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## **A livelihood approach to water interventions in rural areas and implications for Multiple Use Systems**

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*Among all constraints to development, water has been systematically highlighted as one of the most important challenges to rural poverty reduction in sub-Saharan Africa. Highly variable and erratic precipitations, poor development of hydraulic infrastructure and markets, and lack of access to water for domestic and productive uses, all contribute to maintaining high the vulnerability of rural people in the region. Through a recent study, FAO and IFAD have been investigating the linkage between water and rural poverty in sub-Saharan Africa. The study argues that there are ample opportunities to invest in water in support to rural livelihoods in the region, but that interventions must be targeted adequately. The key word is “context-specificity”, and the main challenge is to understand where and how to invest. A comprehensive approach is needed, where investments in infrastructure are matched with interventions in institutions, knowledge and finance in ways that offer an opportunity to get the best return in terms of poverty reduction, and taking into account the extreme heterogeneity of situations faced by rural people over the region. Multiple use systems (MUS) are important in this context as infrastructure systems better address people’s need than sectoral water development programmes. The paper presents the main results of the study with special emphasis on the potential of investments in multiple use systems in the different livelihood zones of sub-Saharan Africa.*

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### **Introduction**

For many people, especially in rural areas where agriculture is at the core of livelihoods, water represents both a basic need and an important production asset. The roles of water, its availability in time and space, in quantity and quality, its accessibility, its control and management vary from one place to another and between users. In many cases, the vulnerability of rural people is considerable, owing to a combination of highly variable precipitations, poor development of infrastructure, lack of access to markets, credits and farm inputs and non-conducive water governance.

In order to help planning more effective water investments in sub-Saharan Africa, FAO and IFAD have joined forces to analyze the conditions required to ensure successful interventions in water in rural areas (FAO and IFAD, 2008). Basing its analysis on information available at regional level and a series of objective criteria, the study proposed a livelihood-based approach, and assessed the potential for poverty reduction through water interventions in the region. The paper presents the approach and main findings of the study, with specific emphasis on multiple use systems (MUS) that corresponds to the multiple needs for rural people to lead a healthy, fruitful life.

### **Guiding questions**

In order to answer the question on how water-related interventions can best contribute to boost livelihoods in rural areas, the study was organized along three main questions:

- **What** is the linkage between access to water and poverty?
- **Where** is water a constraint to agricultural productivity and a priority for sustainable rural livelihoods?
- **Who** are the target beneficiaries of proposed interventions?

The first question is related to the role water plays in rural livelihoods, its relative importance compared to other issues, to questions of access, control and management. The second question implies that the importance of water is not perceived by people in a similar way everywhere. In rural areas of sub-Saharan Africa, where agricultural activities still represent the basis of peoples' livelihoods, water is perceived as a constraint in different ways in different places, in large part driven by climatic conditions, the availability of water, mainly for domestic and agricultural uses, and its importance for agricultural production. The third question recognizes the need to analyze different social and gender categories in a given community, and adapt programmes in ways that they satisfy the needs of the various target groups while contributing to greater equity and improvement of the conditions of living of the most vulnerable people.

### Adopting a livelihoods approach to water interventions in rural areas

The study has adopted a livelihoods approach to development. A livelihoods approach puts people in the centre of the development process, considering the full range of ways in which people ensure their living. Contrarily to supply-driven approaches, the livelihoods approach put household demand in the forefront (Nicol, 2000). The livelihoods approach also challenges the usual sector driven approaches to consider issues in more comprehensive terms, as they are perceived by people, putting the household at the centre of the development process, and considering all the assets (or capitals) needed by the households to ensure their living. Table 1 shows issues and possible interventions in water as they relate to the five livelihoods capitals: physical, social, natural, financial and human.

