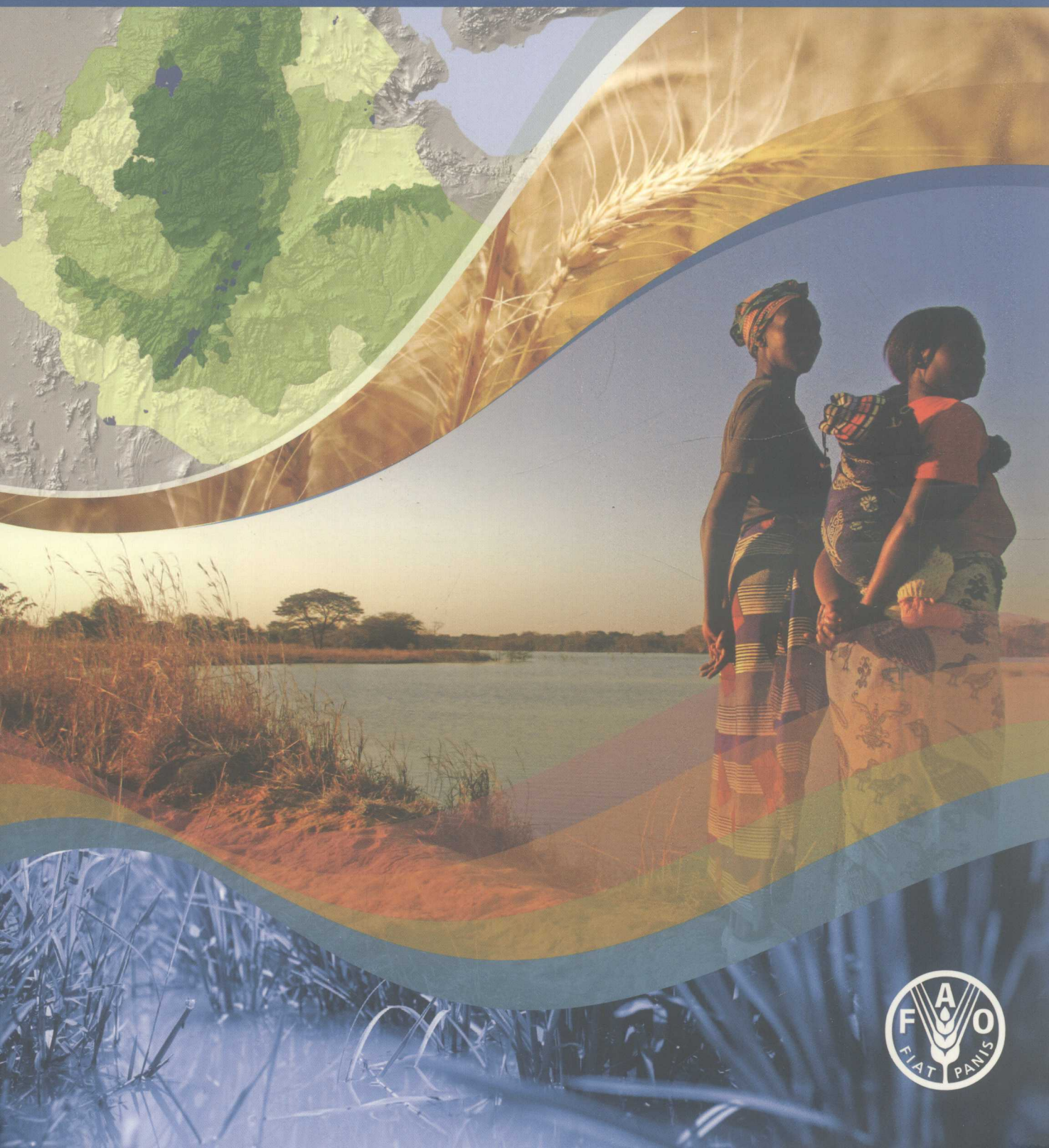


# Assessing the potential for poverty reduction through investments in agricultural water management

A METHODOLOGY FOR COUNTRY LEVEL ANALYSIS



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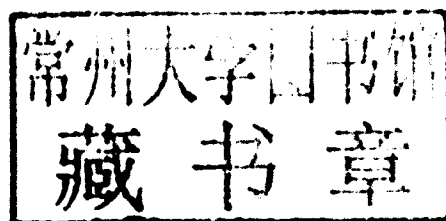
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Developed by

