation were to be developed, it would consume only 12% of what is “available”.

Africa as a whole has not developed irrigation at the pace witnessed in other developing nations particularly in Asia. The continent receives, on an average, 124 mm less precipitation than the world average. As the rainfall is not evenly distributed, irrigation expansion in some countries was driven by rainfall availability. Furthermore, the development on the continent was uneven. About 31% of the irrigated area located in Egypt while five other countries Nigeria, Morocco, Algeria, Tunisia and Libya account for a further 25%. Of the remaining 44% that include all of the LDCs about 70% are located in Sudan and Madagascar. Some key parameters like - geographical area, population, cultivated area, irrigation potential, area equipped for irrigation, and some key socio- economic indicators of LDCs in Africa are shown through Annex 1 to 3.

Table 2. SSA - harvested irrigated crop area (in 1,000 ha)

	Rice	Other Cereals	Vegetables/Roots Crops and Tubers	Industrial Crops	Fodder	Trees, Other Crops	Total
Total	1,488	1,420	778	1,173	560	451	5,870
Percentage	25	24	13	20	10	8	100

Source: FAO 2005

Irrigation increases the value of agricultural production by at least thrice. FAO (1987) reported that although the area under irrigation constituted only about 7% of the cultivated area in 43 countries that include all the LDCs (as at 1970-1980), yet it provided 20% of the value of all the agricultural crops harvested in those countries. The harvested irrigated crop area in the sub-Saharan Africa is as shown in the Table 2. The agricultural water managed areas by type for sub-Saharan Africa are shown in Figure 3.

Generally, sub-Saharan Africa (SSA), where all the LDCs in Africa are located, has less surface water and a higher rate of evaporation than most other developing regions of the world, and the flows of most of the main rivers, with the principal exception of the Zaire river, are subject to large seasonal variations. It may also be noted that only three rivers Senegal, Niger and Nile flow through the Sahel region. Consequently, most of the major rivers would require substantial regulation if they are to

supply irrigation water reliably throughout the dry season. Of course, International water as an issue should not be ignored, as well as downstream impacts. Furthermore, although some 10% of Africa is underlain by high yielding aquifers, they are deep seated and thus costly to serve as source of irrigation water. Many of the coastal deltas and floodplains contain sedimentary basins with very shallow aquifers, which are often overexploited with resultant contamination by sea water intrusion. These characteristics all combine to limit the irrigation potential in the LDCs in Africa compared to other regions.

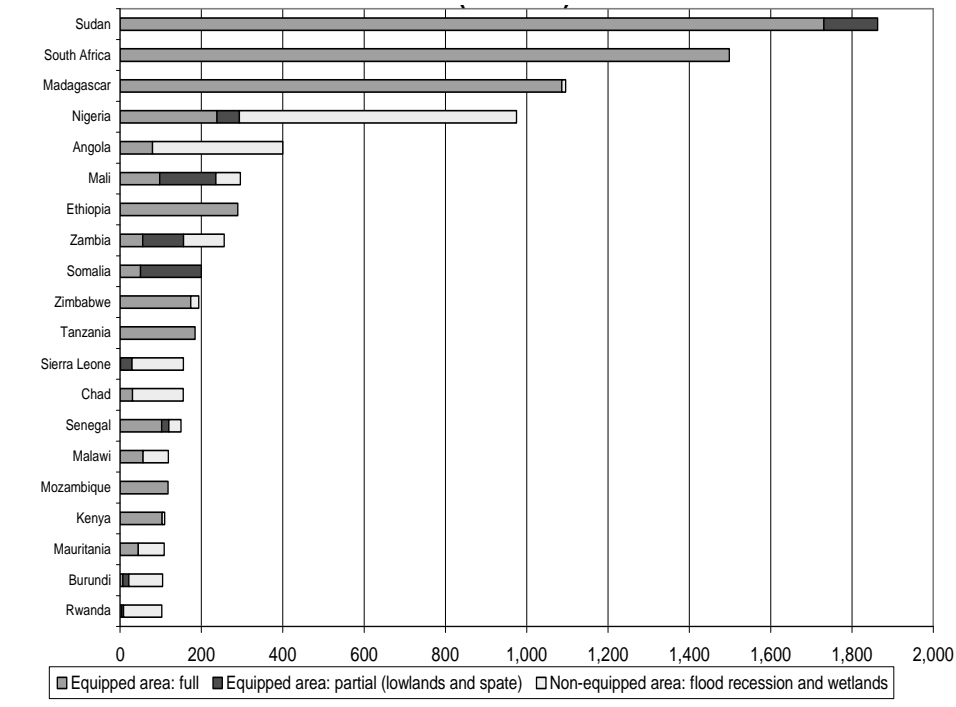


Figure 3. Agricultural Water Managed Area by Type (in 1,000 ha) for sub-Saharan Africa (Source: Darghouth, 2007)

POVERTY AND GOVERNANCE

Several countries in Africa are often faced with deep rooted poverty, malnutrition and inadequate food production which got further aggravated by problems such as high population growth, low agricultural productivity, high natural and man-made tragedies such as climate variability and changes, conflicts and war (*Awulachew 2007*). It is seen that though Africa has sufficient natural capital, the low level of development of physical, human, financial and social capital, has resulted in the continent's low productivity characteristics.

Most LDCs in Africa are agrarian economies. Most societies derive their livelihoods from cropping, fisheries and livestock farming. Agriculture, in most cases is still subsistence rather than commercial, for most. The share of agriculture in the Gross National Product of most LDCs in Africa is still above 60%. No clear indication of priorities is seen. It is probably a sign of arrested development, whereby these countries have no other options but agriculture. Unemployment is

relatively very high. As such, many people lack basic necessities and social needs such as shelter and education. Among the LDCs, a substantial proportion of people survive with less than \$1 per day. Although some of the LDCs are endowed with natural resources, such resources are not developed to benefit those societies.

Lack of skilled masses is also a major challenge for most LDCs. This does not only result in restricted development but also lead to socio-political challenges within and between the nations. This further impacts negatively on prospects of socio-economic development.

The gradual decline of external grant funding options in the recent past has resulted in several LDCs failing to maintain their irrigation infrastructure (where it exists), making it difficult to operate effectively in order to produce food. Given a range of other challenges that exist, such as poor infrastructure, most LDCs no more invest in irrigation development, irrespective of the substantial demand for food.

