WORKSHOP REPORT

Strengthening Agricultural Water Efficiency and Productivity on the African and Global level
GCP/INT/166/SWI

Thematic Workshop of the Entry Phase of the Project
FAO-HQs • Rome • Italy
18 – 22 August 2014

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ACRONYMS AND ABBREVIATIONS

Aquacrop	FAO crop-model to simulate yield response to water of several herbaceous crops.
AES	Agricultural Extension Systems
AWM	Agricultural Water Management
AWP	Agricultural Water Policy
CAADP	The Comprehensive Africa Agriculture Development Programme
DSIP	Development Strategy and Investment Plan
ENAM	Ecole Nationale d'Agriculture de Meknès
FAO	Food and Agriculture Organization
GDP	Gross Domestic Product
ha	hectares
IAV	Institut Agronomique et Vétérinaire Hassan II
INRA	Institut national de la recherche agronomique
ITCZ	Inter-tropical Convergence Zone
MASSCOTE	Mapping System and Services for Canal Operation Technique
m^3	Cubic metre
MWE	Ministry of Water and Environment
MAAIF	Ministry of Agriculture Animal Industry and Fisheries
MASA	Ministère de l'Agriculture et de la Sécurité alimentaire
NAADS	National Agricultural Advisory Services
NAP	National Agriculture Policy
NDP	National Development Plan
O&M	Operations and Maintenance
ONCA	Office National de Conseil Agricole
PICCPMV	Integration of Climate Change in the Implementation of the Green Morocco Plan
PIP	Public Investment Plan
PMH	Small and Medium Irrigation Schemes
PNABV	Plan National d'Aménagement des Bassins Versants
PNEEI	Programme National d'Economie d'Eau
PNSR	Programme National du Secteur Rural
PPP	Public-Private Partnership
SCADD	Accelerated Growth Strategy and Sustainable Development
SDR	Stratégie de développement rurale
SNDDI	Stratégie nationale de développement durable de l'irrigation
SNDDAI	Strategy for Sustainable Development of Irrigated Agriculture
UNDP	United Nations Development Programme
WA	Water Accounting
WH	Water Harvesting
WIS	Water Information Systems
WMZ	Water Management Zones
WP	Water Productivity
WUA	Water Users Association
WUE	Water Use Efficiency

WORKSHOP OVERVIEW

The five days Thematic Workshop of the Entry Phase of the project " Strengthening Agricultural Water Efficiency and Productivity on the African and Global Level" marked the culmination of the Entry Phase of the project. The workshop gathered all stakeholders involved from Burkina Faso, Morocco and Uganda; the donor - the Swiss Agency for Development and Cooperation (SDC); the FAO-NRL and AgWA team, with the objective to produce a fully endorsed project document. The project's five thematic components were discussed and inputs were received in the following order: Water Accounting, Water Productivity, Water Harvesting, Agricultural Water Policy and Water Use Efficiency.

The sessions included presentations by International and National Experts per each theme. FAO's work approach and case studies were presented as well as the outcomes of the countries' reports. Thematic group and project component discussions followed. Each day ended with a wrap up session. The last workshop day brought all themes together to reshape the draft Project Document with the inputs of the stakeholders.

This report synthesizes the main outcomes of the workshop in two sections. The first part synthesizes the workshop by day. The second part focuses on the presentations per theme.

DAY 1 SUMMARY

Workshop Day 1 began with an Introduction Session inaugurated by Mr. Moujahed Achouri, Director of NRL-FAO, and Mr. Manfred Kaufmann from the SDC – the project donor. A presentation by the Project Coordinator – Mr. Maher Salman – on the project, the workshop, its objectives, partners and the five priority work areas – followed.

The first workshop day introduced the project theme – Water Accounting (WA). Mr. Jippe Hoogeveen, NRL-FAO Technical Adviser, made a presentation on FAO's work approach on WA. Ms. Livia Peiser, Technical Officer, NRL-FAO, presented selected FAO WA case studies and the role of WA in the project. Finally, Mr. Salman presented the project theme within the Project Component. During the afternoon, the National Consultants presented their Country Background Papers, the work methodology used, data gathered and main findings on the WA theme of the project.

DAY 2 SUMMARY

Day 2 focused on the project's Water Productivity (WP) theme. Mr. Dirk Raes, Professor Emeritus at K.U. Leuven University, presented FAO's approach to WP. He introduced the AquaCrop model which is managed by FAO. A presentation on the WP Thematic Brief by Ms. Marie Therese Abi Saab - Irrigation and Agronomy Researcher, LARI – followed, including case studies from Lebanon and Jordan. Finally, Mr. Salman presented the project theme within the Project Component.

The National Consultants presented the findings of their Country Background Papers on the WP theme of the project. The participants were grouped for the Group and Project Discussions on country priorities in WP. The Wrap Up of the day followed.

DAY 3 SUMMARY

The thematic components Water Harvesting (WH) and Agricultural Water Policy (AWP) were Day 3's focus. Mr. Frank Van Steenbergen, MetaMeta, made a presentation on the theme of WH and case studies. Mr. Francesco Sambalino, MetaMeta presented the results of his WH report in the project countries. Finally, Mr. Salman presented the project theme within the Project Component. Session two followed. Participants were grouped by country for the Group Discussions.

During the AWP sessions, Ms. Alba Martinez, Project Officer NRL-FAO, made a Thematic Presentation on AWP and gave an overview of the findings of the policy report prepared for Burkina Faso, Morocco and Uganda. Mr. Salman gave a presentation on the policy component within the project. A Group Discussion Session on AWP followed. The Wrap up of the day followed.

DAY 4 SUMMARY

Day 4 focused on Water Use Efficiency (WUE). The Technical Expert, Mr. Daniel Renault, presented the theme of WUE. He presented the Mapping System and Services for Canal Operation Technique (MASSCOTE) tool to assess irrigation performance. He gave an overview of the WUE status in the three project countries and explained MASSCOTE's role in the project. Mr. Salman then presented the WUE component in the project. National Consultants presented their Country Reports findings. The participants were grouped by country for the Group and Project Component Discussions. The Wrap up of the day followed.

