FAOWATER

AGWATER SOLUTIONS
Improved livelihoods for smallholder farmers

COUNTRY INVESTMENT BRIEF

Mapping and assessing the potential for investments in agricultural water management

Burkina Faso

The Agricultural Water Solutions Project

The Agricultural Water Solutions Project aims to unlock the potential of smallholder farming by identifying, evaluating and recommending a variety of agricultural water management (AWM) solutions - including technologies as well as the necessary supporting policies, institutions, financing arrangements and associated business models. This is being achieved through a series of interlinked activities in the seven project sites in Africa (Burkina Faso, Ethiopia, Ghana, Tanzania and Zambia) and in India (Madhya Pradesh and West Bengal). These activities include:

- in-depth case studies,
- mapping areas to identify where solutions are likely to be most viable and have greatest impact,
- discussing AWM solutions and project findings with stakeholders, and
- formulating business models to turn these findings into practical plans.

The national level analysis

This note presents the result of the national analysis. The analysis gathers available thematic maps and district statistics, and combines them with national livelihood maps which have been established through an in-depth consultation process to identify opportunities to invest in AWM in support to rural livelihoods. The suitability of different AWM solutions is then assessed and quantified in terms of investment opportunities and potential number of beneficiaries.

The methodology

Contrarily to classical water investment planning processes, this approach focuses on addressing poor rural people's needs rather than focusing on the development of potentially suitable resources. In so doing, the demand for investments in water is compared to the supply (availability of water). 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. This note presents the different steps followed in the national analysis:

1. Map 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. Map the potential and opportunities to improve smallholders' livelihood through water interventions: estimate the number and percentage of rural households who could potentially benefit from AWM interventions.
3. Map the suitability and demand for a series of specific AWM solutions, showing where they have the highest potential impact on rural livelihoods.
4. Estimate the potential number of beneficiaries, the potential application area and total investment costs for each AWM solution in each livelihood zone.

FAO has conducted and coordinated a participatory AWM mapping process in each project country in close collaboration with national partners. These products have been developed through a stepwise approach including 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, NGOs, etc.) as well as farmers groups. This process was organised in two phases: 1) the purpose of a first workshop was to set up the basis for the analysis and start depicting the relationships between rural livelihoods and AWM and 2) a second or series of events - both at national and regional levels - to review the maps and refine the criteria used to define the potential for AWM and the suitability of different technologies. The outputs of the workshop have been enhanced through further consultation with national and international experts and through secondary data analysis using available national and sub-national datasets and statistics.

IWMI International Water Management Institute · IFPRI · FAO · SEI · iDE · CH2MHILL

Mapping the livelihood context

Different people in different places have different needs

Livelihood domains

1. South-west sub-humid, cereals-root crops (sorghum-yam)
2. West sub-humid, cereals (rice, maize), tree crops and cotton
3. West moist-semiarid, cotton, cereals (rice-maize), vegetables
4. West moist-semiarid, cotton, cereals (sorghum-maize)
5. West moist-semiarid, cotton, cereals (sorghum-maize) and sesame
6. North-west moist-semiarid, cereals (sorghum-rice), irrigated cash crops and remittances
7. Centre-west moist-semiarid, cereals (sorghum-millet), horticulture and remittances
8. South moist-semiarid, , cereals-root crops and tourism zone
9. Centre-east, moist-semiarid, cereals (sorghum,- rice), groundnut, livestock
10. South-east, moist-semiarid, cereals (sorghum-millet), forestry and fauna, tourism
11. Central periurban, horticulture and livestock
12. Central Plateau moist-semiarid, cereals and market gardening zone
13. Centre-north dry semiarid, cereals-vegetables- groundnut
14. North dry semiarid, agropastoral, sorghum-millet -livestock (pastoralism dominant), vegetables
15. North-east arid, transhumant pastoralism and millet
16. East dry semiarid, cereals-livestock, transboundary trade

The purpose of livelihood maps

Livelihood mapping consists in identifying areas where rural people share relatively homogeneous living conditions, on the basis of a combination of biophysical and socio-economic determinants.

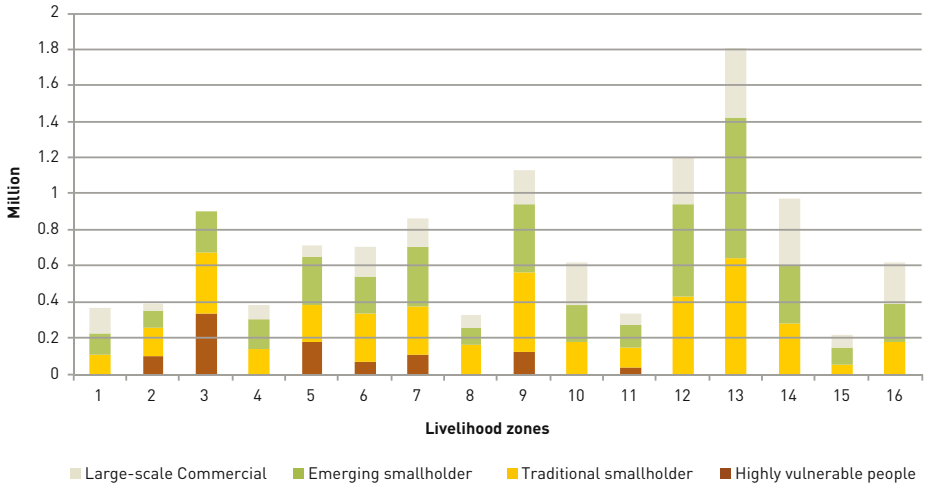
The main criteria to establish livelihood zones are: the predominant source of income (livelihood activities); the natural resources available to people and the way they are used; the prevailing agroclimatic conditions that influence farming activities, and access to markets.