<b>Capital</b>	<b>Issues</b>	<b>Interventions</b>
Physical	Availability of affordable and accessible water of good quality for drinking and other purposes, crop failure risks, access to markets.	Infrastructure for: irrigation, drinking water infrastructure, sanitation, animal watering points, wastewater treatment infrastructure. Roads and markets.
Social	Water sharing in watersheds and irrigation schemes, equity in access, need for community based asset management in irrigation and drinking water.	Improvement of community water point management, community irrigation management through water users associations, development of adequate right systems and legislation addressing specifically the needs of poor households within communities.
Natural	Land and water availability.	Enhanced through catchment's protection, maintenance of natural environment and soil fertility, pollution control.
Financial	Access to cash, credit and savings, for investment and operation and maintenance of hydraulic infrastructure.	Adapted financial services, including term loans, micro-finance, cooperatives, seasonal loans, micro-credit, subsidies and grants.
Human	Skills, knowledge, health.	Training in asset management, water resources issues, responsive approaches, community self-assessment of needs, participatory monitoring, gender mainstreaming, nutrition, hygiene.

Another advantage of the livelihoods approach is that it shows how physical (*hard*) investments, often considered as the first relevant intervention needed to address water-related development issues, are only part of a broader range of necessary actions, most of which being of an institutional or social nature (*soft* interventions).

### Options for water interventions

While water control and access is not the only factor influencing livelihoods in rural areas, it often plays an important role. In agriculture, it offers security and allows farmers to plan their investments without fear of crop failure. Clean and affordable access to domestic water relieves the burden from women and girls who have to spend a considerable amount of time in fetching water. Access to a source of water to water animals

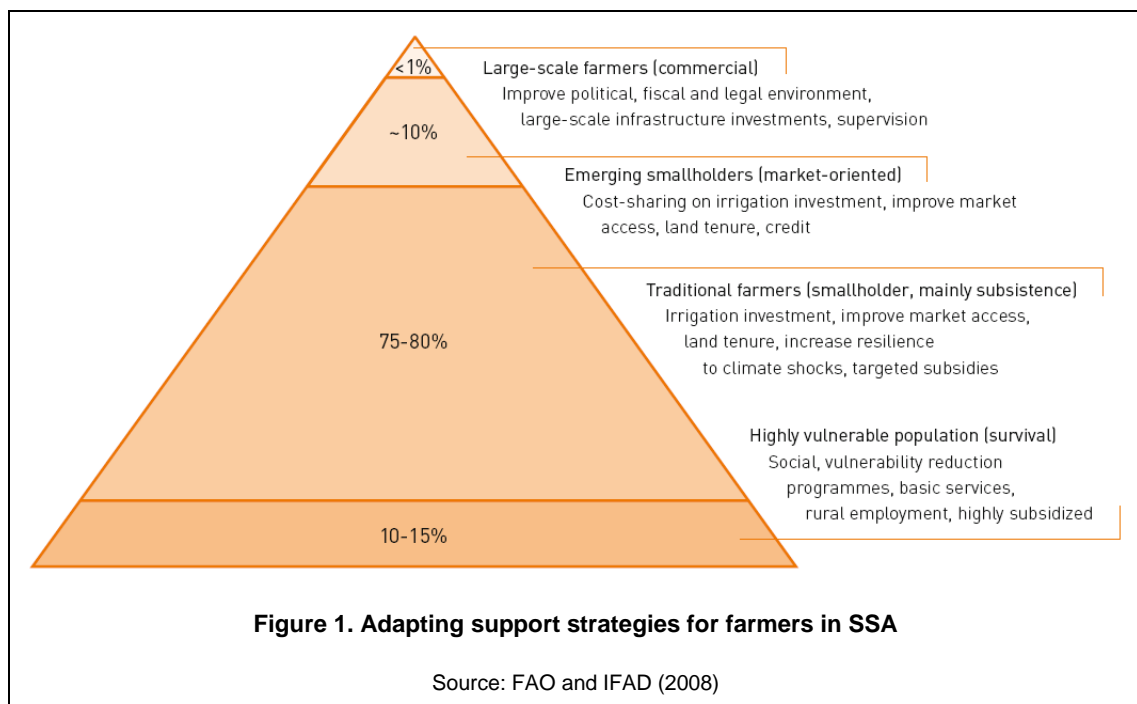
or for small productive activities can have an important impact on the economy of the household, in places where water is scarce.

**Adapting interventions to local conditions**

Effective investments in water in rural areas require a good understanding of the range of different livelihood realities. Large differences can exist between regions in a country in terms of the way secure their livelihood, rainfall and water resources endowment, access to water, conflicts on water, market opportunities, education and knowledge levels and working opportunities for the rural poor. Such differences need to be taken into account in developing water investment strategies that match the needs and capacities of local population. The key word is “context-specificity”.