DAY 5 SUMMARY

Workshop Day 5 brought all themes together. The first session focused on reshaping the Project Document. The participants discussed and agreed on the changes to make to the final project document. These were then presented. The changes and plan of work/modality were fully endorsed.

The closure of the five-day workshop followed. Mr. Salman and Mr. Lebdi summarized the main outcomes of the discussions per theme. Mr. Kaufmann's closing speech followed. He thanked the NRL-FAO/AgWA team and the participants for making it a success, and gave an overview of the steps for the start of Phase I. Mr. Achouri gave a closing speech and thanked all participants for their commitment to the project. He invited them to continue the hard work.

OVERVIEW PER THEME

This section of the report summarizes the workshop discussions per theme.

Water Accounting

SUMMARY 1

THEMATIC PRESENTATION

Presenters: Mr. Jippe Hoogeveen, Technical Adviser, NRL-FAO; Ms. Livia Peiser, Technical Officer, NRL-FAO

Presentation Summary

Water Accounting (WA) is mapped by measuring demand and supply with regard to volumes, flows and quality of water. The frameworks presented to report on water accounting are: *Environmental-Economic Accounting for Water (SEEAW), Water Availability Cost Curve, Water Footprints and Remote Sensing Based Water Accounting.*

FAO's approach to WA has the following six components: Land and Water Resources Database; Water resources availability assessment; Water resources use assessment; Water resources policy review; Decision support tool; and Water Audit comprehensive and summary reports. In addition, FAO examples of case studies in Cyprus, Malta, the Awash and Okavango Basins were presented.

COUNTRY FINDINGS

BURKINA FASO

Presenter: Mr. Halidou Compaore

Presentation Summary

Hydro-Climatic and Geographical Context

Rainfall decreased since the 60's and has been characterized by droughts since the 80's,with high spatial and temporal variability. Aquifers are shallow due to the extent of large crystalline rocks, leading to imbalances between groundwater demand and supply. There are 4 major river basins with

water mainly flowing eastward. The average surface water availability (1960-2000) relies on annual precipitation of 207 billion m^3, of which 4.2 % goes into surface flow (8.79 billion m^3), 15.6 % infiltrates (32 billion m^3) and 40% evaporates. The average year water stress is: 10.6% and in a dry year water stress is 21.8%.

Water Demand Sectors

The main water uses are: Irrigation (64%), domestic use (21%) and Livestock (14%). The non-consumptive demand is mainly for hydropower (80%).

Small Irrigation Sector

In 2006-2007, small-scale irrigation covered approximately 33 551 ha. The examples mentioned of crops produced are: maize, beans, potatoes and cabbage.

Water Governance and Tariffs

There are a number of strategies and policies and institutions in the water sector. The current irrigation tax system is only for large schemes.

Recommendations

Burkina Faso needs to increase its water storage, promote groundwater management and improve the WUE as well as the reallocation of water use.

MOROCCO

Presenter: Mr. Mustapha El Haiba

Presentation Summary

Hydro-Climatic and Geographical Context

Morocco has a semi-arid to arid climate. The global available resources are: 22 billion m^3 with 18 billion m^3 of surface resources and 4 billion m^3 of groundwater resources. 7% of the total area generates more than 50% of total flows. The global expected water deficit by 2030 would reach 1.5 billion m^3. Current deficits are leading to local groundwater over abstractions.

Regulation Capacity

Morocco has a total number of 135 dams with a total capacity of 175.5 billion m^3. The regulated volumes are approximately 8.23 billion m^3/year and almost 90% of surface inflows are regulated.

Agriculture Water Use

Global agricultural demand is 12 billion m^3/year. The total irrigated area in 2013 was 1 458 160 ha (1016 730 ha equipped by the state; 441 430 ha equipped by the private sector). The irrigation potential is estimated at 1.6 million ha (1.3 million ha for perennial irrigation; 300 000 ha under seasonal irrigation).

Small and Medium Irrigation Schemes (PMH)

Traditional irrigation schemes are on average 100 ha (66 %), they rarely reach more 1 000 ha. 2900 PMH schemes exist of which 484 000 ha are under perennial irrigation and 300 000 ha under seasonal or flood irrigation.

AWM Policies and Water Management Institutions

The *National Water Strategy* developed irrigated agricultural policies. The *Water Resources Department* works at national level. At regional level, there are 9 River Basin Agencies. The *Department of Agriculture* is in charge of irrigation. PMH are under the responsibility of the *Provincial Departments of Agriculture*.

Recommendations

Improve water supply looking at conventional and non-conventional resources; and seek options for water transfer between river basins.

UGANDA

Presenter: Mr. Henry K. Ntale

Presentation Summary

Hydro-Climatic and Geographical Context

67% of the country is dry-sub-humid and 20% is semi-arid. Annual precipitation ranges from 600 mm/year to more than 2000 mm/year. Uganda has two wet periods, although the dryer part of the country is characterized by only one pronounced wet season. The sum of external and internal renewable resources is 43.3 billion m^3/year. Currently, the country has limited use of groundwater for supplementary irrigation to a few localized small-scale projects.

Water Use in Agriculture

The current total acreage with advanced irrigation is 10 000 ha. Small-scale irrigation is 54 000 ha. The total water withdrawals are less than 124 million m^3/year and only 5% of potential irrigable area is under irrigation.

Water and Agricultural Policies

The National Water Policy develops water sector policies. The Institutional Setup-Water Management Zones (WMZ) at the sub-national level has to yet properly align with the other water structures. The National Agricultural Policy is still under development.

Constraints

The country's surface water is trans-boundary in nature and there's limited knowledge of surface water flux. There are water quality problems due to poor sanitation and industrial pollution. In addition, irrigation is small relative to rain-fed cultivation. Uganda is subject to localized drought risk.

Recommendations

Support the establishment of a rationalized operational Water Information System (WIS) and develop modeling and analysis tools and build the missing 80/90s data gaps. Develop awareness and capacity for increasing irrigation use, encourage the adoption of efficient irrigation techniques, and develop water storage capacity.