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## Content of the CD-Rom

1. Country investment briefs
2. Mapping outputs of the analysis of opportunities for AWM interventions
3. Interactive computer tool for AWM scenario analysis (an example is provided for West Bengal State)
4. Country livelihood zones analysis reports

## Abbreviations and acronyms

AEZ      Agro-ecological zone

AgWater   Agricultural Water

AWM      Agricultural water management

FAO      Food and Agriculture Organization of the United Nations

GIS      Geographic Information System

GMIA     Global Map of Irrigated Area

IDE      International Development Enterprise

IFPRI     International Food Policy Research Institute

IRWR     Internal renewable water resources

IWMI     International Water Management Institute

NRL      FAO, Land and Water Division

SEI      Stockholm Environmental Institute

SSA      sub-Saharan Africa

TLU      Tropical Livestock Unit



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which aimed to design agricultural water management (AWM) strategies for smallholder farmers in sub-Saharan Africa and India. The project was implemented by:



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The Project was implemented in Burkina Faso, Ethiopia, Ghana, the United Republic of Tanzania, Zambia and in the States of Madhya Pradesh and West Bengal in India.

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## Summary

Several studies have highlighted the potential of AWM for poverty alleviation. In practice, however, adoption rates of AWM solutions remain low and, where adoption has taken place locally, programmes to disseminate these solutions are often challenging. The overall goal of the project was to stimulate and support successful pro-poor; gender-equitable AWM investments, policies and implementation strategies based on concrete, evidence-based knowledge and decision-making tools.

The *AGwater* solutions project examined AWM interventions at the farm, community, watershed, and national levels. It has analysed the opportunities and constraints of a number of small-scale AWM interventions in several pilot research sites across the different project countries, and assessed their potential in different agro-climatic, socio-economic and political contexts.

Contrary to classical water investment planning processes, this approach focuses on addressing the needs of poor rural people, rather than focusing on the development of potentially suitable resources. In so doing, the demand for investments in water drives the assessment process, and its implications in terms of resources use (water, land) is checked against available supply. The demand for investments in water varies according to the needs of the population. In order to capture this demand, the project has adopted a livelihood mapping approach.

Livelihood zones mapping and analysis divides the country into areas where rural people share relatively homogeneous living conditions that are based on a combination of biophysical and socio-economic determinants. It describes the rural population's main sources of livelihood (by category of people), their natural resources base, potential and key constraints to development. It analyses the relation between people and water and assists understanding of the extent and how water can be a factor in development.

The different steps of this methodology followed for national analysis are:

1. Mapping of the main livelihood zones, responding to the following questions:
  - What are the different farmer typologies and rural livelihood strategies?
  - What are the main water-related constraints and needs in the different rural livelihood contexts?
2. Mapping of the potential and opportunities for improving smallholders' livelihood through water interventions:
3. Estimation of the number and percentage of rural households that may benefit from AWM interventions.
4. Mapping of the suitability and demand for a series of specific AWM solutions, showing where they have the highest potential impact on rural livelihoods.
5. Estimation of the potential number of beneficiaries, the potential application area and total investment costs for each AWM solution in each livelihood zone.

FAO conducted and coordinated a participatory AWM mapping process in each project country in close collaboration with national partners. These products were developed using an approach that included national level data collection and processing, case study analysis and local consultation. The livelihood map was developed during a participatory mapping workshop, which gathered a large number of national experts from different fields (agriculture, water, social sciences, geography, etc.)

and institutions (government, universities, non-governmental organizations (NGOs), etc.) as well as farmers' groups. This process was organized in two phases:

- a first workshop established the basis for the analysis and started depiction of the relationships between rural livelihoods and AWM; and
- a second or series of events - both at national and regional levels - were designed to review the maps and refine the criteria used to define the potential for AWM and the suitability of different technologies.