In the absence of detailed local level statistics, the livelihood map is a useful tool to understand rural people dependence to water (access, vulnerability, resilience to shock) and the extent to which investments in water are critical to their development.

The map of livelihood zones is the result of a participatory mapping process involving a wide range of experts, professionals and farmers representatives. Each livelihood zone is described in details in terms of the main smallholders' livelihood strategies, dimensions of poverty, their water-related problems and other constraints for development, and the role agricultural water management plays for their livelihoods. Combined with the map of rural population, the livelihood map makes it possible to assess the demand for water-related interventions in each zone.

Generally, livelihood zone boundaries would coincide with administrative boundaries, but not always. In practice, homogenous agroecological and socio-economic zones often cross larger administrative units. In these cases the delineation is based on other criteria which better capture the delineation between different livelihoods patterns (topography, climatic data, land cover data, etc.).

Key typologies of farming population



Highly vulnerable people:
this category consists of people having no or very limited access to livelihood assets and resources. They are often widows, families affected by HIV/AIDS or other diseases, etc.

Traditional smallholder farmers:
These farmers produce mainly staple food (both crop and livestock) for household consumption and have relatively marginal connections to markets. The aim at stabilizing production and reduce risks of production failures.

Emerging market-oriented smallholder farmers
These farmers may partially subsist from their own production but whose principal objective is to produce a marketable surplus

Commercial farmers
These are large or small-scale commercial farmers and enterprises that are fully oriented towards internal and export markets

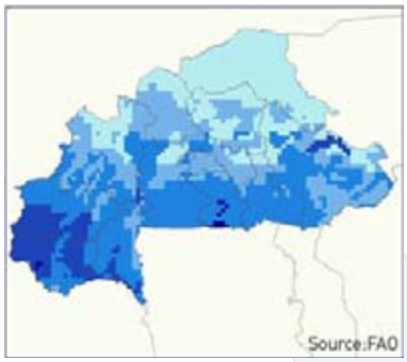
Key characteristics of livelihood zones

Zone	Key livelihood aspects	Main farmers typology	Rural population	Poverty rate	Main constraints for development
1	South-west sub-humid, cereals-root crops (sorghum-yam)	Commercial farmers and emerging smallholders	369 246	High	Lack of water control, soil degradation, lack of farmers coordination and organisation, access to infrastructure
2	West sub-humid, cereals (rice, maize), tree crops and cotton	Traditional smallholders and landless	390 174	Low	Lack of water control, soil degradation, lack of farmers coordination and organisation, access to infrastructure
3	West moist-semiarid, cotton, cereals (rice-maize), vegetables	Traditional smallholders	906 101	Low	Lack of socio-economic infrastructures (education, health, domestic water)
4	West moist-semiarid, cotton, cereals (sorghum-maize)	Emerging smallholders	387 753	Moderate	Lack of socio-economic infrastructures (education, health, domestic water)
5	West moist-semiarid, cotton, cereals (sorghum-maize) and sesame	Traditional and emerging smallholders	718 158	Moderate	Lack of roads and socio-economic infrastructures (education, health, domestic water)
6	North-west moist-semiarid, cereals (sorghum-rice), irrigated cash crops and remittances	Traditional and emerging smallholders	704 617	High	Lack of roads, migration issues, lack of roads and socio-economic infrastructures (education, health, domestic water)
7	Centre-west moist-semiarid, cereals (sorghum-millet), horticulture and remittances	Traditional and emerging smallholders	866 586	Moderate	Lack of roads and socio-economic infrastructures (education, health, domestic water), lack of water infrastructures lack of land for rainfed agriculture
8	South moist-semiarid, , cereals-root crops and tourism zone	Traditional and emerging smallholders	326 481	Moderate	Lack of water control, soil degradation, lack of farmers coordination and organisation, access to infrastructure
9	Centre-east, moist-semiarid, cereals (sorghum,- rice), groundnut, livestock	Traditional and emerging smallholders	1 134 500	High	Farmers literacy, lack of farmers coordination and organisation, high poverty rates, erratic rainfall, access to market
10	South-east, moist-semiarid, cereals (sorghum-millet), forestry and fauna, tourism	Commercial farmers and emerging smallholders	620 863	High	Farmers literacy, lack of infrastructures, land tenure
11	Central peri-urban, horticulture and livestock	Commercial farmers and emerging smallholders	336 859	Moderate	Lack of periurban land, pressure on water, land tenure, high market competition
12	Central plateau moist-semiarid, cereals and market gardening zone	Traditional and emerging smallholders	1 204 850	High	Lack of credit, soil degradation, lack of extension services, lack of market information
13	Centre-north dry semiarid, cereals-vegetables-groundnut	Traditional and emerging smallholders	1 812 470	High	Lack of credit, soil degradation, lack of extension services, lack of market information, isolation
14	North dry semiarid, agro-pastoral, sorghum-millet -livestock (pastoral dominant), vegetables	Pastoralist and emerging smallholders	973 702	High	Lack of water resources and infrastructures
15	North-east arid, transhumant pastorals and millet	Pastoralist and emerging smallholders	220 789	High	Lack of water resources and infrastructures
16	East dry semiarid, cereals-livestock, transboundary trade	Commercial farmers and emerging smallholders	622 918	High	Lack of water resources and infrastructures