**Identifying target groups**

The study recognises the variety of situation in which rural people operate in sub-Saharan Africa. Yet, considering that farming remains the main source of livelihood for most rural people in the region, it has focussed its attention on four main categories of people making their living mostly from farming: highly vulnerable population; traditional smallholders; emerging smallholders and large scale, commercial farmers. While arbitrary by nature, such a typology reflects quite well the situation in many countries of sub-Saharan Africa. Each of these categories contributes in different ways to the country’s economy and has specific needs, summarised in Figure 1, where the level of poverty increases from top to bottom.



Such needs can be detailed in terms of investment, financial support, policy and legislation, capacity building etc. Traditional smallholders, producing mainly staple food for their own consumption and with relatively marginal connexions to markets are thought to represent the majority of rural farmers. The study has estimated them to represent 80 percent of a rural population of about 420 million. Together with the highly vulnerable people, they represent the bulk of rural population requiring poverty reduction interventions. Half way between the traditional smallholders and emerging farmers are the very small scale producers with some connection to markets, practicing gardening, raising some livestock and having some non-agricultural home processing activities. These people are usually poor and access to a secured source of safe water often represents a major issue for them.

**Adapting investments to the needs of beneficiaries**

Improving water access and control includes a range of investment options to support crops, livestock, forestry, aquaculture, domestic and other productive activities. The study analyses a series a water control technologies in terms of their uses. Four categories of technologies are discussed: water capture, storage,

lifting and (field) application. Table 2 (adapted from FAO, 1998) presents examples of such technologies well adapted to smallholders and the variety of possible uses. Criteria for adaptation of technologies to smallholders' conditions include operational simplicity, reduced number of users, no need for external support for operation, low maintenance requirements, limited physical and financial capital requirements. Such criteria imply that in many cases the preferred options will not be those showing the best benefit/cost ratio. Typically, simple and robust investments will have better chances of success than more sophisticated, complex systems.

Types of uses	Technologies			
	Water capture	Water storage	Water lifting	Water use/application
Domestic water use (safe drinking-water, water for cooking, bathing, laundry, cleaning, etc.) Irrigated crops, including vegetable gardening, fruit trees, etc. Enhanced water management for rainfed agriculture Aquaculture and inland fisheries Livestock watering Small industries like beer-brewing, brick making, hairdressing, or ice-block making	Shallow tubewells: • dug wells • drilled wells Spring diversion Run off the river diversion Deep tubewells	Small dams, reservoirs Excavated ponds (incl. integrated paddy and fish production) Rooftop tank Cisterns Underground dams	Human powered pumps: • hand pulleys and buckets • hand pumps • treadle pumps Animal-powered pumps: • mohte • Persian wheel Motorpumps • petrol • diesel Solar pumps	Above ground: • shallow trenches • drip systems • hose • water can Below ground: • porous ceramic jars • porous and sectioned pipe Water purification methods: • filters • boilers • chlorination
	Runoff farming (in-situ water conservation, incl. stone bunds, ridges, broad beds, furrows, no-tillage, infiltration pits, contour bunds, vegetative bunds, terraces, mulching) Water harvesting (off-site water conservation: Catchment area + reservoir) Groundwater recharge			

Source: adapted from FAO and IFAD (2008)

Of particular interest is the range of options available to improve water control for crop production. CA (2007) has described in details the “continuum” from purely rainfed to purely irrigated agriculture, and the range of possible interventions in water control for soil moisture management. Among possible types of interventions, the study selected seven broad categories which are considered to have large potential in terms of poverty reduction. They are: soil moisture management in rainfed agriculture, small scale water harvesting infrastructure, promotion of community-based small scale irrigation, improvement of existing irrigation systems, water control for peri-urban producers, investment in water for livestock production, and promotion of multiple uses of water. Evidence shows that, when well designed, such programmes can substantially contribute to poverty reduction.