The outputs of these consultations were enhanced using secondary data analysis from available national and subnational datasets, and statistics and further consultation with national and international experts.

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## Introduction

Insecure access to water for consumption and productive uses is a major constraint for rural people in sub-Saharan Africa (SSA) and India. For millions of smallholder farmers, fishers and herders in SSA, water is one of the most important production assets, and securing access to and control and management of water is key to enhancing their livelihoods (FAO and IFAD, 2008). Considering that agriculture remains the main source of living, development strategies need to focus on improving productivity in this sector.

Agricultural water is fundamental to agriculture-based rural livelihoods and sufficient availability and reliable access to water is commonly a constraint to production and other activities. In addition, water provides a centre around which other interventions can be organized. In this respect, increasing and improving investments in agricultural water management to support smallholders' livelihoods is still a priority in SSA and India.

Small-scale irrigation is very promising in developing countries; it can promote rural food security, poverty alleviation and adaptation to climate change. It enables households to generate more income, increase their resilience and, in some cases, transform their livelihoods (Tucker, 2010).

Nevertheless, investment decisions concerning AWM are frequently 'supply-driven', dictated by the availability of land and water resources and not by needs and priorities based on farmers' livelihoods. Indeed, the likelihood of the success of water-related investments depends on a more comprehensive analysis of dynamic opportunities and needs that are closely linked to biophysical and socio-economic contexts (FAO and IFAD, 2008).

Therefore, there is a need to develop new models of planning for AWM investments level, by recognizing the diversity and complexity of the country contexts and by tailoring interventions to rural population priorities and livelihood strategies. Any rural water development strategy will need to deal with multi-local diversified livelihood systems with limited capacities for agricultural investment, and a predominance of risk-avoiding strategies (IFAD, 2005). This means, "a fundamental shift beyond considering water as a resource for food production to focusing on people and the role water plays in their livelihood strategies" (WWAP, 2006); and implies a multiple-use perspective (Molden, 2007).

Starting with these considerations, this document presents a methodology that aims to identify AWM potential and opportunities in support of smallholders' livelihoods. Specifically, the methodology shows how livelihood mapping helps define locations where water constraints are a major factor affecting farmers and where specific agricultural water management and technologies can have a positive impact on smallholders' living conditions, particularly the poorest.

The primary goal of this approach is to define and assess the potential for scaling-up opportunities at the national level for AWM interventions in support of the livelihoods of smallholder farmers.

This report proposes a method for identifying the locations where water constraints are a major factor affecting smallholders' livelihoods and where agricultural water management in general, as well as specific technologies, can boost the poorest farmers' livelihoods. This present report builds on previous studies conducted by the FAO and IFAD (2008) and Sullivan *et al.* (2009).

The method described relies on a livelihood mapping approach that allows characterizing the main country livelihood zones geographically and the role of agricultural water access and management in each domain. The likelihood of a successful adoption of AWM options by smallholders varies according to the main sources of livelihood, dictated in large part by different biophysical and socio-economic determinants including agroclimatic conditions, natural resources endowment, socio-political and cultural context.

Understanding the geographical characterization of rural livelihoods and the distribution of the main rural population typologies helps in the design of intervention strategies to improve agricultural water management and increase both the resilience and productivity of agriculture, and more generally to boost agricultural incomes.

More specifically, the approach consists of four elements or steps:

- understanding the link between access to water, water use and rural livelihoods;
- defining where AWM is key to ensuring sustainable rural livelihoods and where it can make a difference;
- understanding how AWM can contribute effectively to boost living conditions in rural areas, identifying which technological options are the most promising, and where the most suitable conditions exist for their adoption;
- defining and locating the target beneficiaries of the proposed AWM approaches and understanding their main strategies and how they can benefit from AWM.