Mapping potential and opportunities for water

Criteria used

1. Water availability (runoff)

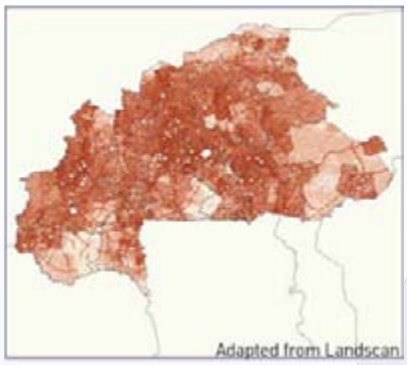


mm/y
- 0 - 50
- 50 - 100
- 100 - 200
- 200 - 300
- > 300

2. Perception of water as limiting factor for agricultural production

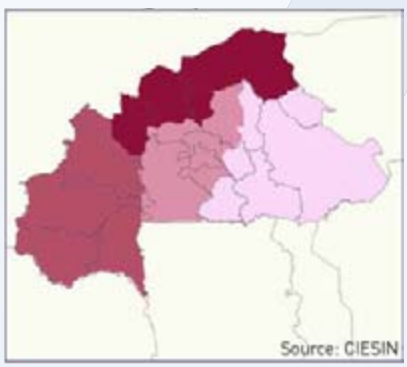
- High
- Medium
- Low

3. Rural population density



P /km²
- < 5
- 5 - 10
- 10 - 15
- 15 - 35
- > 35

4. Poverty (prevalence of underweight children)



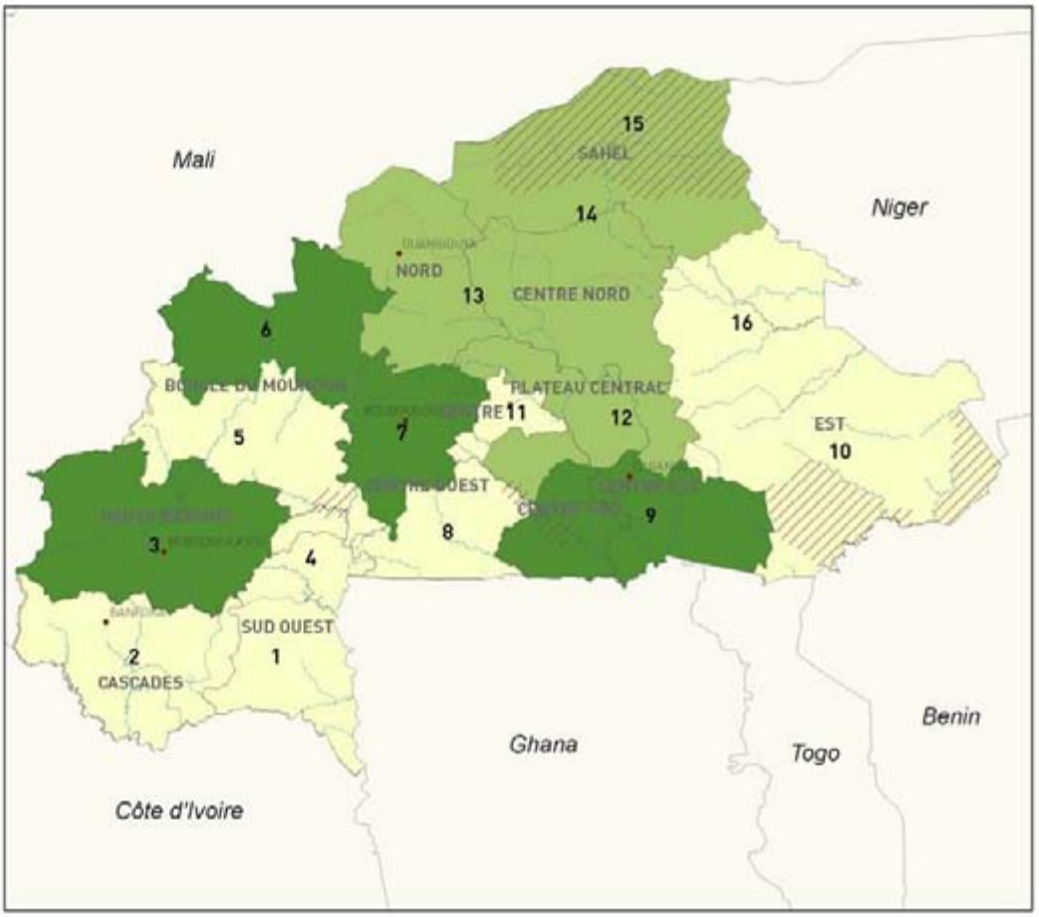
Prevalence (among children < 5)
- < 33%
- 33% - 36%
- 36% - 36%
- 36% - 37%