THEMATIC DISCUSSION CONCLUSIONS

Group Discussions

1. *How sustainable is water use in agriculture? Does the supply (quality, quantity, and timing) match the demand, from all sectors and uses, both currently and in projected trends?*

Burkina Faso and Ugandan participants identified potential to develop water resources but funding is necessary. The Moroccan participants identified that supply does not match demand in the agricultural sector.

2. *If imbalances exist between supply and demand, are the underlying causes known?*

Climate change and the rapid increase of water demand. Participants from Burkina Faso and Uganda identified that infrastructures and skills are poor. There are insufficient resources. Moroccan participants identified inefficiencies in water management.

3. *What opportunities exist for improving sustainable use?*

The participants from Burkina Faso identified the need for capacity building, mobilizing water resources at small scale and institutional support. Moroccan participants identified the need to increase water valorization; improve water demand management and scheduling (small-scale), more PPP's, improve extension and advisory services; increase supplemental and deficit irrigation (small scale). The Ugandan participants identified the need for capacity building, construction of infrastructure (dams) and funding.

4. *What are the main challenges/constraints to develop the above identified opportunities?*

There are insufficient investments in AWM, data availability, extension advisory services, capacity limitations (technical and financial) as well as awareness and enabling conditions (access to inputs,

credit, technology, etc.). It was also mentioned that labor costs are constraints for sustainable supply/demand water management as well as internal migration of [young] people to other sectors.

5. *Are these opportunities and challenges addressed in national policies? And what are the actions to address them?*

Well-defined policies exist but are often times not coordinated nor adequately implemented. The participants from Burkina Faso identified insufficient AWM capacities and buildup of programs, and structure management. The Moroccan participants identified the need to develop the water economic sector. The Ugandan participants identified the need of building infrastructure.

Project Components

Main Objective

Understand current and projected **surface water and groundwater resources availability and demand**

Outputs

National water audits prepared for Burkina Faso, Morocco and Uganda

Activities

1. Prepare an updated **national land and water resources database;**
2. Conduct t**raining programme on** the O&M of **the land and water resources database;**
3. Examine **trends of meteorological records, river discharges and groundwater levels;**
4. Prepare a **water use assessment;**
5. Develop a spatially distributed **water accounting tool;**
6. Conduct t**raining programme** for relevant personnel on the O&M **of the water accounting tool;**
7. Carry **out outreach and awareness campaign** to disseminate the results of the Water Audit.

Comments

It was requested the implementation of activities in an integrated manner. The word "lack of" will not be used; "insufficient" is more appropriate. Burkina Faso and Morocco's advisory services are not sufficient. Morocco suggested adding *geo-referencing* and to merge Activities 2 and 4.

Water Productivity

SUMMARY 2

THEMATIC PRESENTATION

Presenter 1: Mr. Dirk Raes

Presentation Summary 1

The AquaCrop tool was explained. The inputs and the outputs to the model and its variety of uses were explained. Two case studies were presented. The first, in Ethiopia, yields were low and a WH method was developed. The latter, in the Bolivian Highlands, deficit irrigation was applied for quinoa.

AquaCrop is useful to understand crop responses to environmental changes (educational purposes); develop irrigation strategies under water deficit conditions; compare attainable against actual yields (benchmark tool); design optimum management practices and study the effect of climate change on food production.

Presenter 2: Ms. Maryse Abi Saab

Presentation Summary 2

Table 1. Assessment

	Burkina Faso	Morocco	Uganda
Assessment	Low water productivity; Optimal yields are not being obtained Low, unreliable rainfall threatens crop production; Small-scale irrigation initiatives are expanding rapidly; Bad management of irrigation practices; Degradation of soil chemical and physical status.	Productivity of rain-fed and irrigated systems is low; Yield gaps between the current farmers' yield and the researcher managed plots are high; Dry spell occurrences during and in between seasons; The country depends heavily on irrigation; Uncontrolled irrigation has led to serious water deficits; Irrigation scheduling is not well practiced.	Large yield gaps for rain-fed and irrigated crops; Yields are less than those in controlled stations; Delay in rainfall onset and rainfall variability during the cropping season; Great loss of land productivity; Misuse of fertilizers; Small-scale informal irrigation.

Recommendations

Promote sustainable water management practices through supplemental irrigation; and enhance soil conservation practices in farming systems. Promote irrigation water-saving techniques, improve irrigation practices, and manage water allocation for cropping systems and elaborate deficit irrigation strategies in irrigated farming systems.

AquaCrop Case Studies

Two Aquacrop case studies were presented in Lebanon and Jordan. In Lebanon experimental data was used for wheat and potato production. In Jordan scenarios were built to study the impact of field management practices on rain-fed yields of wheat. AquaCrop helped test scenarios.

COUNTRY FINDINGS

BURKINA FASO

Presenter: Mr. Korodjouma Ouattara

Presentation Summary

Introduction

Burkina Faso practices extensive agriculture. 86% of the population is in involved in agriculture and is rainfall dependent. Sorghum, millet, maize and rice are staple food crops. Cotton, groundnut, sesame are cash crops. Agriculture is 75% rain-fed with low input of organic and mineral fertilizers on poor soils, 2.6% of the agricultural land is irrigable and 12% of the irrigable land is in use.

Case Studies

Two case studies were presented. The first, in the Ziga and North Sudanese zones where WP in rain-fed agriculture was increased with WH techniques leading to improved varieties of crops and yield increases. The second case study was on a small-scale *peri*-urban irrigation scheme in Ouagaougou.

Conclusions

Low crop yields are due to: unfavorable climate conditions, poor soil fertility, and inefficient management of surface and rainwater. Recommendations included: to combine WH techniques with soil nutrient management and use of improved seeds; contextualize soil and water conservation techniques to increase their adoption; and improve WUE and WP in irrigation to decrease runoff, evaporation and drainage losses.

MOROCCO

Presenter: Mr. Riad Balaghi

Presentation Summary

Hydro-Climatic and Geographical Context

Morocco's long-term rainfall average is around 365 mm varying from a minimum of 198 mm recorded in 1994-1995 to a maximum of 610 mm recorded in 2009-2010 season. The total land area is 71

million ha of which agricultural land is approximately 8.7 million ha. Irrigation is available for 16% of croplands.