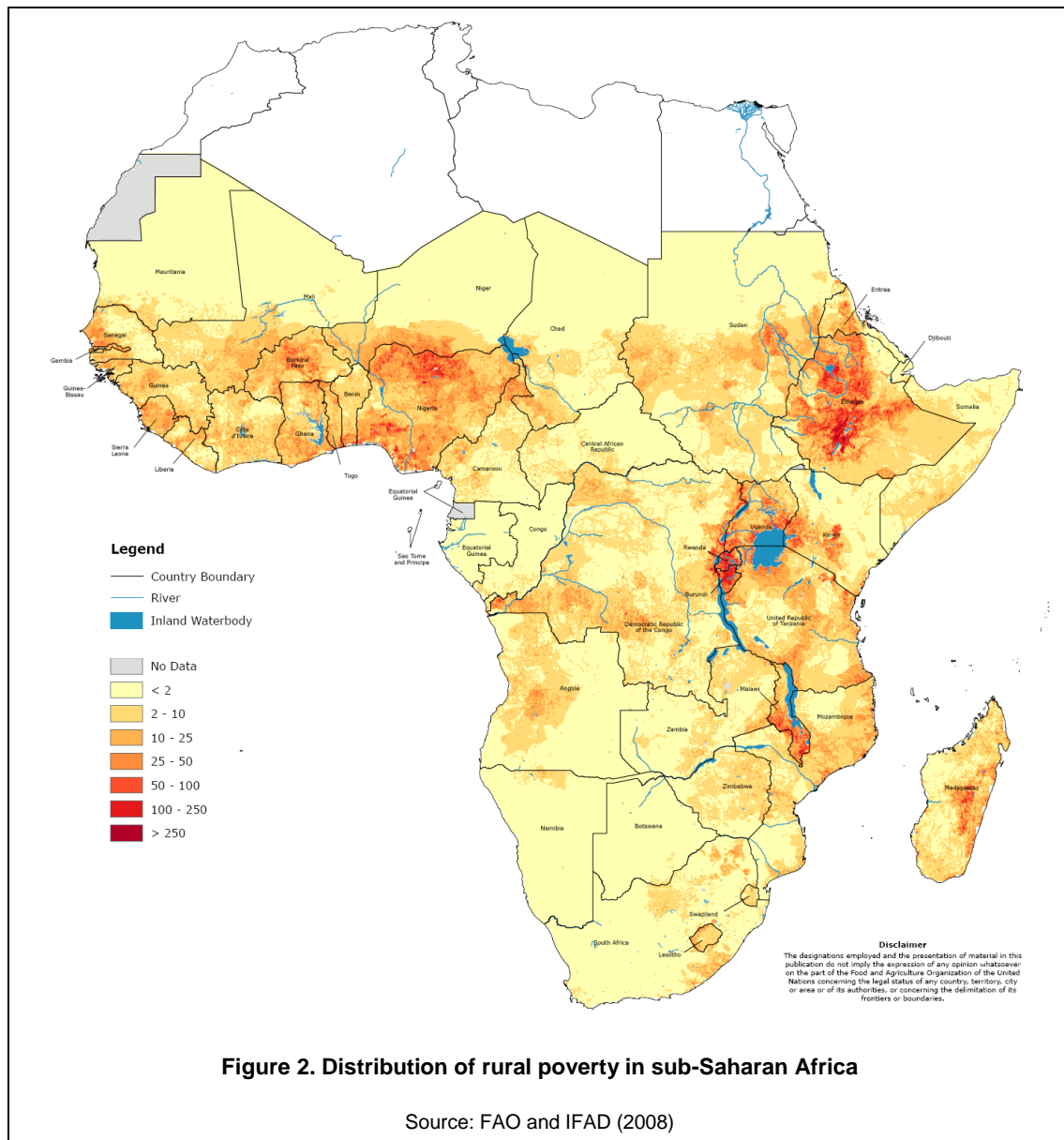
### Essential conditions for success

While focussing on water control, the study acknowledged the fact that in most cases the success of water investments in terms of poverty reduction depends on a series of conditions and complementary investments in human, physical, financial, social and natural capital. Seven major conditions for success have been identified and discussed in the report. They are: enabling governance and policies; secured access to market (including good access to market information, favourable terms of trade, and access to inputs); physical infrastructure (including roads, markets, storage, processing and refrigeration facilities, affordable and reliable energy supply); equitable and secure land tenure and water rights; soil fertility management; adapted financial support packages (including, where justified, subsidies and weather insurance); and investment in human capital (in which gender considerations are of prime importance). Such conditions are considered to be as important as the water-related interventions they support.