Number of potential beneficiaries

The potential for investment in water in support to rural livelihoods is a function of the demand from rural population and the availability of the resource. The maps above show a distribution of rural population who could benefit from water-related interventions. The level of demand is based on the analysis of the livelihood zones described before, combined with poverty level.

The supply is a function of availability of water, calculated on the basis of well established thresholds of water per person (water development being constrained below 1700 m^3/pers.). These maps are *generic*.
The following pages show that the potential varies substantially as a function of the proposed technology.

interventions



Administrative boundaries
Protected areas

In Percentage of Rural Population

15% - 50% 51% - 58% 59% - 80%

Administrative boundaries
Protected areas

Livelihood zone		Water availability: IRWR/cp (m^3/p/y)	Rural population			Perception of water as limiting factor for agricultural production	Potential beneficiaries	
No	Name		Total (,000)	Density (p/km^2)	% poor (underweight)		Person (,000)	in % of rural population
1	South-west sub-humid, cereals-root crops (sorghum-yam)	2,765	369	26	36.0	Low	55	15%
2	West sub-humid, cereals (rice, maize), tree crops and cotton	3,841	390	25	36.2	Medium	195	50%
3	West moist-semiarid, cotton, cereals (rice-maize), vegetables	2,143	906	38	36.2	High	725	80%
4	West moist-semiarid, cotton, cereals (sorghum-maize)	924	388	55	35.6	Low	58	15%
5	West moist-semiarid, cotton, cereals (sorghum-maize) and sesame	1,125	718	44	36.2	Medium	359	50%
6	North-west moist-semiarid, cereals (sorghum-rice), irrigated cash crops and remittances	691	705	41	36.5	High	528	75%
7	Centre-west moist-semiarid, cereals (sorghum-millet), horticulture and remittances	645	867	72	33.1	High	628	72%
8	South moist-semiarid, cereals-root crops and tourism zone	1,980	326	30	33.1	Low	49	15%
9	Centre-east, moist-semiarid, cereals (sorghum,- rice), groundnut, livestock	1,192	1,135	58	32.9	High	908	80%
10	South-east, moist-semiarid, cereals (sorghum-millet), forestry and fauna, tourism	2,295	621	19	32.9	Medium	310	50%
11	Central peri-urban, horticulture and livestock	298	337	136	33.1	Low	51	15%
12	Central Plateau moist-semiarid, cereals and market gardening zone	431	1,205	86	33.0	High	696	58%
13	Centre-north dry semiarid, cereals-vegetables- groundnut	385	1,812	73	34.7	High	974	54%
14	North dry semiarid, agro-pastoral, sorghum-millet , vegetables	358	974	37	36.0	High	498	51%
15	North-east arid, transhumant pastorals and millet	397	221	16	36.7	High	121	55%
16	East dry semiarid, cereals-livestock, transboundary trade	1,041	623	31	32.9	Medium	311	50%

Mapping the suitability and demand for specific AWM solutions

The AWM options

The project selected a series of promising AWM technologies on the basis of a baseline study, validated by a national consultation workshop. The following solutions were retained and were the subject of in-depth research conducted by the project:

- **Low-cost motor pumps pumps (for surface water or groundwater abstraction)**
  Motorized pumps up to 5 HP that can lift and distribute water for farming practices. Their cost in Sub-Saharan Africa ranges from 200 up to 500 US$. They can irrigate a few hectares; smallholders in SSA use pump irrigation for high value crops, although they seldom exceed 1 ha of irrigated land per household. Farmers who have access to irrigation have substantially higher incomes and better food security than their neighbors who rely on rainfall. This needs a reliable method of drawing water from an available water source, whether it be a river, a reservoir, a pond, canal or groundwater.
- **Inland valley bottom - wetland rice**
  Inland valleys are low-lying areas, including valley bottoms and floodplains, receiving runoff from hills and mountains. Through the use of water capture and delivery structures the systems provide supplemental irrigation and improve soil moisture retention. The Government has shown an interest in revitalizing its domestic rice sector to meet growing demand, reduce imports and contribute to poverty reduction and youth employment. Inland valleys are a possible low cost, high potential option
- **Small reservoirs**
  Small reservoirs are earthen or concrete dams that are less than 7.5 meters high. They can store up to 1 million cubic meters of water and sometimes have a downstream adjacent irrigation area of less than 50 hectares. Capital investment is generally externally driven and community management remains the norm.