Irrigation development is unaffordable for all the LDCs in Africa. This, together with unavailability of adequately skilled technicians makes it impossible for such countries to pursue irrigation farming. In addition, limited access to markets as well as economies of scale erodes any interest that these countries might have in agri-business.

The common characteristics of all the LDCs, is the tragic level of poverty that prevail in all of them. The majority of their citizens are chronically afflicted with not only material poverty, but more devastatingly, with poverty of ideas that is largely a function of the limited opportunity they have for human development and pursuit of productive livelihood. If you remove the element of poverty in them you would have moved significantly towards a definitive solution to elevating these nations out of the rank of LDCs. There is obviously nothing more urgent and important than effective and sustainable anti-poverty strategies by the stakeholders in LDCs. Irrigated agriculture can offer a great opportunity in this regard.

FOOD INSECURITY AND THE NEED FOR IRRIGATION

In the 34 LDCs, the proportion of the undernourished has remained around 38% since 1970's. Two or three out of five people in the LDCs in Africa are not having adequate food (Diouf, 2003). In addition, civil strife and wars have adversely affected millions of people in these nations. Consequently, of the estimated close to 800 million people that remain hungry and poor – 650 million of them live in the least developed countries (Diouf, 2003). However, while in South Asia, it is predicted that the number would diminish sharply, in Africa the number of undernourished is projected to increase by about 100 million to over 300 million, with almost all being in the LDCs (FAO, 2005).

This would arise from near doubling of the net cereal trade deficit (from 27 to 50 million tons) for Africa as foreseen by FAO. The soaring food prices and the escalating impacts of climate change is taken as fact that worsen the situation, while bio fuel production is ignored. This is more ominous given the precarious balance of payments situation of many of these LDCs, and the fact that many of them finance their growing food import requirements from agricultural export earnings. Consequently, the New Partnership for African Development (NEPAD) has suggested that their

domestic production would need to grow by at least 4% per annum for 20 years rather than the average global projection of 2.7% annually and as against the 2% recorded in the past decade.

FAO (2005) has identified three principal causes of food insecurity in LDCs. These are namely:

- low agricultural productivity due to technological, policy and institutional constraints;
- high seasonal and year-to-year variability in output and food supply - often caused by unreliable rainfall, failure to deal with issues of climate changes and insufficient water control infrastructure;
- the lack of off-farm employment opportunities that contributes to uncertainty and low incomes.

TECHNOLOGY NOT ADAPTED TO THE ENVIRONMENT

There is limited range of off-shelf agricultural technology that could be utilised without modifications to suit local conditions in Africa. Significant gaps ranging up to 60-100% between experimental and real farm yields are commonly recorded. To close these gaps would require several strategies that would make the technology attractive and the complementary support services and inputs accessible and affordable to the predominantly low-resource farmers. The latter includes appropriate macro- and micro- socio-economic policies and a supply and marketing system that make such technology affordable.

POOR ENVIRONMENTAL STEWARDSHIP

'Soil mining', the removal of soil nutrients by plants in excess of that returned is also considered to be a serious problem, and a critical constraint to production growth. FAO reports that in inter-tropical Africa a total of 9 million tonnes of plant nutrients were lost in 1983 and projected that the losses may have reached 13 million tonnes by the year 2000. This obviously has implications on both agricultural productions as it has on soil conservation, because vegetative cover that is essential to minimize soil erosion and conserve soil moisture depends on soil fertility. There is significant potential for increasing agricultural productivity through better control of water and increasing the use of plant nutrients - through Integrated Plant Nutrition Systems (IPNS) - but the constraints limiting rapid exploitation of the potential would need to be removed or minimized through research and improved dissemination techniques. Improvements in crops that are drought resistant and the development of diversified farming systems that can cope with insufficient and irregular rainfall would also be important in stabilizing their food production.

DECLINING INVESTMENT IN IRRIGATION AND DRAINAGE

There were many irrigation project failures in LDCs in the past, which contributed to declining investment in the sector since the 1980s. Although it is suggested that the decline in agriculture and infrastructure investments was global, yet it was more significant in SSA. The successes recorded on

recent projects have however, opened a new window of hope. This has led to the slow but steady recovery since 2004 in the World Bank (Figure 4).

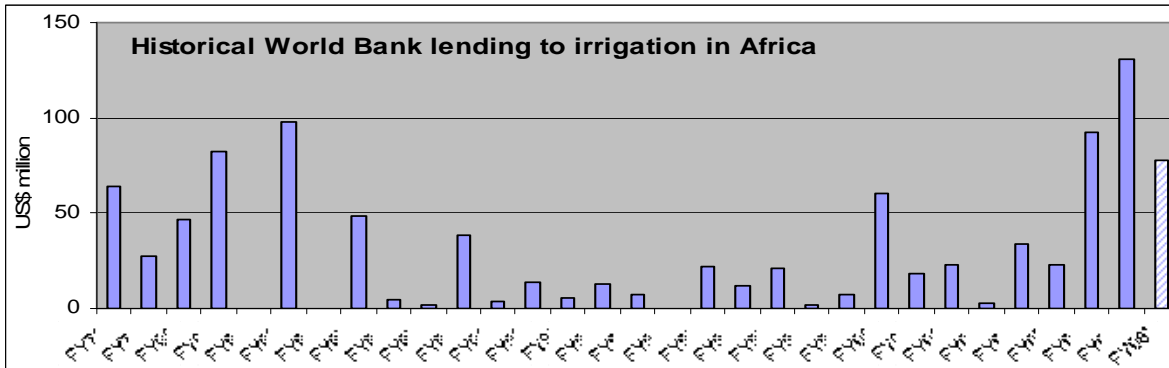


Figure 4. Historical World Bank Lending to Irrigation in Africa (Source: Darghouth, 2007)

COSTS OF IRRIGATION

Development of irrigation facilities in African has often been more expensive than elsewhere. However, these apparent high capital costs are frequently caused largely by lack of basic rural infrastructure, such as roads, high transport costs, major storage facilities, shortage of trained manpower, housing, hospitals, water supplies and generally lack of established settlements. The costs of these infrastructures are embedded directly or indirectly in the irrigation development cost, thus giving an inflated and distorted total cost. Furthermore absence of sufficient data on the local conditions leads often to over-design and high safety margins. It is however significant to note the reversal of trend in the Economic Rate of Return (ERR) of sub-Saharan Africa irrigation projects which hitherto were lower than anywhere else are now higher. This is clearly discernable from Figure 5.