This approach has been implemented and tested in surveys conducted in Burkina Faso, Ethiopia, Ghana, Tanzania and Zambia, and in the states of Madhya Pradesh and West Bengal in India. In each country/state, a number of relevant AWM interventions were identified by desk studies and consultations with national experts.

## Content of the CD-Rom

The report encloses a CD-ROM with additional information, as follows:

### 1. Country investment briefs

The briefs are summary reports prepared for each project countries (Burkina Faso, Ethiopia, Ghana, the United Republic of Tanzania, Zambia, Madhya Pradesh and West Bengal States in India) that describe the results of the analysis at country level and present all the mapping outputs as well as figures regarding the investment potential.

### 2. Mapping outputs<sup>1</sup> of the analysis of opportunities for AWM interventions

The maps presented include, for each country/state:

- i) Maps of livelihood zones
- ii) Maps of potential beneficiaries of AWM interventions
- iii) Maps of biophysical suitability by type of AWM intervention
- iv) Maps of livelihood-based demand by type of AWM intervention.

### 3. Interactive computer tool for AWM scenario analysis (an example is provided for West Bengal State)

The tool is developed in MS Excel and allows the users to customize the map of potential beneficiaries of AWM interventions by changing the value of the perceived demand for AWM intervention in the different livelihood zones.

### 4. Country livelihood zones analysis reports

These reports, prepared by national partners in each project country/state, provide an in-depth overview of the country-level livelihood context by describing the different livelihood zone profiles, their key characteristics as well as their water-livelihood implications.

<sup>1</sup> The GIS datasets and metadata are available and can be downloaded in the FAO Geonetwork portal: <http://www.fao.org/geonetwork/srv/en/main.home>

## Scope of this report

This report is to present the methodology used for mapping and assessment of the potential for investments in agricultural water management at country level in support of rural livelihoods. More specifically, the approach aims to:

- 1. Map and describe the main country livelihood contexts**

This is the starting point of the approach. The intent is to identify, characterize and locate the key livelihood contexts to better understand their main constraints and development needs their different farmer typologies and the implications for AWM.

- 2. Map the AWM potential to improve smallholders' livelihoods**

The purpose is to assess the entry point for AWM so as to improve rural livelihoods and, more specifically, identify where to prioritize investments in AWM in order to have the maximum impact on rural livelihoods.

- 3. Map the suitability domains of specific AWM solutions**

The purpose is to assess and map the area identified as the most promising for AWM technologies and investment options so as to generate the highest impact on smallholders' livelihoods. Specifically, the intent is to define and locate geographical domains where a given AWM technology or solution will result in highest benefits for livelihoods and where there is more likelihood for its adoption by smallholder farmers.

- 4. Estimate the potential number of beneficiaries and costs of investing in AWM**

On the basis of the geographical domains of the different AWM investment options, the approach foresees the estimation of the number of potential beneficiaries and application area as well as the potential investment costs at national level.

## Concepts and definitions

### The livelihoods perspective

The livelihoods perspective is an approach to determining how people make a living. It incorporates an understanding of how household capabilities, assets, and activities combine within a specified environment to achieve household well-being in the short and long term. Livelihoods analysis assesses the resilience of household strategies in the face of shocks and stresses, and assists in identifying vulnerable areas or groups. The findings generated provide a useful framework for supporting households in improving their living conditions and enhances their resilience to both external (e.g. drought) and internal threats (e.g. family illness) (FAO and IFAD, 2008).

According to Chambers and Conway (1992), livelihood comprises the capabilities, assets (stores, resources, claims and access) and activities required for a means of living. It comprises the adequate stocks and flows of food and cash required to meet basic needs. It is made up of a range of farm and off-farm activities that together provide a variety of sources of procurement for food and cash. Thus each household can have several possible sources of entitlement that constitute its livelihood. These entitlements are based on the endowments of a household, and its position in the legal, political and social fabric of society. A livelihood is sustainable when it: i) can cope with and recover from stress and shocks that determine vulnerability; ii) maintain or enhance its capabilities and assets; and iii) provide sustainable livelihood opportunities for the next generation.