## Mapping rural poverty and livelihoods in sub-Saharan Africa

In order to analyse and understand the spatial distribution of rural livelihoods and their implications for water programmes, the study has adopted an approach increasingly used in food economy and early warning programmes (USAID, 2008). Livelihood mapping consists in identifying areas presenting some homogeneity in terms of the main sources of living for rural people. Extensively used in combination with vulnerability mapping, such maps help understanding possible sources of vulnerability among rural populations and adapt interventions in the most effective way.

By nature, livelihood mapping is not specific to any sector. However, in view of the particular importance of water, as discussed above, both for domestic and productive uses, in rural areas, such maps can be interpreted with a water focus and help adapting water interventions. Typically, *livelihood zones* are area showing homogenous and well distinguished biophysical and socio-economic determinants. Biophysical determinants include climate, water resources endowment, soils, etc. Socio-economic determinants include population structure and dynamics, culture and ethnic groupings, distance from markets, institutions and laws.



One important and relatively well known socio-economic factor is that related to population distribution and prevalence of poverty. Taking into account available information on distribution of rural population (FAO-

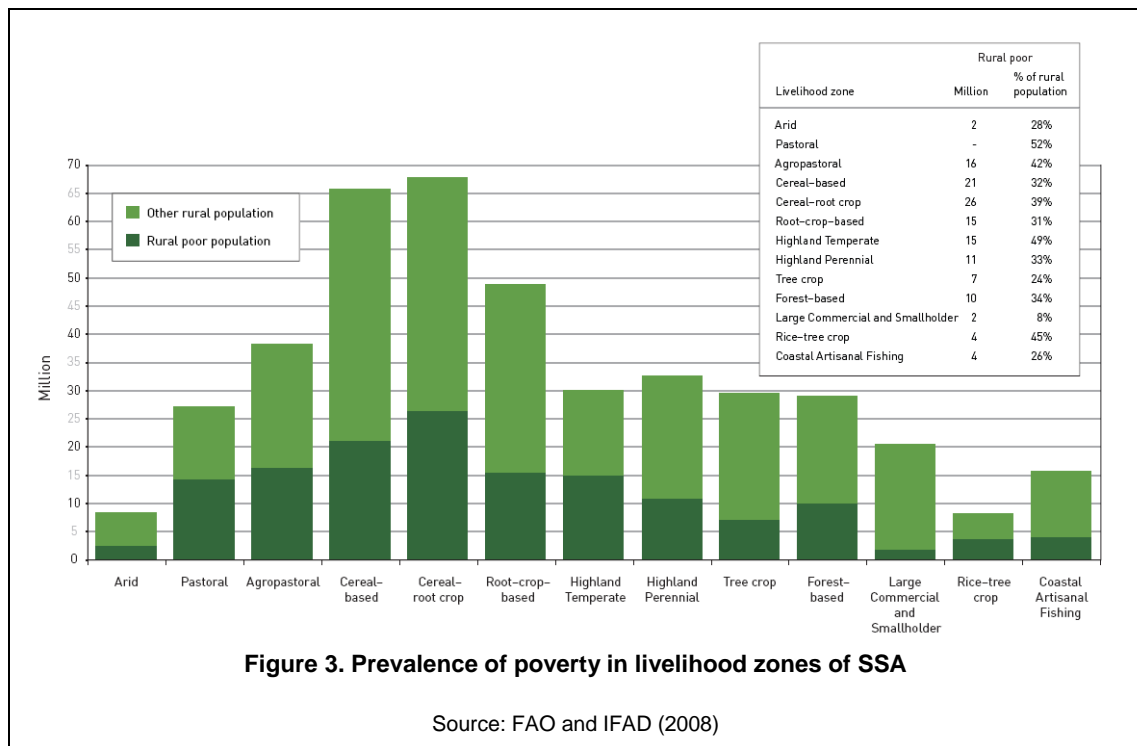
FGGD, 2008) and district-based information on prevalence of food insecurity and child malnutrition (CIESIN, 2008; DHS, 2008), the study prepared a map of showing the distribution of rural poverty in the region (Figure 2). The map shows the particular concentration of poverty in Eastern African highlands of Ethiopia and the Lake Victoria basin as well as Madagascar, and in the Gulf of Guinea, with particular emphasis on Nigeria.