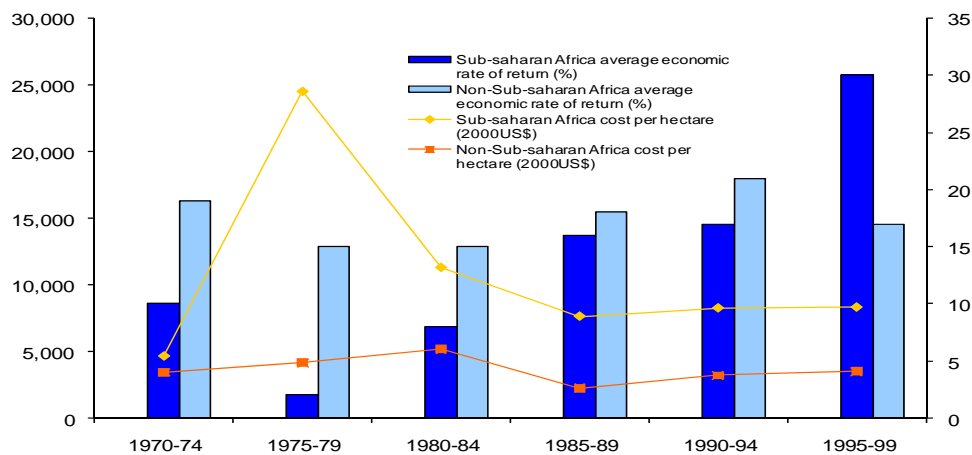


Figure 5. Economic Rate of Return of SSA Irrigation projects was lower but is now higher than Non-SSA (Source: Darghouth, 2007-)

Among the suggestions advanced to lower costs have been participatory irrigation management (PIM) and public-private partnership in both the planning, operation and maintenance of irrigation schemes. Although a few contend that privatization has undermined progress towards the Millennium Development Goals (MDG), as a result of which several African LDCs find themselves in a bind. Following the decline in public investments by the donor and private financing, many of these governments have had to cut public spending in order to pay back creditors. This debilitating combination has resulted in a vicious cycle of deteriorating infrastructure, high costs and low revenue (Bayliss, 2007). Consequently, many irrigation schemes in the LDCs are performing poorly. It is still nonetheless imperative that LDCs should continue to channel investment in public facilities and strengthen public-sector capacity while rearticulating public policies to make resources directed to encourage private investment more productive than they have been; scale-up financing, particularly for investment in extending service provision; and deploy domestic revenue to ensure access.

Box 2: LESSONS LEARNED FROM PAST INVESTMENTS

- Irrigation projects if innovatively designed and packaged could be affordable, with high returns as opposed to being essentially intended to support 'subsistence agriculture';
- Most investments are less attractive but have been made more attractive by the soaring food prices;
- Rapid degradation of infrastructure, and low sustainability arising from institutional inefficiencies;
- Low private investment that is much lower than in other developing regions of the world;
- Some examples of new generation of successful irrigation projects in LDCs:
 - o *Niger* Pilot Private Irrigation Project: ERR > 65%. Farmer incomes up from US\$ 159 to US\$ 560. Average investment US\$ 50 per farmer;
 - o *Tanzania*, River Basin Management and Smallholder Irrigation Improvement project ERR = 16%. Irrigation efficiency up by 100%, with positive impacts on downstream users;
 - o *Mali*, Office du Niger Project: paddy yields up from 2 tonnes/ha to 6 tonnes/ha. Local population doubled. ERR = 30%. Public Private Partnership (PPP): development of 25,000 ha through commercial FDI in Mali;
 - o Irrigated export horti/floriculture in *Ethiopia, Senegal, Zambia, Mauritania, Kenya, Tanzania and Uganda* is a growing business. In Kenya horticulture employs 100,000 people. In Uganda, it was the number one contributor to poverty reduction;
 - o Cultivation of *higher yield cereals* (largely rice, wheat about 1/2) and *industrial crops* (largely sugar, cotton - about 1/3);
 - o Peri-urban horticulture, almost around all large cities;
 - o Commercial and outgrower sugarcane in *Zambia, Uganda Swaziland, South Africa*;
 - o High-yielding wheat-maize-groundnut rotations in *Zambia*.

OTHERS

Additionally, progress of LDCs towards achieving Millennium Development Goals (MDG) is reported by the World Federation of United Nations Associations (WFUNA) 2004 to be very poor and identified seven constraints that impede the improvement of daily life in these nations and therefore

hinder attainment of the MDGs. These priority issues are as follows:

- the number of people living in poverty has almost doubled while the rate of economic development has been declining;
- the rate of population growth is high in the LDCs which tend to ‘undo’ development efforts that might otherwise succeed;
- non-inclusive and non-participatory governance that do not enable women and other marginalized groups to participate in local and national decision-making processes;
- low or stagnant overseas development aid (ODA) and foreign direct investment (FDI) in the LDCs as well as trade barriers;
- debt trap – so much of their revenue goes to debt servicing such that there are not enough money available for development;
- weak government agencies and corruption in the political systems;
- climate change and its attendant effect on their weak economy and fragile environment;
- weak research capacity to even translate work done elsewhere, adapt and refine them to accommodate the peculiar situation of the LDCs.

AGRARIAN ECONOMY AND UNDERDEVELOPED IRRIGATION POTENTIAL

As can easily be discerned, the causes and consequences of food insecurity and poverty are inextricably intertwined to the challenges of their poor development indices. Much of the solution to these challenges lies in the increase of agricultural productivity, due to improved land and water management that are supported by investments in infrastructure that goes in tandem with market development and access. Citizens of LDCs depend more on exploitation of natural resources for their livelihood, hence the use of both land and water resources need to be made sustainable. It is also significant to note that only 7% of the total arable land is irrigated in Africa – of which only 3.7% is in Sub-Saharan countries where all the 34 LDCs are located – the lowest regional percentages in the developing world.

POSSIBLE INTERVENTIONS TO ASSIST LDCS

The Southern African Regional Irrigation Association (SARI) has organized several meetings to look at possible irrigation developmental needs and options of these countries, including some LDCs within the region. The analysis shows that most of the LDCs believe that financial resources are the most limiting factor. This is followed by lack of skills in the water-related and engineering fields, as well as lack of policies that actively support irrigation development. It was also obvious that most of the LDCs have not actually quantified their resources in order to evaluate the potential for irrigation development. This is also the case with most LDCs from West as well as East Africa.