The vulnerability context refers to seasonality, trends, and shocks that affect people's livelihoods. The key attribute of these factors is that they are not susceptible to control by local people themselves, at least in the short and medium term (DFID, 2000).

Livelihood strategies vary significantly within a country, from rural to urban areas, and across countries. The household is taken as the unit of reference because it is the primary level of aggregation through which people organize production, share income and consumption (FAO, 2006a).

Policies and institutions that influence rural household's access to livelihood assets are also important aspects of the livelihood framework (DFID, 2000). Institutions are the social cement linking stakeholders to access to capital of different kinds to the means of exercising power and so define the gateways through which they pass on the route to positive or negative [livelihood] adaptation (Scoones, 1998).

### Mapping rural livelihoods

Provided that patterns of rural livelihood vary from one area to another, based on local factors such as climate, soil or access to markets, livelihood mapping consists of identifying and mapping areas with relatively homogeneous conditions, where households share similar livelihood patterns and have relatively similar entitlements, which are formed by considering both biophysical and socio-economic determinants. In this case, specific attention is given to the use and management of rural water resources. The analysis, therefore, delineates geographical zones within which people share similar livelihood patterns, such as source of income, access to food, farming practices, including crops, livestock and access to markets.

Different livelihood options are available to people depending on where they live (the agro-ecological context) and the resources to which they have access (land, infrastructure, assets, financial resources, labour, social network, etc.). The possibilities are many but not unlimited; in practice, the range of options is typically limited. People produce food, they exchange goods or services for food, or they earn cash with which they can buy food. Once it is evident that a group of people in a certain area share a predominant way of securing their food, then it is possible to characterize the area in terms of the

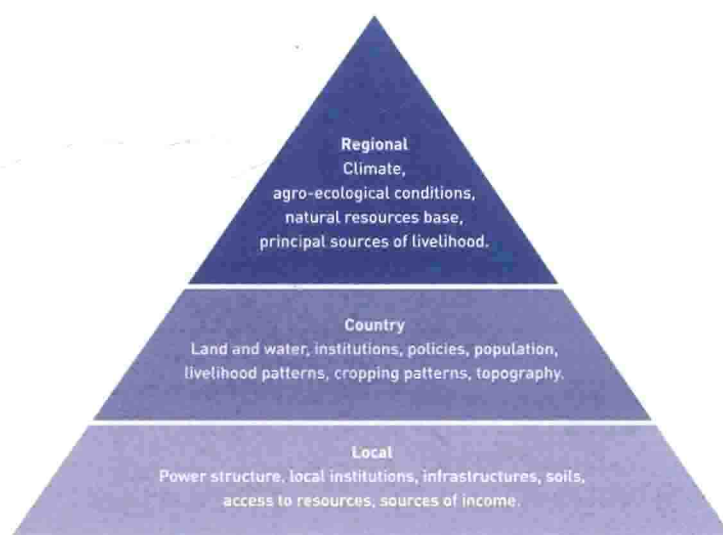


dominant economic activity: a maize-based farming zone, or pastoral zone based on camel raising (USAID, 2008).

It is important to recognize that mapping livelihoods at different scales uses different criteria and parameters. Livelihoods are characterized at the regional level differently than at country or local levels. For example, at the regional level, given the heterogeneity of large-scale conditions, livelihood mapping in rural areas will be based predominantly on the agro-climatic conditions that dictate major farming practices, while such a scale will make it difficult to account for the variety of socio-economic conditions that influence livelihoods locally. Scaling down to the country and local levels, such socio-economic conditions, together with political and institutional parameters, can better take into account the delineation of domains of homogenous livelihoods (FAO and IFAD, 2008).

Figure 1 shows the different variables at different scales that allow the identification, mapping and characterizing of homogeneous livelihood zones.