The Agricultural Sector in Morocco

The sector's contribution to the GDP is on average 15 to 20%. However, it has been in decline since the 90's by 60% on average (2000-2010). It is the primary source of employment (38% overall; 75% in rural areas). It plays a crucial role for food security and sustainable development.

The Cropping System and WP

The cereal/fallow system is predominant. Olive orchards cover approximately 680 000 ha, or nearly 55% of the national tree orchards. In the 60's, Morocco was a net exporter of pulses but production declined in favor of more cost-effective crops. The WP of cereals and olive trees in rain-fed areas are low. The WP of vegetable crops in irrigated areas in the Gharb region is relatively high.

Projects for improving WP in Rain-fed and Irrigated Areas

The *Integration of Climate Change in the Implementation of the Green Morocco Plan (PICCPMV)* project launched in 2011 by the Ministry of Agriculture with funding from the World Bank (WB) was mentioned. A Public-Private Partnership (PPP) for improved irrigation productivity in the Guerdane region will develop a 300 km long irrigation network for water access to farmers (10 000 Ha; 600 farms).

Conclusions

Since the 60s, Morocco strengthened its water infrastructure. There is a significant gap between rainwater and irrigation productivity. Irrigation water must be regarded as a vital commodity that should be saved.

UGANDA

Presenter: Mr. Nicholas Kiggundu

Presentation Summary

Introduction

The *Ministry of Agriculture, Animal Industry and Fisheries (MAAIF)* is responsible for on-farm works. The *Ministry of Water and Environment (MWE)* is responsible for off-farm AWM works. The *Development Strategy and Investment Plan* (DSIP) is the foundation document for the CAADP.

Hydro-Climatic and Geographical Context

Uganda has weathered soils with inadequate nutrients and low holding capacity prone to leaching. The internal surface water resources estimations are 39 km^3/year; groundwater estimations are 29 billion m^3/year. Total renewable water resources are estimated at 66 billion m^3/year. The water availability of rivers estimations are 8 246 million m^3/year; lakes 38 100 million m^3/year; groundwater 3 350 million°m^3/year; and runoff 40 968 million m^3/year.

Irrigation Development

Formal irrigation started in the 60s. FAO estimates an average annual gross irrigation water use at 7°500 m^3/ha/year. The irrigation potential is approximately 550 000 ha and the total annual water withdrawal requirement: 4 125 billion m^3/year. Organized irrigated agriculture is at nursery gardens around Kampala. There are approximately 15 identified sites for the development of irrigation.

AWM Constraints

Inadequate policies and supporting strategies, coordination and program integration, support to smallholders and linking of research to development; poor data availability and reliability; insufficient connectivity between tenure systems and AWM strategies; and poor water management.

Conclusions

The average country wide WP is low. Short term strategies for improving agricultural WP are needed. Set up of training/demonstration and research centers; improve fertilizer use; implement in-situ rain WH technologies and record keeping/data collection and publications.

THEMATIC DISCUSSION CONCLUSIONS

Group Discussions

1. *What are the options/opportunities to increase yields and water productivity in rain-fed/irrigated agriculture?*

To increase WP yields, the following is needed: disease control; fertilizers; conducting climatic analysis to find the optimal sowing date; developing agricultural and land suitability maps; irrigation scheduling/management; selection of appropriate crop varieties; improved seeds; WH/collecting excess water for supplementary/deficit irrigation; soil fertility management & soil conservation practices; better use of groundwater, where applicable; early warning systems for irrigation/groundwater recharge; and training of farmers through good extension services.

2. *In your view, which crops should be prioritized for the enhancement of WP?*

The Burkina Faso participants mentioned that cotton; vegetables, sesame, fruit crops and maize should be prioritized. The Moroccan participants mentioned that industrial crops, fruit-trees, and vegetables should be prioritized. The participants from Uganda expressed the need to prioritize coffee, fruits, vegetables and maize. The participants agreed that the enhancement of WP would increase food security; yield improvement potential; well adapted crops and markets; low water needs and crops on socio-economic and environmental sustainability.

3. *In your view, what are the main challenges/concerns to increase productivity?*

Insufficient training of farmers on management practices and capacity of extension services; high costs and insufficient access to agricultural inputs of good quality and equipment; low income levels of farmers; poor management of product chain; natural resource degradation and adaptation to climate change; weak connectivity between land tenure and AWM and weak farmers' associations;

4. *How are the previously identified challenges addressed in national policies? And what are the actions to address them?*

Links with policies exist but problems arise when implementing policies. The participants from Morocco stressed the need for food chain organizations, PPP's and advisory offices. Ugandan participants identified the need for incentives to set up cooperatives and partnerships with farmer representatives. The countries raised the need for subsidies; tax waivers for inputs; storage facilities constructions; partnerships with research organizations; IWRM; landscape and ecosystem approaches; major impact assessments; juridical reform and participatory management.

Project Components

Main Objective

To **increase water productivity** in small scale agriculture in Burkina Faso, Morocco and Uganda

Outputs

Enhanced capacity for improved water productivity in small-scale agriculture in Burkina Faso, Morocco and Uganda

Activities

1. Conduct training programmes at regional/national levels in the use of tools to enhance water productivity (AquaCrop);
2. Apply and monitor the application of practical tools to enhance water productivity (AquaCrop) under small scale farming conditions for rain-fed and irrigated agriculture;
3. Launch information campaigns to promote changes in water management practices under both rain-fed and irrigated agriculture, and widely disseminate the results of the project.

Comments

The importance of linking WP with other themes was discussed. The WP component should not limit its use to AquaCrop only.

The Burkina Faso participants stressed the importance of developing soil fertility maps. Morocco mentioned that it has a crop monitoring system using hydrological and crop information which could integrate AquaCrop. Morocco suggested carrying out trainings at regional levels.

THEMATIC SUMMARY 3

THEMATIC PRESENTATION

Presenter: Mr. Frank Van Steenbergen

Presentation Summary

Key Figures

Food production increased to 60% from 2005-2050. Rain-fed agriculture is 83% of land area and 58% of food production; 75% of increased food production can come from rain-fed agriculture and the potential productivity increases are highest in rain-fed agriculture.