It is a fact that if you cannot measure it, you cannot manage it. Unfortunately, most LDCs do not realize the potential value of the water resources they possess. Until such time that these countries could quantify their water and land resources, they are unlikely to benefit from such resources or any other spin-offs from water resource development. It therefore implies that any meaningful interventions in these countries should start by mapping national water and land resources in order to identify and even quantify the existing potential. Where this has been done in the past, feasibility studies for irrigation development need to be undertaken. It is at this stage when technical skills shortage and economic issues tend to fail the LDCs. In cases where irrigation schemes ever existed and collapsed, rehabilitation strategies need to be developed. Issues of trade, marketing and input costs and inputs supply become paramount. That technical skills alone not enough to address the problems faced by LDCs in Africa is obvious.

Promotion of regional trade will possibly unlock some of the irrigation potential of LDCs in Africa. However, internationally, trade issues are as complicated, leading to lack of trust among role-players.

Commercializing irrigation farming is another possibility. However, this also hinges on economies of scale and size of the farming units. Unfortunately, in most LDCs in Africa, ownership of land is non-existent. Even though farmers have the land to cultivate, it is usually not registered on their names. They are often very small to justify substantial investments. Support to irrigation development under such circumstances then becomes the responsibility of non-governmental organizers often linked to international donors. Elsewhere governments are not as transparent, leading to lack of trust between the regime and internationally funded NGOs.

Skills development is probably the most appropriate form of intervention for LDCs in Africa. This suggests that nationals from such countries could be exposed to a range of knowledge that will in-turn benefit such societies in the long-run. This form of intervention does not benefit the masses directly. Neither does the intervention benefit irrigation development through infrastructure development. However, it builds the capacity of the society and its capability to assess the challenging situation, and to develop sustainable means of adaptation. This form of intervention usually works better if the capacity of the state machinery is developed first, as it usually has a multiplier effect. If the capacity of the state is developed later than that of the ordinary citizens, it usually leads to tensions among practitioners and policy makers.

The synthesis further suggests that for LDCs to be properly supported with minimum negative side effects, senior government officials need to be trained not only in technical skills, but also in policy and general rural development values. Since there are limited international institutions that financially support this approach unconditionally, regional initiatives could be used as vehicles for such support. The Southern Africa Regional Irrigation Association (SARIA), West Africa Regional Association for Irrigation and Development (ARID) and Southern and East Africa Regional Network (SEARNet) are the best examples of apolitical regional institutions for this purpose.

PRIORITY ISSUES IN IRRIGATION AND DRAINAGE FOR LDCs

The New Partnership for Africa's Development (NEPAD) framework is the most appropriate and possibly the latest framework document that projects Africa's economic development ambition through, among other things, irrigation and agriculture is a significant ambition. Through NEPAD, African leaders and heads of State have committed themselves to a number of development initiatives. This, in some cases, has led to budgetary commitments as well as collaboration within the region. For instance, the Declaration on Agriculture and Food Security in Africa, which was ratified by the African Union Assembly Heads of State and Government during its Second Ordinary Session, held in Maputo in 2003, provided strong political support to the Comprehensive African Agriculture Development Programme (CAADP). NEPAD framework follows other international and regional commitments such as Rio Agenda 21, Johannesburg World Summit on Sustainable Development, Maputo African Union (AU) Summit, etc. where agricultural development through irrigation has been highlighted.

The NEPAD is almost 10 years old now but with limited impact in irrigation development, particularly among the LDCs in Africa. As much as AU Heads of State further committed to investing 10% of their national budgets to agriculture and rural development, this has yet to happen. This, however, has been challenging to implement as most countries have other pressing needs. The CAADP of NEPAD provides an integrated framework of development priorities aimed at restoring agricultural growth, rural development and food security in the African region. In its very essence, it seeks to implement the key recommendations on food security, poverty reduction and sustainable use of natural resources, made at several international gatherings. The CAADP comprises five pillars, namely:

- Expansion of the area under sustainable land management and reliable water control systems
- Improvement of rural infrastructure and trade-related capacities for improved market access
- Enhancement of food supply and reduction of hunger
- Development of agricultural research, technological dissemination and adoption to sustain long-term productivity growth, and
- Sustainable development of livestock, fisheries and forestry resources.

A NEPAD Implementation Committee was formed in 2003, to ensure among other things, the implementation of CADP, and more specifically the:

- National long-term food security and agricultural development strategies
- National medium-term investment programmes
- Bankable investment project profiles.

It is within this context that Least Developed Countries in Africa, in an effort to direct its interventions and resources aimed at fighting poverty through irrigation development, would like to engage with, among others, the International Commission on Irrigation and Drainage.

Priority issues are challenges that take precedence and are of high concern. The identification of priority issues was thus approached through identification of key challenges as the entry point to prioritisation. Central to virtually all existant issues of governance in the LDCs in Africa, is the question of poverty. The most significant development challenges of LDCs are in brief:

- poverty reduction and food security;
- reverse diminishing economic growth especially in agriculture;
- ensure social equity and environmental sustainability.

These are directly and intimately related to integrated water resources management, food security, irrigation development and the livelihoods of people in these nations.

To enhance the relevance of ICID as an international non-governmental organisation (INGO) and its intervention to the LDCs in Africa, priority attention should thus primarily be about how to generate workable ideas on irrigation and drainage as well as ways to implement them in the interest of the majority of the citizens of LDCs who still languish below poverty line. Furthermore, it is also clear that the economic vulnerability of LDCs is mostly responsible for their poverty and food insecurity, and this has been largely contributed by the instability of their agricultural production arising from dependence on rainfed agriculture with the attendant vagaries of tropical rainfall. Consequently, the key to their sustained economic growth and poverty reduction would be the development of productive agricultural capacities and related creation of productive employment. But, what priority action should be implemented to operationalise the irrigation and drainage agenda of LDCs in Africa?