**Figure 1 Rural livelihood determinants at different scales (FAO and IFAD, 2008)**



Most livelihoods are complex and are shaped by a wide-range of factors. Generally, four primary categories of determinants can be identified: i) Geography climate and natural resources; ii) Production; iii) Market and Infrastructure; iv) Socio-economic patterns. In addition, as the approach aims at determining relationship and interaction between livelihoods and water resources, it is necessary to add a fifth determinant: access to water resources.

#### **i. Geography climate and natural resources**

These variables correspond to natural capital in the sustainable livelihood framework (DFID, 2000) and represent natural resources available to people and the way they are used and the prevailing agroclimatic conditions that influence farming activities. People living in a fertile highland area have very different options than those living in a semi-arid lowland area. The most important natural factors are topography (i.e. the physical features of an area, including the relief, coasts, rivers, and plains), soil, climate (i.e. temperature and rainfall) and vegetation. These are the variables that most influence the typology of production activities and the livelihood strategies.

## ii. Production

There are several types of rural production system. Most can be grouped into a few main categories: agricultural; agro-pastoral; pastoral; fishing; hunting-gathering and, in some cases, other systems (e.g. labour-based, mining areas, game reserves, etc.). The system of production is determined by several factors, of which geography, climate and natural resources are clearly the most significant. Other factors that influence production patterns are markets and infrastructure as well as the socio-economic context.

**Table 1 Sources of rural livelihoods associated with major production systems (adapted from FEG consulting)**

Sources of rural livelihood	Main characteristics	Additional notes
Agriculture	Example of main types of Agricultural Livelihood zones <ul style="list-style-type: none"> <li>• Rainfed and/or irrigated</li> <li>• Food crop and/or cash crop</li> <li>• Crop surplus or crop deficit</li> <li>• Hand and/or animal/mechanical traction</li> <li>• Short or long rains dependent</li> <li>• Lowland - highland - mid-highland</li> <li>• High/low potential</li> <li>• In/Fertile soils</li> <li>• Sparsely or densely populated</li> </ul>	In this type of zone, the main activity is crop production, typically supplemented by livestock keeping but on a small scale (e.g. 1-2 dairy cattle and poultry for most households). We want to rank the main crops consumed and the main crops sold.
Pastoral	Agro-ecological zone	Pastoral livelihoods are those where the core or main activity is the raising of livestock. We want to rank the main types of livestock based on their importance to household food and income.
Agro-pastoral	<i>Crops more/less important than Livestock</i> Plus any agricultural or pastoral characteristics	Agro-pastoralists both herd livestock and grow crops.
Fishing	Boats, nets and/or lines	source of income.
Labour-based	Plantation - ranch - urban Local work - seasonal - long-term migration Type of plantation (tea, coffee, etc.)	In this type of zone the majority of people derive their income from labour and purchase most of their food
Hunter-gatherer	Hunting of animals more/less important than gathering of wild plants	Hunter-gatherers derive a substantial proportion of their food from hunting and gathering (not just income, as for pastoralists that may collect and sell charcoal, for example.)
trading	Indicate main characteristics	pattern not listed above.

## iii. Market and infrastructure

The most important human-made factors are those related to infrastructure (roads, railways, and telecommunications). People living along major roads may have better access to markets, food and income options than those living in more remote areas. We can think of these three factors as linked to consumption as follows: geography affects both the options for production (climate, soil, etc.) and for marketing/trade (roads, proximity to urban centres, etc.), which in turn affect household consumption. Household production (of food and other items) may either

be directly consumed or may be traded/exchanged for other items in the market. Consumption is critically determined by what is available in these markets, and how people obtain the means to purchase these commodities.

iv. **Socio-economic patterns**

The socio-economic context is a crucial element to describe livelihoods, although socio-economic criteria can hardly be mapped. These elements are often defined by targeted surveys and the use of subnational statistics. Examples of socio-economic criteria are: population density and distribution, farmers' typology, average landholding size, vulnerability to climate shocks, access to credit, etc.