WH Case Studies

Specific case studies to showcase the implementation of WH techniques were presented in: Niger; the Tigray, Ethiopia; Eritrea; Cascade Check Dams, Yemen; Warping Dam, China; Iran; Maharastra, India; Ethiopia; and Niger.

Opportunities and Priorities

Landscape approaches are opportunities for complete transformation. Various unused techniques exist. Education, capacity building, and connecting policies and funding are needed.

COUNTRY FINDINGS

Presenter: Mr. Francesco Sambalino

Presentation Summary

Rain-fed Agriculture in Africa

Burkina Faso has 3.5 million ha of farmland of which 0.68% is under irrigation (INERA). Morocco has 8.4 million ha of farmland of which 1.5 million ha is under irrigation (Aquastat potential of irrigation 1.6 ha). Finally, 80% of Ugandans depend on rain-fed farming which covers 60% of export earnings (CDKN). Most of the rainfall is lost in form of evaporation or runoff.

BURKINA FASO

Hydro-Climatic and Geographical Context

Burkina Faso is hit recurrently by droughts. The country has a precipitation that ranges between 500°mm/year in the north and over 1000 mm/year in the southwest. An extreme drought occurrence in the 70's triggered the development of strong WH components (e.g. GERES, PAF).

WH Techniques

Techniques used: Cordon Pierraux, Zai Pits, Demi Lunes, Private WH Ponds, Boulis.

MOROCCO

Hydro-Climatic and Geographical Context

Precipitation ranges between 1 200 mm/year in the Rif in the north. And less than 100 mm/year in the south and on the fringes of the Sahara. Crop production requires irrigation or WH.

WH in Morocco

WH exists in the Rif; semi-arid Areas; check dams in the central belt. In the South there are water spreading weir and spate irrigation in Khettara. The WH techniques used in Morocco: metfia-cisterns, terraces, jessours, spate irrigation and, lac collinaire and liman.

UGANDA

Hydro-Climatic and Geographical Context

In Uganda, a bimodal rainfall pattern is more suitable for rain-fed production. Farming areas relied primarily on precipitations. In pastoral areas, herders relied on seasonal water sources. WH is not well spread except in the southwest of the country.

WH Techniques

The WH techniques used in Uganda: mulching, trash lines and terraces.

Table 2. Comparative Analysis

	Burkina Faso	Morocco	Uganda	All
Diagnostic studies	Mapping of past initiatives and opportunities prepared.	Studies available or in process.	Scattered information, no study at national level.	
Political agenda	WH is high up in the agenda (PNSR).	WH high up in the agenda (Plan Maroc Vert).	Only few technologies are prioritized but present in main policy (NDP).	
WH on the ground	Some regions changed by farmer movement promoting in situ WH.	WH in many forms; WH and valorization of production coupled to boost benefits.	Lower adoption of WH measures except valley tanks in the cattle belt and in Karamoja; presence of local agronomic measures (trashlines,mulching).	
AES	Underfunded.	Restructured (ONCA-CCA).	NAADS disbanded due to mismanagement and corruption.	
Education and Research	Strong focus on AWM: Inera; WH can be strengthened at university level; CAP-Matourkou key to technical formation.	IAV, INRA, ENAM cover aspects on WH but could benefit of specific courses; some technical schools have WH in their programs.	Research on WH needed; insufficient specific courses on WH.	Training on multidisciplinary landscape approach.
Crosscutting	Lack of information on downstream approaches that integrates disciplines.			

Table 3. Recommendations

	Burkina Faso	Morocco	Uganda	All
Technical	Fertility management enhancement; Promote cheap carts for stone transportation.	Siltation of Lac Collinair can be curbed with SWC; WH and groundwater recharge against salinity.	Valley tanks coupled with capacity building; WH demonstration plot should be affordable.	Control ET, leakage and siltation from ponds; Couple road development with WH and SSI; Build up on local initiatives and aim to boost short term benefits; Couple fertility management with WH; Work at landscape level and promoting Recharge, Retention and Reuse (3R); WH storage developed jointly with skills of users.
Capacity building and knowledge sharing	Farmers innovators and local champions; Exchange visits and in-country as well as inter country knowledge exchange; Capacity building of government staff; Curricula strengthening and on the job coaching of technicians.			
Institutional/financing	Support collaboration between MASA and others;	Make farming appealing to young farmers; Support the newly created ONCA.	Boost force on account system to support private investments or support private contractors; NAADS is not a good option for the project.	Landscape approach that goes beyond IWRM – embed in a cross sectorial visions/policy; Endorsement of national guidelines; Differentiate interventions according to livelihoods and AEZ; Policies satisfactory but insufficient transparency; Coordination between ministries; Private investment support – loans, MF.
Research	Research downstream and off-stream effects of WH; Document successful stories and showcase them; Investigate low-input options for small holder farmers (Participatory Action Research); Joint research between institutes and disciplines.			

THEMATIC DISCUSSION CONCLUSIONS

Group Discussions

1. *What role do you envisage for WH in increasing agricultural production?*

The needs to increase water availability are: capture runoff, increase water retention capacity of soils, and increase groundwater recharge and a better resource valorization.

2. *In your view, what are the main challenges/concerns to increase WH for crop production?*

Insufficient awareness and capacity building of farmers; ensuring enough water is made available to the downstream users; sustainability of systems; establishment of WH systems that consider agro-ecological zones; involvement of communities; insufficient funding; consideration of health and security; creation of opportunities for local economies.

3. *How are the previously identified challenges addressed in national policies and what are the actions to address them?*

There actions proposed are: capacity building/extension programs; allocation of funding; awareness-raising; implementation of monitoring programs; PPP's; and improvement of land management.

4. *What are the key factors that need to be in place to trigger spontaneous WH adoption?*

Capacity building and awareness campaigns; having a national strategy, establish a vision on WH with options on techniques; better coordination of strategies; funding and organization; ensure that farmers demand specific technologies and encourage their participation and ensure quick results; Reinforcement of institutions on the WH; and dissemination of good practices.