For the 3 options a biophysical suitability and the potential demand based on livelihood conditions have been mapped and are presented further down.

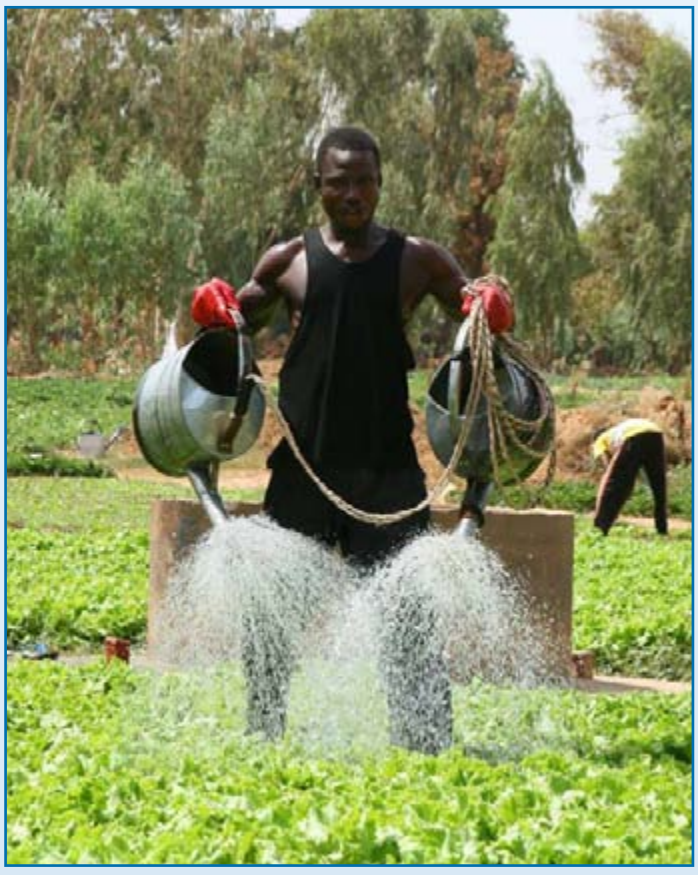
Biophysical suitability

The map uses a set of criteria to assess the potential geographical extent of each AWM solution. These criteria represent the distribution of the biophysical conditions under which a AWM solution can have the potential highest impact on livelihoods. The maps show two levels of suitability:

- High suitability: areas which present optimal conditions both in terms of biophysical and infrastructure conditions for adoption of a given AWM solution.
- Moderate suitability: areas where there are possibilities for application of a given AWM solution, but where conditions are less favourable.

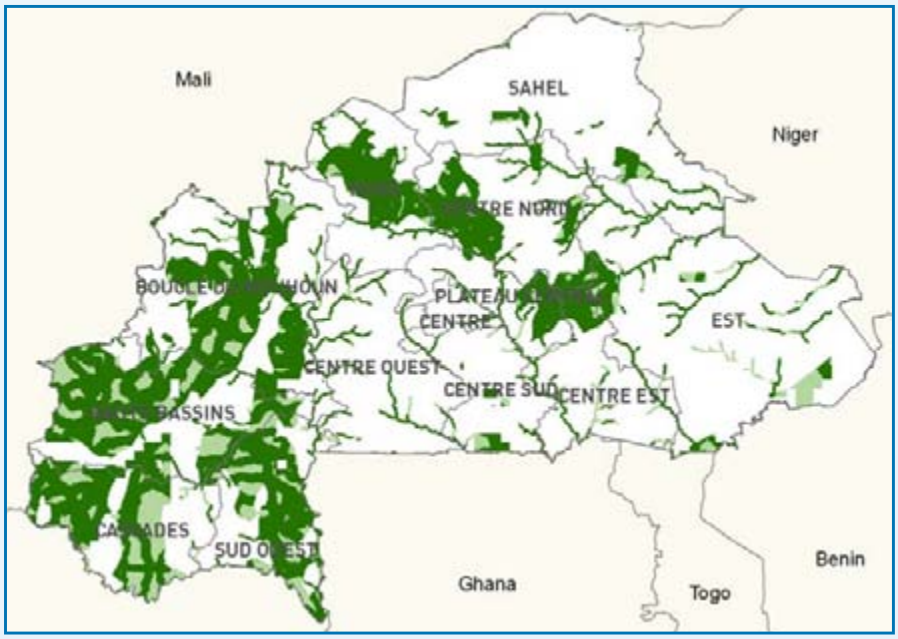
Livelihood-based demand

Local consultations and individual expert knowledge allowed expressing the potential demand for a technology among the population living in the different livelihood zone and provided more in-depth information on the potential adopters. These are for instance: farmer typology, vulnerability to shocks, dependence on water resources, and average landholding size. The resulting map shows distribution of these factors in the different livelihood zones which, in turn, identify areas where livelihoods conditions are more favourable for a given AWM solutions.