**Identifying the main livelihood zones**

Similarly, the study produced a map showing the main livelihood zones for the region. Based mainly on agro-climatic conditions, as indicated above, the map shows thirteen main zones, described mainly by the type of farming system they sustain (FAO and World Bank, 2001). While it is recognised that at such scale only very broad categories can be identified, and that the complexity and diversity of local situations remain, the map allows for a first analysis of water-related issues in the different zones. In addition to these 13 zones, two local but highly relevant zones have been identified. They do not appear on the map, because of their local nature, but are relevant both in terms of sources of livelihood and water issues.

**Relationship between livelihoods, water and poverty**

The 15 livelihood zones are described in details in FAO and IFAD (2008). For each zone, a detailed description of the importance of water is provided. Clearly, the role of water changes with climate and aridity conditions, and population density. Large parts of the continent are characterised by high vulnerability to climate variability and droughts, and water control plays an important role. In densely populated areas, the need to intensify agricultural production also calls for better control of farm inputs, including water. Figure 3 shows the distribution of rural population and prevalence of poverty in the different zones, both in absolute and relative terms.



**Figure 3. Prevalence of poverty in livelihood zones of SSA**

Source: FAO and IFAD (2008)

**Assessing the poverty-reduction potential of water interventions**

**Criteria used for the regional analysis**

The study proposes a qualitative approach to assessing the potential of water-related interventions for poverty reduction in sub-Saharan Africa. Based on the context-specificity principle, and on the concept of livelihood zoning described above, it identified three levels of potential for poverty reduction: “low”, “medium” and “high”. The potential in each livelihood zone has been assessed on the basis of three criteria: prevalence of poverty (both in absolute and relative terms); water as a limiting factor for rural livelihoods (related mainly to agro-climatic conditions); and potential for water intervention (based on the potential for

further development of water resources and irrigation potential). Priority for action is then obtained through a combination of the three criteria. For example, in a zone where prevalence of poverty is high and water is clearly a limiting factor, if there is enough water available for new interventions, then the zone represents a high level of priority. At the other extreme, zones with low poverty rates, areas where water is not perceived as a limiting factor and areas where there is no more potential for additional water control present few opportunities for poverty reduction through water interventions. The results indicate that the areas with major potential for poverty reduction according to the three criteria are agro-pastoral, cereal-based, and cereal-root crop-based zones, together with the highland temperate zone, host to a large share of the region's rural poor. Areas with abundant precipitation and water resources show low potential for poverty reduction through water control investments, while other regions are classified as "moderate".