Project Components

Main Objective

- To **improve farmers' resilience** to dry spells;
- To **increase the productivity** of small-scale rain-fed agriculture.

Outputs

Enhanced water harvesting capacity in Burkina Faso, Morocco and Uganda

Activities

1. Carry out an assessment of the status of water harvesting sub-sector;
2. Implement on-ground pilot projects in countries of project;
3. Develop and implement a training program on WH and sub-strategies for WH as input to agriculture and water resources strategies.

Comments

The groups from Burkina Faso and Morocco suggested placing Activity 4 (strategies) before Activity 2 (pilots). The Moroccan group commented on the importance of specifying: WH for agriculture.

On the last day of the Project Component Discussions, Morocco confirmed no existing RWH strategy, only one component in the *Plan Maroc Vert* and the National Water Strategy. It is important to connect pilots with capacity building. Participants suggested flexibility in order of activities.

Agricultural Water Policy

SUMMARY 2

THEMATIC PRESENTATION AND COUNTRY FINDINGS

Presenter: Ms. Alba Martínez Salas

Presentation Summary

BURKINA FASO

State of AWM

Agriculture is predominantly rain-fed with low productivity. Soils have low water retention capacity. Approximately 29 730 ha of land is equipped for irrigation (13% of potential) and 24 545 ha of equipped low lands exists (5% of potential). Surface irrigation is the main irrigation technique. About 80% of the water storage infrastructure is in bad state.

Policies

The *Stratégie de Développement Rurale (SDR) 2004-2015,* the *Stratégie Nationale de Développement Durable de l'irrigation (SNDDI),* the *Programme National du Secteur Rural (PNSR) 2011-2015*, the *Stratégie de Développement Rurale (SDR) 2004-2015* develops the sector. Burkina Faso's CAADP was signed in July 2010. The *Programme National d'Investissements Agricoles (PNIA)*, 2010-2015 aims to achieve the CAADP's objectives.

MOROCCO

State of AWM

Agriculture is predominantly rain-fed. Approximately 1 458 150 ha are equipped for irrigation (88% of potential). Surface irrigation accounts for 76% of total area irrigated. Morocco has a good water storage capacity 135 large dams (about 17.5 km^3) built. Agriculture productivity per ha is one of the lowest in the Mediterranean region and the country faces increasing water scarcity. Agriculture accounts for more than 80% of water withdrawals.

Policies

The *Plan Maroc Vert* is Morocco's rural development strategy that aims to accelerate development of agriculture with higher value and productivity and modernize smallholder agriculture. The two programs for the strategy's implementation are: the *Programme National d'Economie d'Eau en Irrigation (PNEEI),* the *Programme d'extension de l'irrigation (PEI),* and the *Plan National d'Aménagement des Bassins Versants (PNABV).* So far the PEI modernized almost 370 000 ha were by early 2014 (74 % of targeted area by 2020). Under the PNEEI, studies for irrigation development were conducted in 128 340 ha of which 11 300 ha had already been developed for irrigation by 2010. The PNABV plan had already recovered 570 000 ha (38 % of the total target) by 2007.

UGANDA

State of AWM

Agriculture is predominantly rain-fed with low productivity. Approximately 14 148 ha is equipped for irrigation and 53 000 ha of informal irrigation of rice. The irrigation potential is estimated between 200°000 – 400°000 ha. Surface irrigation is the main technique used. The country's water storage capacity is weak.

Policies

The following policies that aim to develop the agricultural sector were presented: the *National Development Plan (NDP) 2010/11 - 2014*/15, the *National Agriculture Policy (*NAP), and the *Public Investment Plan (PIP) 2013/14 – 2015/16.*

Uganda signed its CAADP Compact in March 2010. The DSIP *2010-2015* implement CAADP under sub-program *1.4 - Sustainable Land Management* and *1.5 - Water for Agricultural Production*.

33 sites for small scale irrigation and WH demonstrations have been identified. Demonstration sites in 7 districts were established. Sites for development of water for agricultural production facilities were identified. Technical assistance was provided in the setup of the Aketa Farm Irrigation demonstration centre.

Table 4. Comparative Analysis

	Burkina Faso	Morocco	Uganda
AWM Objectives	Increased efficiency and productivity New irrigation schemes Equipment of low lands Rehabilitation/modernization/maintenance of schemes Development and rehabilitation of dams; Promotion of small scale irrigation; Intensification and diversification of irrigated crops Development of water information systems	Increased efficiency and productivity Irrigation modernization Soil conservation Linkage of dams with irrigation schemes Better integration of smallholders into development strategies Higher added value, higher productivity of irrigated products	Increased efficiency and productivity Increase area under irrigation Rehabilitation of existing schemes WH Water storage development Promotion of Small Scale Irrigation

Key Project Activities

The project aims to formulate bankable investment projects on AWM in the context of the CAADP process in Burkina Faso. It aims to prepare a National Investment Profile, review and analyse ongoing and pipeline AWM projects and identify supplementary investment areas in Morocco. And it aims to formulate bankable investment projects on AWM in the context of the CAADP process in Uganda.

Recommendations (short-term)

Burkina Faso: identify progress in the implementation of AWM projects of the PNIA, prioritize, define and formulate them within the project framework. Morocco: conduct an initial review of investment projects implemented under the PNEEI and PEI, develop a framework for project analysis including criteria for the assessment of environmental and socio-economic factors, prioritize projects to assess, and define those to assess within the project framework. Uganda: research on the most up to date progress in the implementation of AWM projects of the DSIP, prioritize, define and formulate them within the project framework.

THEMATIC DISCUSSIONS CONCLUSIONS

Group Discussions

1. *What are the key focus areas of AWM in your country? Which ones do you consider more important?*

It is difficult to access financial services, insufficient investments and resource mobilization.

2. *In your opinion, how has been the progress in implementing AWM sub-programmes of National Investment Plans?*

Burkina Faso participants identified long delays in the implementation of programs. The participants from Morocco identified a weak implementation of programs. Ugandan progress in implementation is hampered by a reduction in funds for agriculture (3.5% of total public allocations while they should have been 10% in accordance with CAADP).