The following were identified as critical issues:

- improvement of assessment function, database management and information/data sharing;
- formulation of irrigation and drainage policies that are pro-poverty reduction;
- Participatory Irrigation Management and empowerment of farmers;
- training and capacity building of: farmers, WUA leaders, Project managers, NGOs and local experts involved in the management of public irrigation schemes;
- increased technological learning and interface between research and manufacturers with farmers,

IMPROVEMENT OF ASSESSMENT FUNCTION AND DATABASE MANAGEMENT

Effective and efficient irrigation policies, design and plans can only emerge when there are adequate information and databases on various factors such as: hydro-meteorological data, land suitability, performance of existing irrigation and drainage projects, as well as success factors that

have contributed to farmers' economic performances. The Task Force was unable to make any headway because of the paucity of data. In the long run it resorted to the use of outdated information, because that was all that could be gathered. It must however, be emphasized that without accurate and appropriate information, no sound policies and efficient design can be formulated. ICID could facilitate improvement/creation of data bases that could include some or all of the following:

- assessment of land and water resources potential at river basin and national levels;
- the establishment or improvement of appropriate methodologies for collection, collation, analysis and dissemination of land and hydro-meteorological data;
- the establishment or improvement of systems, institutions and methodologies for monitoring on-farm water resources, land-use, other agricultural inputs and crop production;
- the compilation of an inventory of types and extent of the various agricultural water management techniques and their present and potential contribution to production.

POLICY FORMULATION THAT IS IN SYNERGY WITH POVERTY REDUCTION STRATEGIES

Sound national strategies and policies are needed to ensure government commitment to a programme, thereby helping to attract donor support and ensure its continuity as well as improving the chances of success.

LDCs require a significant paradigm shift on irrigation such that it would impact more significantly on poverty reduction through productive capacity building. Irrigation and drainage policies could be designed such that science, technology and innovation policies geared toward technological catch-up can be integrated into the development and poverty reduction strategies of LDCs. Furthermore, it should be fashioned in ways in which part of official development assistance could be used to support capacity building and learning in LDCs to avert the food insecurity.

Policies need to create the conditions and remove the obstacles to the participation of the poor in the growth process, e.g. by increasing access to land, water, labour and capital markets and by investing in basic social services, social protection and infrastructure. As the poor often depend heavily on natural resources for their livelihoods, policies to promote environmental sustainability should also be integral to promoting pro-poor growth.

The poor farmers often avoid higher risk opportunities offered by irrigation with its potentially higher payoffs because of their vulnerability. In addition, the journey out of poverty is not one way and many return to it because man-made and natural shocks erode the very assets that the poor need to escape poverty. Policies that tackle risk and vulnerability, through prevention, mitigation and coping strategies, would improve both the pattern and pace of growth and can be a cost effective investment in pro-poor growth.

The Task Force proposes the following for consideration in developing pro-poor national irrigation policy planning for LDCs in Africa:

- promote country-led medium and long-term programmes and co-ordinate and align donor support to fit the country-led frameworks;
- promote infrastructure for inclusive growth, involving and benefiting the poor through improved access, encouraging their involvement and promoting their employment, while ensuring affordability including the use of 'smart subsidies';
- promote enabling environments for pro-poor growth, focusing on market outcomes through strengthening the enabling environment, ensuring an improved risk to reward ratio and any direct farm-level support should be non-market distorting;
- the informal irrigation sector is often large, thus the way from informality to formality should be made a continuum through reduction of disincentives to formalization and facilitation of risk taking and profitability of irrigated agriculture;
- irrigated agriculture contributes to growth and poverty reduction beginning at the field level all the way to the table thus the need to promote a holistic approach to rural poverty reduction in the LDCs poverty reduction strategies (PRS);
- the risks and vulnerability of smallholder irrigators to increase market participation has to be reduced through securing their assets (land, water, finance) and mitigating shocks (by way of new forms of insurance).

PARTICIPATORY IRRIGATION MANAGEMENT AND EMPOWERMENT OF FARMERS

LDCs are resource poor nations, but whose irrigation infrastructure are typically managed by public institutions. These schemes are characterized by paternalistic approach resulting in poor management, low irrigation efficiency, high cost, poor cost recovery and neglect of farmers in decision-making. The 1980s thus witnessed a flurry of reforms aimed primarily at transferring responsibility to farmer, but without improved performance due largely to the inability to incorporate commensurate capacity building in the institutional change processes. The situation has however recorded significant improvement following an appreciation of the fundamentals and requirements for irrigation management transfer. Today, with notable exception of Sudan and Mali, most LDCs have their public irrigation schemes managed by Water User Associations (WUAs) that have progressively assumed greater role and responsibilities from the public institutions. The formation of water-user association would create an avenue for effective participation of the farmers and facilitate their resource mobilisation for more effective and efficient operation and maintenance of the systems.

The farmers need to participate in and influence the operation and management of their schemes. Approaches are needed to increase the voice and influence of poor women and men in order that operation and management of schemes can be made more responsive, rather than determined by narrow vested interests. Effective participation strategies need policy and institutional change for which the state, in all its dimensions, is made more accountable to the interests of the farmers. The state needs to provide the opportunity for structured public-private dialogue at various levels. The state needs to provide the required incentives, enabling environments and policy and planning frameworks to be more accountable to the voices of the farmer. Nevertheless, the question remains as

whether political reform a precondition to improve water management or national political reform can emerge from irrigation sector.

The task force noted and recommends the following:

- institutions and processes of institutional change are often neglected; thus there is need to more vigorously promote dialogue between the state, the private sector and civil society;
- private sector and civil society capacity building (e.g. formation of farmer organizations) has to be seen as a central part of a national poverty reduction strategy (PRS) focusing on both their pace and pattern of growth;
- greater focus needs to be placed on governance structures and the sustainability of infrastructure facilities; stronger focus on maintenance, which would emphasise resource mobilisation to aid cost recovery; improved and accountable public operator management with enhanced transparency to address corruption and environmental sustainability;
- more vigorously promote dialogue and interaction that would focus on both the pace and pattern of growth with particular reference to socio-economic, technical, organisational and institutional considerations and factors.

TRAINING AND CAPACITY BUILDING OF FARMERS AND MANAGERS

Human resources is the most important asset of any nation and knowledge has become a critical factor in the global sphere of competition and production. In this context, unless the LDCs are assisted to enhance their knowledge content to achieve economic prosperity and diversity, they are in danger of becoming increasingly marginalized. The task force recommends the following for priority attention:

- assessment of present and long-term manpower, training needs and skill gaps;
- technical assistance to institutions particularly those with the mandate for farmers' training and on-farm water management extension work; and
- facilitate in collaboration with donors the establishment of specialised training facility/centres that can add value and improve skill/knowledge relevant to the identified skill gaps and training needs.