v. **Access to water resources**

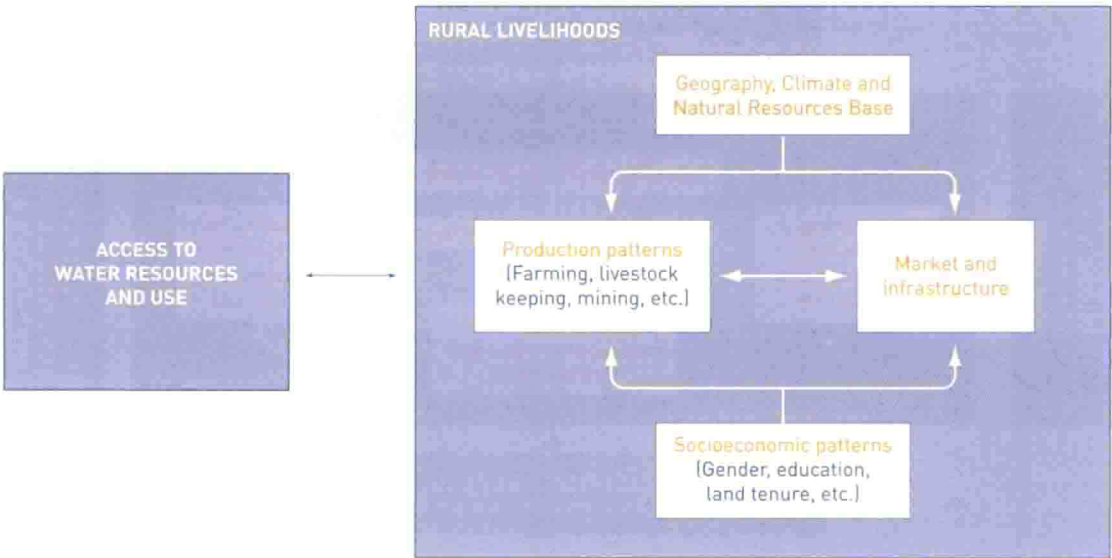
The main focus of this analysis is to understand the implications and linkages between water resources and rural livelihoods. As the main objective of this approach is to provide clear recommendations for AWM interventions in support of livelihoods, these aspects are then crucially important to the definition of the livelihood zones boundaries and description and are key livelihood determinants for the mapping process.

Mapping livelihood zones is a challenge as not all livelihood determinants can be mapped, represented or are relevant at all scales. Mapping livelihoods at national level entails an effort that captures the most distinguishing characteristics of the zones, while avoiding over-approximation. This process is particularly challenging in contexts where statistical and spatial datasets are not available or have significant gaps, particularly in sub-Saharan Africa (SSA).

Livelihood zone mapping involves more than just the drawing of maps. A livelihood zone map is of little use unless it is accompanied by a detailed description of the patterns of livelihoods in each zone, and ideally by an analysis of the underlying reasons for differences between zones. This means analysing in some detail the production and trade/exchange options in each of the zones and the influence that the underlying geography has on each (FEG, 2011).

Most livelihoods are complex, and are shaped by a wide-range of factors. Generally, when defining livelihood zones we look at four primary factors (Figure 2):

Figure 2 Rural livelihoods determinants



## Summary of methodology

The method is characterized by different phases to be implemented over a period between 3 and 6 months, depending on the complexity and size of the country. The approach foresees a balance between desk analytical work, field-level data collection and participatory consultations with national experts and stakeholders.

Specifically, the approach is characterized by:

1. An inception phase to define the mapping criteria and data needed for the analysis and to build the information and knowledge base as well as to conduct the data and information collection process
2. A participatory mapping phase to interpret the data and information collected and start depicting livelihood zones, AWM investment potential and suitability domains for AWM solutions
3. A data and information-processing phase to consolidate and fully describe the map of livelihood zones and assess the AWM investment priorities, geographical domains for AWM solutions and estimate and quantify the potential beneficiaries of AWM solutions.
4. A validation phase that is characterized by participatory validation workshops as well as the data check and comparison using surveys, studies and field sample.

Figure 3 shows the framework of the method proposed.

Figure 3 Framework methodology