3. *What have been the main constraints/triggers to the implementation of these sub-programmes?*

Difficulties to access to financial services, insufficient investments and resource mobilization. The participants from Burkina Faso noted insufficiency of informative texts for law implementation, low involvement of beneficiaries from the beginning, land tenure issues and weak synergies amongst institutions. The Moroccan participants mentioned that insufficient availability of extension services, professional organizations and skills in modern application irrigation techniques exist. The Ugandan participants stressed insufficient coordination amongst stakeholders and funding.

Project Components

Main Objective

To mainstream Agriculture Water Management (AWM) in national policy frameworks and processes in Burkina Faso, Morocco and Uganda

Outputs

1. Defined Bankable investment projects in AWM for Burkina Faso;
2. Investment profile of AWM at national level is produced, prioritized investment is defined, and national capacity is built in Morocco;
3. Defined bankable investment projects in AWM for Uganda;
4. Outreach materials (including technical reports) on the mainstreaming of AWM in CAAP-Pillar 1 process are prepared.

Comments

The Moroccan group stressed the importance of mainstreaming AWM in national policy frameworks and processes. All groups agreed with the activities within the policy project outputs. A proposal could be to accelerate the measures included in the water strategy.

SUMMARY 4

THEMATIC PRESENTATIONN

Presenter: Mr. Daniel Renault

Presentation Summary

WUE

WUE is defined as effective water use/actual water withdrawal. Efficiency is scale and process dependent otherwise losses exist. WUE requires an understanding of the rationale of each actor vis a vis of efficiency. WUE needs real on-farm data.

Modernization of Irrigation Management

The FAO 1997 definition of Modernization is: *process of technical and managerial upgrading of irrigation schemes to improve resource utilization and water delivery service to farms*. Modernization is needed to tackle complexity, provide more diversified services and meet water demands with a more cost effective management.

The FAO Methodology for Diagnostic and Planning

The *Mapping System and Services for Canal Operation Technique (MASSCOTE)* is a step-wise procedure for assessing performance of irrigation management, and develop modernization plans. MASSCOTE's steps are: *Step 1: Rapid Appraisal Procedure; Step 2: Capacity and Sensitivity; Step 3: Perturbations; Step 4: Water Accounting; Step 5: Cost; Steps 6-11: Planning for Modernization.* The MASSCOTE Application has been applied in more than 50 medium to large scale systems in 20 countries. It has been adapted to small-scale irrigation for this project.

Table 5. WUE Comparative Analysis

	Burkina Faso	Morocco	Uganda
National capacity	Recent; fair.	Good; long tradition.	Decent.
Local capacity	To be developed.	Local capacity.	Poor data and structures.
System size for project	All systems.	PMH (less thank 3 000 ha).	All systems.
Main diagnosis	Low performance monitoring and maintenance.	Highly stressed country.	Few functional systems.
Perspective focus	Improve existing systems and development of new ones.	Improve management of small scale irrigation systems.	25 new project and NIMP development by 2035 from 57 000 to > 253 000 ha.

Recommendations

The main steps used will be similar for each country: typology of irrigation systems (consolidate), MASSCOTE applications (one per type of system), benchmarking performance, pilot test options for modernization/investments and developing national strategies for Capacity Development & Modernization.

COUNTRY FINDINGS

BURKINA FASO

Presenter: Mr. Rémi Coulibaly

Presentation Summary

Demography and Socio-Economic Situation

Burkina Faso has a surface of 274 000 km^2 with a total population of 14 017 262 people of which 51.7% are women, 59.1% are under 20 years of age. 11 million (79.7%) are within the rural population. The annual growth rate is 3.1%. The country's rural sector is the backbone of the economy, which represents 86% of the GDP (2009) and 75% of export incomes. In addition 30-55% of budget is allocated to public investment programs. Subsistence agriculture prevails and it is hardly mechanized with poor use of agro-inputs.

Hydro-Climatic Context

There are two seasons: one rainy season from May to September and a dry season from September to May. The country has climatic zones 3 zones and 4 hydrographic basins.

Irrigation Potential

The estimated underground water resources are 9.7 billion m^3/year. The irrigation potential is 233 500 ha. The current irrigated perimeter is 40 000 ha.

Irrigation Systems

The irrigation perimeters provided were: small: 1 to 50 ha; medium: 50 to 300 ha; and large: more than 300 ha. Small irrigation uses river deviation water and medium and large use dams. Small-scale irrigation is managed at community whilst farmers manage medium-scale and the state managed large-scale schemes.

WUE and Performance of Small and Medium Perimeters

The approaches on WUE on performance of small and medium parameters are: diagnostic analysis of irrigated perimeters; PMI approach-BF; and a rapid participatory diagnosis and planning actions to improve performance of irrigated perimeters.

Policies

The *Accelerated Growth Strategy and Sustainable Development (SCADD)* aims to bring the irrigated sub-sector to 50% of production by 2015. The *National Program for the Rural Sector* also aims to address WUE. The *Water Law* defines the legal status of water and its administration and its financial aspects. Finally, the *Strategy for Sustainable Development of Irrigated Agriculture (SNDDAI)* defines types of irrigation.

Conclusions

The major identified constraints were: difficulties in mobilizing surface and underground water, irrigation facilities are expensive, groundwater evaporation rates are high (2 m/year) and low skills of irrigators.

MOROCCO

Presenter: Mr. Ali Hammani

Presentation Summary

WUE

The FAO definition of WUE is: *the ratio of the effective water use by the crops and the water withdrawal*. The WUE components include water transport, distribution and on-farm efficiency. It was mentioned that no measured data exists on global WUE at the irrigated perimeter scale. However, transport and distribution of efficiency values were shared as follows: *open channels:* 85 to 95% (main canals), 80 to 85% (secondary network), 90 to 95% (tertiary network), 61 to 77% (overall network); *Pipes:* (95 to 99%) main canals; 94 to 98% (secondary network); 90 to 95% (tertiary network) and 85 to 95% (overall network).