INCREASED TECHNOLOGICAL LEARNING/INTERFACE BETWEEN RESEARCH AND MANUFACTURERS WITH FARMERS

The main sources of technology flows to LDCs are through international trade and foreign direct investment. Sustained economic growth and poverty reduction would be hampered unless viable productive capacities can be enhanced through significant progress in technological learning and capacity-building. The task force recommends the following:

- the old idea of one size fits all technologies has to be discarded in favour of technologies that

respond to the very diverse needs of a wide range of small irrigators by targeting research and development investments to smallholders;

- private sector is weak and cannot fill the technological learning and the research and development gaps; thus invariably LDCs must realise the necessity for greater public sector role with support from donors. Public-private partnerships (PPP) could be facilitated through aid being made predictable, applying a mix of financial instruments to leverage private sector investment and building capacity in capital and financial markets;
- PPP to focus mainly on demand driven or market oriented/driven research and development (R&D);
- LDCs to imbibe the commodity approach focusing mainly on the value chain of the principal commodity that has the largest chain, multiple entry points and that provide quick returns.

THE ROLE OF THE ICID

It is significant to appreciate at the onset that ICID is an international NGO that operate through its National Committees (NCs). Consequently, to be able to situate the role best suited to ICID would require full appreciation of the role, challenges and opportunities that abound for NGOs operating in the LDCs in Africa. Non-governmental organisations (NGO) are increasingly playing an important role in the development of LDCs in Africa. On the other hand, critical to poverty alleviation and good governance in the LDCs are the need to improve policies in respect of the manpower capacity building and training, as well as the role of NGOs. In view of the limited material resources of LDCs, their priority issues would best be addressed through *focusing on knowledge accumulation and technological learning* as vital processes towards genuine *productive capacity building* in these countries. Lack of trained manpower is a serious constraint to irrigation development in the LDCs and would require substantial effort on capacity building and training. NGOs on the other hand are playing an important role in the capacity building, advocacy, mobilising additional funds and training in these countries, especially for the development of small-scale irrigation. They do so by involving farmers and communities from inception and by using existing traditional technologies to advance irrigation development.

Mati (2007) states that here is a need to adopt holistic approaches to agriculture water management as in the past sectorised approaches between what constitutes rainfed as opposed to irrigated agriculture and soil and water conservation led to competition rather than to complementarities for resources and services.

Mr. Diouf (*FAO b. 2005*) in his speech recognizes the role of agriculture especially in rural areas is essential in the eradication of poverty and food security in the LDCs. He also recognizes that eradication of rural poverty and food insecurity is a huge undertaking which will require a concerted effort and continuous dedication by the international community and indeed the governments of LDC countries both through the reform of agricultural policies in the rich countries and the improvement of domestic policy incentives for productivity by raising investments in agriculture and thus strengthening of their supply-side capacities to take advantage of trading opportunities. He also made

mention that the field programme assistance undertaken by the FAO meets a wide range of needs, from emergency relief and agricultural rehabilitation to policy assistance to governments and to practical programmes for food security, sustainable growth and rural development. However, FAO's role is catalytic and will assist in helping to set up a situation in which major investment would be the next step. Finally, Santini (2001) recognized that of utmost importance before any intervention is selected, that it is essential to establish secure land and water rights and to create effective, user-driven local management institutions.

The meeting of virtually many national key representatives in Africa facilitated by the FAO conference "Water for Agriculture and Energy in Africa" in Sirte, Libya in December 2008 helped to advance and endorse a recent new initiative "Agricultural Water for Africa (AgWA)" with ICID supporting the move. In fact, AgWA has emerged as a partnership of African and international organizations with a common interest to support re-engagement (AWM) in Africa. The demand for concerted support has been raised by a strong and recent momentum in implementing Comprehensive African Agriculture Development Plan (CAADP). Taking stock of the current fragmentation of the sector, the main partners (AfDB, IFAD, FAO, NEAPD, ICID, IMAWESA, IWMI, WB) of Partnership officially endorsed their launch during the Africa Ministerial Conference in Sirte in December 2008. AgWA is building close linkages with international and regional partnerships and with sub-regional partnerships such as ARID, SARIA and IMAWESA. The overall objective of the AgWA Partnership is to increase food production, generate wealth, and contribute towards achieving MDG 1 by supporting countries, national and international organizations, and donors to re-engage in Agricultural Water Management (AWM) for Africa.

To achieve these overall objectives, AgWA has identified four priorities for developing irrigation in Africa, including advocacy; resource mobilization; knowledge sharing; and donor harmonization. AgWA provides a platform for delivering comprehensive support to agricultural water in Africa and will promote renewed interest and reengagement in agricultural water among policy decision makers. More specifically, AgWA aims to: scale up investments and ensure a more reliable, broad based and sustained flow of funds for agricultural water; promote analytical work and support sectoral strategies in the field of agricultural water; promote knowledge sharing, dissemination and capacity strengthening, and initiate innovative business lines in support to scaling up investments in agricultural water; and promote regional integration, coordination and partnerships, and empowerment of national and regional stakeholders.

In future, AgWA intends to emerge as an 'Expert Pool' in support of CAADP implementation, while also retaining a degree of autonomy. Its workplan will identify activities like 'already financed' actions by partners, with further elaboration founded on specific deliverables. AgWA plans to establish an Oversight Committee with ICID as a member.

ICID is committed to support AgWA, and has common interest in advocacy and knowledge sharing in AWM and strengthening AWM networks in Africa. ICID's Preference for Africa is manifested by its relationship with the two regional associations of Africa: ARID and SARIA, which extends the ICID network in Africa well beyond that defined by formally active countries. ICID's "broad-based" national committees each constituted according to the countries' wishes provide a flexible model for bringing together the various interests in AWM in each country, facilitated by a regional and international context that could now include AgWA's activities. ICID has an active Africa Regional Working Group and Task Force on LDCs in Africa, a Special Team on Lake Chad Basin, and upcoming regional conferences that can contribute to the advocacy and exchange of knowledge components of AgWA. ICID workbodies with African involvement can focus on- Global climate change and agricultural water management, on-farm irrigation, use of poor quality water for irrigation, water management in water stressed regions, modernization of irrigation services, technology and research uptake and exchange, and financing water for agriculture etc. ICID

recognises that countries outside Africa have much to contribute to the AgWA objectives (most notably China, Brazil, and India) and encourages them through their national committees to do so. ICID's WatSave Awards, top ten technologies and support for IPTRID all contain strong advocacy for Africa's achievements and future needs.

Among the challenges encountered by NGOs in the LDCs are the interference from official bodies; lack of technical expertise, tools and equipment; lack of support from government with security of land tenure, which the farmers need; and lack of control over marketing and price policies that may undermine the success of their schemes.