Solution 1: Potential for small motor-pumps

Biophysical suitability



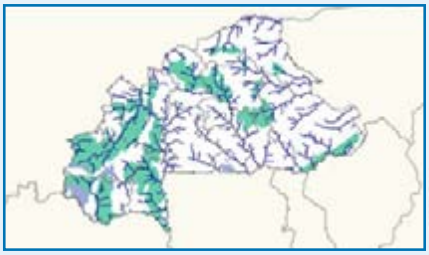
Highly suitable

Moderately suitable

Biophysical criteria and conditions

Market accessibility (h)

Distance to surface water + runoff + groundwater



Suitability for small pumps has been assessed for agricultural areas on the basis of: Proximity to surface water (less than 1 km) or presence of soils with shallow groundwater potential or, alternatively, yearly surface runoff of more than 250mm.In addition, higher suitability is associated with proximity to market centers (populated places of 20th inhabitants or more).

Biophysical criteria and conditions			
Suitability Assumptions	**Market Accessibility**	**Surface water**	**Alluvial soils**
Highly Suitable	< 4 hrs travel time	< 1 km distance from surface water OR runoff > 250 mm/y	Presence of fluvisols/gleysols/ gleyic subunits in soil profile
Moderately suitable	4-8 hrs		
Unsuitable	>8 hrs	1 km distance	

Small motor pumps:

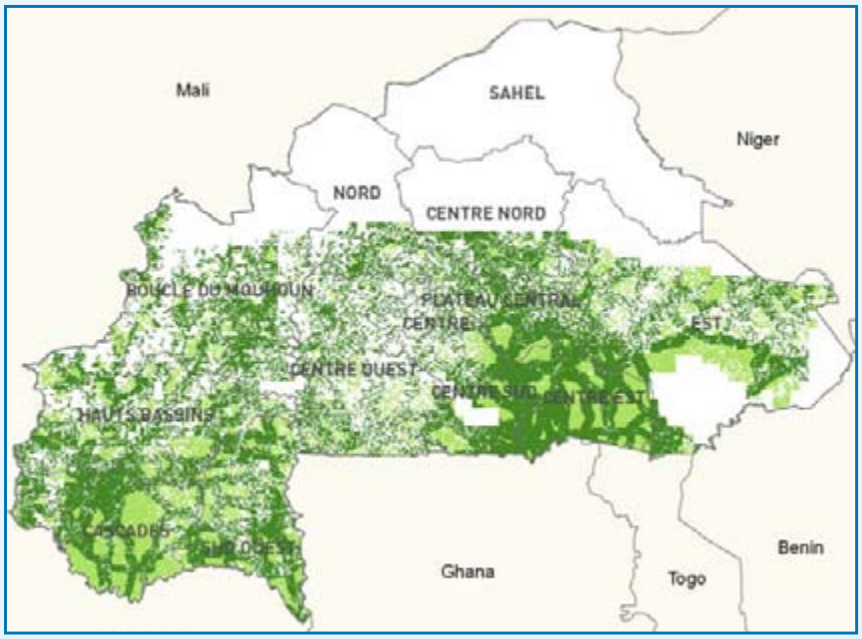
The livelihood-based demand is assessed through the analysis of the livelihood context of the zone. In particular, the context is assumed to be more favorable in zones with relatively higher prevalence of:

- **Smallholders**
  This typology of farmers is considered to be more in demand of this technology
- **High population density**
  This indicates higher pressures on natural resources therefore the need for intensification which is associated to this technology
- **Small landholding size (< 2 ha)**
  Similarly to high population density, this factor indicates the need for intensification which is associated to this technology

High Medium-high Medium-low

Solution 2: Potential for inland valley bottom management (for rice)

Biophysical suitability



High suitability
Medium suitability

Biophysical criteria and conditions

Market accessibility (h)

Length of growing period

Suitable area for management of inland valley bottoms is defined as valley area where Length of Growing Period (number of days during which T > 5° C and ETa >= 0.5 ETo) is more than 120 days; in addition areas closer to market centers are assumed to be more suitable.

Biophysical criteria and conditions			
Suitability Assumptions	**Market Accessibility**	**Distance to hyd.network**	**LGP**
Highly Suitable	< 4 hrs travel time	< 1 km distance	Less than 120 days
Moderately suitable	4-8 hrs		
Unsuitable		> 1 km distance	> 120 days

Inland valley bottom:

The livelihood-based demand is assessed through the analysis of the livelihood context of the zone. In particular, the context is assumed to be more favorable in zones with relatively higher prevalence of:

- **Smallholders**
  This typology of farmers is considered to be more in demand of this technology
- **High population density**
  This indicates higher pressures on natural resources therefore the need for intensification which is associated to this technology