### **Assessing investment potential for MUS**

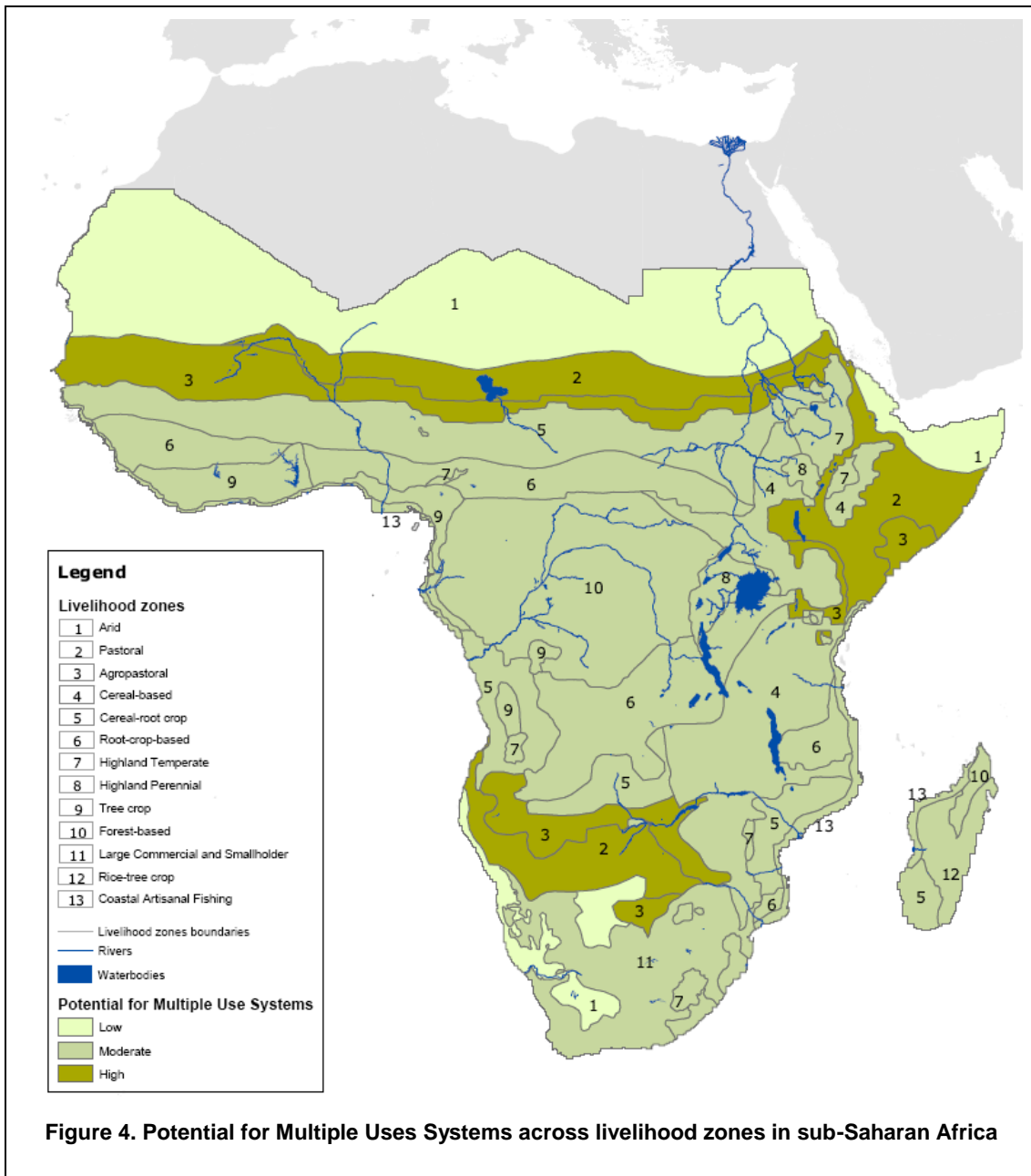
In its final stage, the study assessed investment potential for the seven types of possible interventions described above. After having assessed the relevance of each intervention for each livelihood zone, a simple and transparent calculation was performed to assess, by zone, the potential for investment in these seven types of interventions. The potential was expressed in hectares for rainfed soil moisture management, small scale irrigation, irrigation improvement, and peri-urban water control, in heads of livestock for livestock watering, in Mm<sup>3</sup> of storage for water harvesting infrastructure and in number of households for multiple use systems. Average unit costs were assigned to each type of intervention, and the potential, later expressed in number of beneficiaries, was calculated using the three criteria described above. Details of the computation method are presented in Annex 2 of FAO and IFAD (2008).

Multiple Use Systems (MUS) play an important role in livelihoods of sub-Saharan African households (IFAD 2007). When possible, investments that provide water for more than one household purpose are likely to be more effective than single-purpose investments in improving livelihoods (Renwick, 2001). Different typologies of MUS that meet the livelihood needs and conditions of rural people in sub-Saharan Africa have been described by Boelee, Laamrani and van der Hoek (2007):

- agriculture-related purposes, such as irrigating home gardens, watering livestock, washing agricultural equipment, and soaking fodder;
- domestic purposes, such as laundry, bathing, washing household utensils, soaking grains, cooking, drinking, house cleaning, and sanitation;
- commercial purposes, usually small-scale activities or home industries, such as brick making, butcher's or other shops, washing vehicles, pottery, and mat weaving;
- productive purposes, usually non-consumptive, such as fisheries and water mills;
- recreation.