The opportunities could be enhanced and challenges eased by ICID as an international NGO if the opportunities can be exploited to advance a win-win partnership with the local NGOs in the LDCs. For instance, the National Committees of the ICID in the LDCs could evolve from a coalition of existing national NGOs rather than launching new groups, and could leverage the members from government agencies to improve the environment for successful small scale irrigation. ICID could also work with multilateral organisations to advise governments of LDCs in Africa on ways to promote policies that would favour the work of NGOs and to mobilise funds from donors for NGO-oriented projects, while providing the NGOs with the technical expertise and equipment from manufacturers, which are facilities the NGOs in the LDCs often lack. Furthermore, ICID could assist the LDCs to prepare suitable projects to tap into the new windows of opportunities provided by the donors. ICID through the NCs could apply for funds for project preparation based on an articulate policy developed by each LDCs with assistance of ICID. An example is seen in a sponsored funded project handled by ICID titled "Country Policy Support Programme". Similar exercise could help LDCs in Africa if funding support could be mobilized.

ICID as a frontline international organization on irrigation and drainage has the advantage to help operationalise all the priority issues, through:

- **Advocacy:** why irrigation is important to poverty alleviation and merit more support than in the past?
- **Knowledge of the irrigation and drainage issues:** through training, capacity building and empowerment;
- **Synthesize and disseminate lessons from successes and failures:** through manuals, guidelines, workshops, conferences and seminars;
- **Facilitate implementation:** lead, advice or support the implementation of the right policies and/or projects.

The three key elements of proposed ICID pro-poor strategy for irrigation development in LDCs are:

- to leverage the knowledge base of ICID to assist the National Committees in the LDCs to emerge or to be strengthened to emerge as truly NGOs. They must necessarily be broad-based and work closely with other relevant national NGOs to promote effective participation of the poor farmers simultaneously as members, agents and beneficiaries. This would enable them draw from donor and multilateral funds for advocacy as NGOs;
- ICID and National Committees should more vigorously pursue activities and programs that seek to tackle the multiple dimensions of poverty, including the cross-cutting dimensions of

gender and environment, and that are mutually reinforcing;

- capacity building and empowering the poor farmers is essential for bringing about the financial support needed to make such National Committees active while promoting pro-poor growth and addressing the multiple dimensions of poverty. To achieve this, the National Committees of ICID, their instrumentality and its decision making processes need to be open, transparent and accountable to the interests of the poor and protection of the environment. Programs, activities and resources need to be channelled to build the capacity of irrigation to be a veritable source for poverty alleviation.

When implementing the above, it should be recognized that the LDCs are not a homogenous group; that country contexts vary considerably, and that implementation must be based on a sound understanding of the individual country.

Interventions by international bodies towards supporting LDCs should take into account all the dynamics mentioned above. This, however, is different from country to country support, which is often driven by strategies of political nature. For an international organization to support LDCs, regional institutions/ organizations of credibility should play a significant role in terms of facilitation, in-kind support and even financially contributing. In the case of Africa, the LDCs could be supported through such local institutions as ARID, SARIA, SEARNet, and others, whose interests are in line with irrigation development, poverty alleviation, capacity and institutional development, and technology exchange.

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Annex 1. Population and Cultivable Area in LDCs of Africa

Sl. No.	Country	Population (million)			Geographical area (Km ²)	Cultivable area (million ha)	Cultivated area (million ha, 2002)	% of cultivable area
		1994	2005	2025				
1	Angola	10.7	16.1	27.3	1,246,700	32.0	3.3	10.3
2	Benin	5.2	8.4	14.5	114,763	7.0	2.8	40.0
3	Burkina Faso	10.0	13.9	23.7	274,000	9.0	4.4	48.9
4	Burundi	6.2	7.9	15.0	278,34	1.4	1.3	92.9
5	Cape Verde	0.4	0.5	0.8	4030	0.08	0.04	50.0
6	Congo	2.5	3.6	5.4	2,345,409	-	0.2	
7	Comoros	0.4	0.8	1.2	2,235	0.14	0.1	71.4
8	Djibouti	0.6	0.8	1.1	23,200	0.006	0.001	16.7
9	Equatorial. Guinea	0.4	0.5	0.8	28,051	0.8	0.2	25.0
10	Eritrea	3.4	4.5	7.7	117,600	1.6	0.5	31.3
11	Ethiopia	53.4	79.0	125.0	1,104,300	13.2	10.7	81.1
12	Gambia	1.1	1.6	2.5	11,295	0.4	0.2	50.0
13	Guinea	0.7	9.0	14.5	245,857	6.0	1.5	25.0
14	G/Bissau	0.1	1.6	2.9	36,125	1.1	0.5	45.5
15	Lesotho	0.2	2.0	2.2	30,355	0.36	0.3	83.3
16	Liberia	2.0	3.4	6.8	111,369	-	0.6	
17	Madagascar	1.4	18.6	30.0	587,041	8.0	3.5	43.8
18	Malawi	10.8	13.2	21.4	118,484	3.6	2.4	66.7
19	Mali	10.5	11.6	20.6	1,240,192	43.7	4.7	10.8
20	Mauritania	2.2	3.0	4.5	1,025,520	1.0	0.5	50.0
21	Mozambique	15.5	20.5	29.0	801,590	36.0	4.4	12.2
22	Niger	8.8	13.3	26.3	126,700	16.5	4.5	27.3
23	Rep. C. Africa	3.2	4.2	5.8	622,984	15.0	2.0	13.3
24	Rwanda	7.6	9.2	15.2	26,340	1.5	1.4	93.3
25	Sao Tome Principe	0.1	0.2	0.2	964	0.05	0.05	100.0
26	Senegal	8.1	11.8	18.0	196,722	3.8	2.5	65.8
27	Sierra Leone	4.4	5.6	8.6	71,740	5.3	0.6	11.3
28	Somalia	9.0	8.2	13.7	637,760	8.1	1.1	13.6
29	Sudan	27.4	36.9	54.3	2,505,813	105.0	16.6	15.8
30	Tanzania	28.8	38.5	60.0	945,090	40.0	5.1	12.8
31	Tchad	6.2	10.1	17.5	1,284,000	19.0	3.6	18.9
32	Togo	4.0	6.2	9.9	56,790	3.4	2.6	76.5
33	Uganda	20.6	28.9	54.0	241,038	16.8	7.2	42.9
34	Zambia	9.2	11.5	16.5	752,618	16.3	5.3	32.5
Total/ Average								