High Medium-high Medium-low

Solution 3: Potential for small reservoirs

Biophysical suitability

High suitability
Medium suitability
protected area

Biophysical criteria and conditions

Livestock density

Livestock density (unit / km²)
0 - 5
5 - 30
> 30

Aridity Index (P/ETo)

aridity
< 0.05 Hyperarid
0.05 - 0.2 Arid
0.2 - 0.5 Semi-arid
0.5 - 0.65 Dry-subhumid
> 0.65 Humid

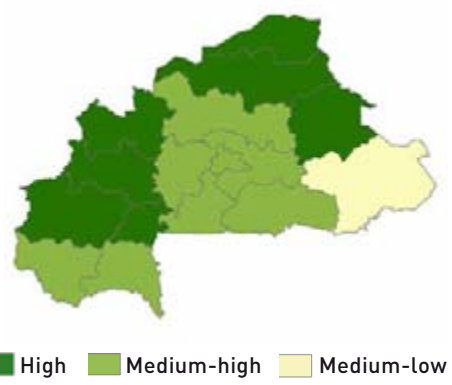
Suitable area for small dams is here defined as agricultural area where Aridity Index (yearly precipitation divided by yearly reference evapotranspiration) is between 0.2 and 0.65, semiarid to dry-subhumid; in addition, a higher livestock density is assumed to be in correlation with enhanced multiple uses of small dams.

Biophysical criteria and conditions		
Suitability Assumptions	**Aridity**	**Surface water**
Highly Suitable	0.2 < A.I. < 0.65	Density (unit/km²) > =30
Moderately suitable		Density < 30
Unsuitable	A.I. > 0.65 or A.I < 0.2	

Small reservoirs:

The livelihood-based demand is assessed through the analysis of the livelihood context of the zone. In particular, the context is assumed to be more favorable in zones with relatively higher prevalence of:

- **Traditional smallholder farmers with relatively higher prevalence of livestock-based livelihoods**
  Small reservoirs are one of the most important water sources for livestock in semi arid areas, particularly for traditional farmers that aim at stabilizing the production and improving nutrition rather than increasing production for sale
- **Higher poverty rates**
  this technology aims at providing water for multiple uses , i.e. cropping livestock water and domestic purposes. This multifunctional nature is crucial to contribute reduce vulnerability to shocks and increase resilience and therefore to alleviate poverty.



High Medium-high Medium-low

Estimating the potential benefits of investing in AWM

Potential beneficiaries, application areas and investments costs

Potential beneficiaries (rural households) - 50% of adoption rate

Livelihood zones	Low-cost motor pumps				Inland valley bottom - wetland rice				Small Reservoirs			
	(,000 households)		(% total househ.)		(,000 households)		(% total househ.)		(,000 households)		(% total househ.)	
	min	max	min	max	min	max	min	max	min	max	min	max
1	15	20	4%	5%	16	20	4%	5%	0	0	0%	0%
2	17	23	4%	6%	16	20	4%	5%	0	0	0%	0%
3	31	43	3%	5%	29	37	3%	4%	0	3	0%	0%
4	14	19	3%	5%	17	23	4%	6%	0	0	0%	0%
5	27	33	4%	5%	22	25	3%	4%	1	27	0%	4%
6	16	20	2%	3%	10	12	1%	2%	0	26	0%	4%
7	7	7	1%	1%	29	31	3%	4%	1	37	0%	4%
8	2	2	0%	1%	9	11	3%	3%	1	6	0%	2%
9	6	8	1%	1%	73	87	6%	8%	24	35	2%	3%
10	3	5	0%	1%	22	28	3%	5%	1	12	0%	2%
11	2	2	0%	1%	7	8	2%	2%	11	17	3%	5%
12	34	37	3%	3%	65	73	5%	6%	36	61	3%	5%
13	81	87	4%	5%	38	41	2%	2%	2	54	0%	3%
14	12	13	1%	1%	0	0	0%	0%	8	22	1%	2%
15	0	0	0%	0%	0	0	0%	0%	0	0	0%	0%
16	11	14	2%	2%	8	11	1%	2%	14	19	2%	3%
Total	276	332	2%	3%	361	426	3%	4%	100	321	1%	3%

Potential application area (ha) - 50% of adoption rate

Livelihood zones	Low-cost motor pumps				Inland valley bottom - wetland rice				Small Reservoirs			
	(,000 households)		(% total househ.)		(,000 households)		(% total househ.)		(,000 households)		(% total househ.)	
	min	max	min	max	min	max	min	max	min	max	min	max
1	12	16	14%	18%	24	30	27%	34%	0	0	0%	0%
2	14	18	9%	12%	24	30	16%	20%	0	0	0%	0%
3	25	34	6%	8%	44	55	10%	12%	0	3	0%	1%
4	11	15	8%	11%	26	34	20%	26%	0	0	0%	0%
5	21	26	3%	4%	33	38	5%	6%	1	27	0%	4%
6	13	16	2%	2%	16	18	2%	3%	0	26	0%	4%
7	5	6	1%	1%	43	47	8%	8%	1	37	0%	7%
8	1	2	1%	1%	13	17	6%	7%	1	6	1%	3%
9	5	6	1%	1%	110	130	13%	15%	24	35	3%	4%
10	2	4	0%	1%	32	42	6%	8%	1	12	0%	2%
11	1	1	1%	1%	11	12	7%	8%	11	17	7%	11%
12	27	29	4%	4%	97	109	13%	14%	36	61	5%	8%
13	65	70	8%	8%	56	61	7%	7%	2	54	0%	6%
14	9	11	2%	3%	0	0	0%	0%	8	22	2%	5%
15	0	0	0%	1%	0	0	0%	0%	0	0	1%	1%
16	9	11	2%	2%	12	17	2%	3%	14	19	3%	4%
Total	221	266	3%	4%	541	639	8%	9%	100	321	1%	5%