On Farm Efficiency Values in Large Scale Perimeters

The WUE values for surface irrigation are: lined open channels 85% (network); 70% (on farm); 70% (global). Sprinkler irrigation values: pipes 95% (network; 70% (on farm); 60% (global). Drip irrigation values: pipes 95% (network); 95% (on farm); 90% (global).

On Farm Measured WUE

On farm measurement results for surface irrigation: submersion 67%; furrow 59%; basin 52%. For drip irrigation it was: 18 m sprinklers: 76%; 12 m sprinklers: 85%. Drip irrigation's WUE and water distribution uniformity is variable. Farmers over-irrigate crops.

Conclusions

Performance assessments are not systematic. Gravity is main technique used. WUE has to be defined not only at the farm scale but also at the hydrological system scale. WUE reference value doesn't take into account farmer behaviors and irrigation practices. Irrigation in Morocco has a large potential for WUE improvement. Currently, policy is implemented at river basin scale and agricultural policy at administrative district scale. Most irrigated perimeters suffer from water stress and little attention is given to on-farm irrigation water management.

UGANDA

Presenter: Mr. Joshua Wanyama

Presentation Summary

Irrigation Schemes

Informal irrigation is practiced on the fringes of wetlands. Formal irrigation also exists. The typology of irrigation schemes were presented as follows: small-scale: less than 50 ha; medium scale 50-100 ha; and large scale more than 500 ha.

Irrigation Practices

Flood/basin irrigation is practiced for rice cultivation. Furrow irrigation is practiced for upland rice, vegetables & cereals. Drip irrigation is practiced for seedlings & greenhouse irrigated flower sand horticulture farms. Center-Pivot/gun sprinkler irrigation is mainly used in large plantations.

Institutional Set-Up of Irrigation Schemes

The government bodied developing the sector is the MAAIF and the MWE. The District Government supervises irrigation infrastructure at scheme level and the operations of the Farmer's Associations. Farmer's Cooperatives manage schemes, collect revenue, and mobilize funds.

Conclusions

Emphasize on WUE needs to be put in place at policy, system and farmer levels. The MWE and MAAIF will streamline policies for optimum water use in agriculture by developing an irrigation water policy. Smallholders and managers would benefit from capacity building in WUE. An emphasis on data captures and management on water use on irrigation schemes needs to be put in place.

THEMATIC DISCUSSIONS CONCLUSIONS

Group Discussions

1. *What are the scope/priorities for improving Water Use Efficiency (at canal/system level, at field level, at scheme level?*

Canal system level: the need for canal lining for small-scale irrigation; and improvement of canal regulation, maintenance strengthening and performance monitoring, as well as institutional frameworks for better operation and maintenance.

Field level: improved techniques for soil, water conservation and fertility, as well as land preparation are needed. An implementation of modern techniques for surface irrigation and better design of drip irrigation are also needed. The use of proper irrigation scheduling and improvement of performance monitoring is also needed.

Scheme level: improving conjunctive use of surface and groundwater water allocation and distribution, capacity of Water Users Associations (WUA) as well as performance monitoring. In addition the planning of cropping patterns was stressed.

2. *With what degree of certainty WUE and measurements are known (water delivery, inflow, etc.)?*

The participants from Burkina Faso mentioned that WUE measurements are only theoretical estimations. Data for certain big dams exists only. The participants from Morocco mentioned that there's a high degree of data uncertainty on earthen canals. But large concrete canals are monitored. Field level techniques are available for drip sprinklers. However they are difficult for surface irrigation, the capacities exist but mobilization is needed. The participants from Uganda mentioned that no measurements exist and the appropriate tools are needed.

3. What are the specific leverages for improving WUE at farm/field level, at system/scheme level)?

The participants emphasized the need to strengthen capacities of AWM at all levels, performance monitoring, water law enforcement, applied research as well as farmers' organizations. In addition, the need for developing infrastructure and rehabilitating existing ones was identified. The need for improved O&M, policies related to water tariffs and land preparation were also stressed.

Project Components

Main Objective
To **improve** the performance of irrigation systems for small scale irrigation and the use of water saving techniques in the three project countries

Outputs
Enhanced capacity for increased water use efficiency in small scale irrigation in Burkina Faso, Morocco and Uganda

Activities

1. Conduct training programmes at regional/national levels on the use of WD-MASSCOTE;
2. Apply WD-MASSCOTE to analyze and evaluate the performance of small scale irrigation systems in pilot cases in each of the three project countries;
3. Develop a modernization plan for small scale irrigation in pilot cases in each of the three project countries;
4. Launch information campaigns for the increase of water efficiency and widely disseminate the results of WD-MASSCOTE application in the three counties.

Comments

The Moroccan group identified the need of developing alternative tools to WUE. The Ugandan group commented on the importance of including support infrastructure for monitoring network as well as recommendations for the design of small-scale irrigation systems. The participants from Burkina Faso proposed focusing on small and medium scale irrigation.

CONCLUSIONS

The five-day workshop concluded with enriching discussion sessions. The Technical Experts gave detailed information on the theme and FAO's work approach. The presentation linking the themes to the project components provided important information on how these topics will be implemented in the next project Phase I. The Reports of the National Consultants provided data that will be used for the upcoming phase of the project. The Project Components were all approved with slight changes. The participants endorsed the Project Document. The Final Project Document will serve as reference for project implementation. The Project is ready to begin Phase I.

ANNEX 1. LIST OF PARTICIPANTS

Complete Name	Role	Country/ Organization
Abdelhak Laiti	Country Focal Point/ TF Member	FAO Morocco
Adama Toure	Task Force Member	Burkina Faso
Alassane Guire	Task Force Member	Burkina Faso
Alba Martinez Salas	Project Officer	FAO-NRL
Ali Hammani	WUE Consultant	Morocco
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Asma Hamzaoui	Task Force Member	Morocco
Aziz Abouabdillah	Task Force Member	Morocco
Charles Mutumba	Task Force Member	Uganda
Daniel Renault	WUE Expert	Freelance Consultant
Donkora Kambou	Task Force Member	Burkina Faso
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Fatiha Berrima	Task Force Member	Morocco
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Henry Ntale	WA Consultant	Uganda
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