Annex 2. Water Resources and Irrigation in LDCs of Africa

Sl. No.	Country	Annual renewable water resources (million m ³)	Annual water withdrawal for agriculture (million m ³)	Irrigation potential (ha)	Area equipped for irrigation (ha)	% of irrigation potential	% of cultivated area
1	Angola	148000	211	3700000	80000	2.16	2.42
2	Benin	26393	59	322000	12258	3.81	0.44
3	Burkina Faso	12500	690	165000	25000	15.15	0.57
4	Burundi	15484	222	215000	21430	9.97	1.65
5	Cape Verde	300	20	3109	2780	89.42	6.95
6	Congo	832000	4	340000	2000	0.59	1.00
7	Comoros	1200	4.7	300	130	43.33	0.13
8	Djibouti	300	3	2400	1012	42.17	100
9	Equatorial Guinea	26000	1	30000	-	0.00	0.00
10	Eritrea	6300	550	187500	21590	11.51	4.32
11	Ethiopia	122000	5204	2700000	289530	10.72	2.71
12	Gambia	8000	21.3	80000	2149	2.69	1.07
13	Guinea	53200	1365	520000	94914	18.25	6.33
14	G/Bissau	31000	14.4	281290	22,558	8.02	4.51
15	Lesotho	3022	0.6	12500	2637	21.10	0.88
16	Liberia	232000	60	600000	2100	0.35	0.35
17	Madagascar	337000	14313	1516819	1086291	71.62	31.04
18	Malawi	17280	810	161900	56390	34.83	2.35
19	Mali	100000	5900	566000	235791	41.66	5.02
20	Mauritania	11400	1500	250000	45012	18.00	9.00
21	Mozambique	217100	550	3072000	118120	3.85	2.68
22	Niger	33650	2080	270000	73663	27.28	1.64
23	Rep. C. Africa	144400	1	1900000	1000	0.00	0.00
24	Rwanda	9500	102	165000	8500	5.15	0.61
25	Sao Tome P	2180	-	10700	9700	90.65	19.40
26	Senegal	38800	2065	409000	119680	29.26	4.79
27	Sierra Leone	160000	353.6	807000	29360	3.64	4.89
28	Somalia	14200	328.1	240000	200000	83.33	18.18
29	Sudan	64500	36069	2784000	1863000	66.92	11.22
30	Tanzania	93000	4632	2132221	184330	8.64	3.61
31	Tchad	-	-	-	-	0.00	0.00
32	Togo	14700	76	180000	7300	4.06	0.28
33	Uganda	66000	120	90000	9150	10.17	0.13
34	Zambia	105200	1320	523000	155912	29.81	2.94
Total/ Average							

Annex 3. Summary of Socio-economic Indicators of Least Developed Countries in Africa

Sl. No.	Country	Total Population (million)	Population density (persons per km ²)	Urban population (%)	Economically active population (,000)	Annual population growth rate (%)	Gross National Income (GNI) per Capita (US\$)	Human Development Index (HDI)	HDI Rank (over 179 countries)
1.	Angola	16.1	14	54.0	7,032	2.9	1410	0.446 (LHD)	157
2.	Benin	8.5	79	40.0	3,419	3.2	510	0.437 (LHD)	161
3.	Burkina Faso	13.9	54	18.3	6,247	3.1	430	0.370 (LHD)	173
4.	Burundi	7.9	306	9.5	3,880	3.8	100	0.413 (LHD)	172
5.	Central African Republic	4.2	7	38.1	1,848	1.6	350	0.380 (LHD)	178
6.	Chad	10.1	8	25.3	4,053	3.4	430	0.388 (LHD)	170
7.	Comoros	0.8	375	27.8	338	2.6	650	0.561 (MHD)	137
8.	DR Congo	58.7	27	32.1	22,251	3.2	120	0.411 (LHD)	177
9.	Djibouti	0.8	36	86.1	335	1.7	1010	0.516 (MHD)	151
10.	Equatorial Guinea	0.5	18	39.2	200	2.4	12860	0.642 (MHD)	115
11.	Eritrea	19.4	41	19.4	1,810	3.9	170	0.483 (LHD)	164
12.	Ethiopia	79.0	75	16.1	37,195	2.6	160	0.406 (LHD)	169
13.	Gambia	1.6	151	53.9	732	2.9	290	0.502 (MHD)	160
14.	Guinea	9.0	38	33.0	4,299	1.9	440	0.456 (LHD)	167
15.	Guinea-Bissau	1.6	47	29.6	601	3.0	180	0.374 (LHD)	171
16.	Lesotho	2.0	66	23.3	847	0.8	930	0.549 (MHD)	155
17.	Liberia	3.4	34	58.1	1,274	2.7	120	-	176
18.	Madagascar	18.6	34	28.5	9,066	2.8	290	0.533 (MHD)	143
19.	Malawi	13.2	118	17.3	5,453	2.5	160	0.437 (LHD)	162

20	Mali	11.6	10	30.5	3,033	3.0	380	0.380 (LHD)	168
21	Mauritania	3.3	140	40.4	1,239	2.8	580	0.804 (HHD)	140
22	Mozambique	20.5	175	34.5	9,520	2.2	310	0.384 (LHD)	175
23	Niger	13.3	11	16.3	4,387	3.5	240	0.374 (LHD)	174
24	Rwanda	9.2	369	17.5	4,197	2.0	230	0.452 (LHD)	165
25	São Tomé and Príncipe	0.2	164	58.1	50	1.7	-	0.654 (MHD)	128
26	Senegal	11.8	63	41.5	5,015	2.6	700	0.499 (LHD)	153
27	Sierra Leone	5.6	82	36.8	2,116	3.6	220	0.336 (LHD)	179
28	Somalia	8.2	14	35.2	3,243	3.0	-	-	-
29	Sudan	36.9	15	40.8	11,214	2.1	650	0.526 (MHD)	146
30	Togo	6.2	116	40.0	2,446	2.7	350	0.512 (MHD)	159
31	Tanzania	38.5	43	24.2	18,939	2.6	340	0.467 (LHD)	152
32	Uganda	28.9	128	12.5	12,588	3.2	280	0.505 (MHD)	156
33	Zambia	11.5	16	35.0	4,352	1.8	500	0.434 (LHD)	163
Total		Total	(Average)	(Average)	Total	(Average)	(Average)		
			87.09	33.72		2.4	769.4		

Note: LHD: Low Human Development
MHD: Medium Human Development
HDD: High Human Development