Note: the above potentials are considered independently for each AWM option. There is therefore a possibility of double counting, i.e. the same rural household benefitting several AWM options. The total investment potential, areas and beneficiaries for the four options is likely to be less than the sum of the options taken separately

Assumptions

The maps are used to assess the potential number of beneficiaries and the extent of land which could benefit from any of the AWM solutions. These calculations represent a 'gross' potential and do not take into account demand-side aspects of agricultural production. Therefore a possible adoption rate is not applied. The calculations are performed as follows:

1. The figures reflect the assumption that 50% of farmers, among those who could potentially benefit from the AWM option, are able or willing to adopt it.
2. The total number of rural people falling into the areas of high or low suitability is calculated on the basis of a rural population density map. These results are then aggregated by livelihood zone
3. The livelihood-based demand criteria allow for the establishment of "correction" factors that represents the part of the rural population which is likely to benefit from a given AMW solution. The factors reflect the importance of a given solution for the population living in the livelihood zone.
4. A unit area of land per household that can benefit from a given AWM solution is established on the basis of information obtained from the case studies and literature, i.e. 0.8 ha for low-cost motor pumps, 1.5 ha for inland valley bottom and 1 ha for small reservoirs. The number of potential beneficiaries, expressed in number of households, is then used to calculate the extent of land that could benefit from the solution. From national statistics , the country average household size is 5 persons.
5. The result is assessed against current extent of cropland in the suitable area, and in terms of its impact on the water balance, and adjusted downwards if needed.
6. The "correction" factors derived from livelihood-based demand (eg. farmers typology, poverty, land holding size etc.) are applied as de-multiplying factors.

Estimating the potential benefits of investing in AWM

Investments costs

Livelihood zones	Investment cost (Million USD)					
	Low-cost motor pumps		Inland valley bottom -wetland rice		Small Reservoirs	
	Min	Max	Min	Max	Min	Max
1	5.9	7.8	14.2	17.8	-	-
2	6.8	9.1	14.6	17.7	-	-
3	12.5	17.2	26.3	32.9	-	22.5
4	5.4	7.5	15.5	20.3	-	1.1
5	10.6	13	19.8	22.8	6.7	143.7
6	6.5	8.1	9.4	10.6	0	95.6
7	2.7	3.0	25.8	28.3	3.2	128.7
8	0.6	0.8	7.7	9.9	6.1	47.8
9	2.3	3.1	66	78	114.5	169.9
10	1.1	1.9	19.4	25.4	4.1	120.3
11	0.6	0.7	6.7	7.3	17.1	27.2
12	11.9	12.9	58.2	65.7	91.6	144.4
13	24.8	26.6	33.8	36.6	4.9	120.7
14	2.8	3.3	-	-	9.3	28.5
15	0	0.1	-	-	0.1	0.3
16	4.3	5.6	7.5	10.2	47.7	85.3
Total	**99**	**121**	**325**	**384**	**305**	**1136**

Note: the above potentials are considered independently for each AWM option. There is therefore a possibility of double counting, i.e. the same rural household benefitting several AWM options. The total investment potential, areas and beneficiaries for the four options is likely to be less than the sum of the options taken separately

Calculating investment costs

The following assumptions have been made to assess investment cost for each AWM option.

1. the total investment cost is based on the number of households and not on the number of hectares
2. Small pumps:
   - The average water amount required for irrigated agriculture is calculated as 7 500 m3/ha/yr
   - An upper limit would apply to potential application area, should the total volume of stored water exceed 30% of total annual runoff in each livelihood zone
   - the total investment cost is based on the number of households and not on the number of hectares
3. Small reservoirs:
   - the potential investment costs have been calculated on the basis of the available annual runoff
   - An upper limit would apply to potential application area, should the total volume of stored water exceed 30% of total annual runoff, at state level.
4. Inland valley bottom – wetland rice:
   - no assumptions were made

Investment costs at country level		
AWM options	Unit cost	Investment costs (min-max) Million US$
Small motor-pumps	400 US$/household	99-121
Inland valley wetland rice	600 US$/ha	328-384
Small Reservoirs	750 000 US$/m3 of water stored	305-1136

For more information consult the project website **http://awm-solutions.iwmi.org**
or the FAO Water website **www.fao.org/nr/water/projects_agwatermanagement.html.**
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