Clearly, MUS are expected to have more potential in the pastoral and agropastoral livelihood contexts where water is scarce and unevenly distributed in time and space. In these areas, all activities, including irrigation, livestock watering, domestic and other productive activities are constrained by water scarcity. MUS also offer positive opportunities in terms of enhanced equity, as it tends to benefit women, girls and vulnerable people more directly than better-off farmers (IFAD 2007).

Assessing the potential for multiple use systems in sub-Saharan Africa was particularly difficult. The study relied on estimates provided by Renwick et al. (2007), where several levels of multiple uses systems are proposed. Unit cost was assessed on the basis of regional investment estimate for "Domestic+" systems as estimated by Renwick et al. (2007) for sub-Saharan Africa, and considering one system per household. An average unit cost of 75 US\$ per household was obtained for MUS. In total, it is estimated that about 44 million households or 220 million persons could benefit from investments in MUS in rural areas, which corresponds to 52 percent of the rural population of the region. Investments in MUS would require 3.3 billion US\$, about 4 percent of the total investments of the seven types of interventions. The livelihoods zones where MUS investments would be highest are 1) cereal-root crop-based, 2) agro-pastoral, and 3) cereal-based zones, characterised by a combination of poor access to water, high population density and prevalence of poverty, and where it could potentially reach 90 percent of the rural population (Figure 4). Instead, in well water-endowed areas, the potential of MUS is thought to be less than 10% of rural population, given the availability of alternative sources of water for most activities. It should be clear that such figures must be considered only as indicative, and as an order of magnitude of the potential for investments in MUS in support to rural poverty in the region.



## Conclusions

For many rural poor in sub-Saharan Africa water remains an important element of livelihood. Reliable and affordable access to sufficient domestic water supply and to sanitation satisfies basic household needs, helps improving health and hygiene, and reduces the drudgery of female household members. For crop production, the main source of livelihood for most rural people in the region, a better control of soil moisture is often the first condition for enhanced productivity, and it is an effective way to reduce vulnerability to climate variability. Animals, small and large, play an important role in household economy, food security and improved nutrition, and access to water for them is therefore important. Along rivers and lakes, people make a living out of inland fishery, the importance of which is usually largely underestimated. Local economies in rural areas are not made only of farming, and many people need water to satisfy the needs of their small industries, whether agro-processing or not.

Water-related programmes tend to be sectoral, with water supply and sanitation as a major MDG-related target on one side, and water control for agriculture (mostly irrigation) in support to food security and poverty alleviation on the other side. In agriculture, in particular, regional programmes focus on the



achievement of a physical potential, with the objective of doubling irrigation in the region (NEPAD, 2002; Commission for Africa, 2005), but with little connexion with the demand, be it in terms of agricultural products or in broader terms of poverty alleviation. This study has attempted to consider water-related investments from the user's perspective, using the livelihood approach to address water issues in all its dimensions.

A demand-driven approach to water investments in rural areas of sub-Saharan Africa has been developed, where population number, and in particular the rural poor, is combined with freshwater endowment (precipitation, water resources) to assess the demand for interventions that enhance access, control and management of water resources. In so doing, the study emphasises the necessary context-specific aspect of water programmes, and shows how demand varies across livelihood zones. While recognising the importance of water, the study also stresses the importance of enabling environment to ensure the success of water interventions. It stresses the need and importance of "soft" measures, as a condition for success of "hard" investments, including governance, policy, institutional and capacity-building environment. It also stresses the need to match investments in water with investments in other infrastructure, including markets and roads, in order to generate added value locally and increase the impact; and, for the agriculture sector, the need to combine investments in water control with investments in soil fertility enhancement, a problem of major importance in sub-Saharan Africa.

Multiple use systems, in particular those that build on domestic water supply systems and developed to serve other uses ("Domestic +" systems), play an important role in promoting household-level income-generating activities. Likewise, "Irrigation +" systems, because they mobilize important quantities of water, have the potential to develop and serve additional water needs that comparatively represent a small amount of water. Both types are perfectly in line with a livelihood approach which offers a comprehensive approach to water programmes at household level. Like for other investments, the demand for MUS depends on local conditions, and in particular alternative sources of water available to households (springs, rivers, lakes).

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### **Keywords**

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