BEST IRRIGATION PRACTICES IN THE NILE BASIN

EFFICIENT WATER USE FOR AGRICULTURAL PRODUCTION (EWUAP)

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Study objectives

- Identification of Large Scale Irrigation Schemes in the Nile Basin
- Describe the weaknesses and potentials of the Large Scale Irrigation Schemes
- Search for best practices

When is irrigation good ?

- If the crop production is high sothat food production is secured, farmers have a steady and sufficient income to continue their practices and employment for labors is generated
- If the high crop production is associated with a minimum consumption of total water resources, sothat more water remains in the basin for downstream irrigators and other water user groups
- Most of the depleted water resources have contributed to beneficial crop production and not to non-beneficial evaporation losses
- Most of the irrigation water resources have contributed to beneficial crop production and not to percolation of soil moisture that could potentially contaminate groundwater systems; some leaching is however unavoidable for the dilution of salts from the soil profile
- The land cultivation practices are preventing phyisical and chemical degradation of soil and land
- There is no over-exploitation of surface and groundwater resources that yields into dwindling water resources for irrigation

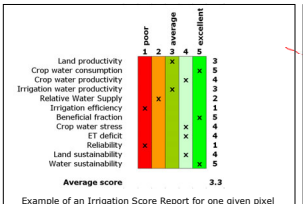
Indicator	Why important?
Land productivity	– Increase food security – Contribute to rural development – Generate employment
Crop water consumption	– Water conservation – Re-allocate water to higher value products
Crop water productivity	– High return of the depletion of all water resources (rain, irrigation, soil water, seepage) – Indicates potential water savings while safeguarding production
Irrigation water productivity	– High return from irrigation water application – Indicates potential water savings while safeguarding crop production
Relative Water Supply	– Determining over-irrigation or under-irrigation – Evolution of irrigation strategies
Irrigation efficiency	– A low efficiency requires more energy costs for pumping – A low efficiency lowers the level of managable water resources – A low efficiency can potentially increase groundwater contamination due to losses – There is an increased risk of non-recoverable losses
Beneficial fraction	– Crop transpiration is beneficial to biomass production – Evaporation losses from leaves, soil and water are non-beneficial
Crop water stress	– Assessing whether irrigation water reaches the roots of the crop – Evaluation of regulated deficit supply intentions
Evapotranspiration deficit	– Quantification of water shortage – Insight in required reductgion or enhancement of irrigation water supply
Reliability	– Skillsof the water supply agent to timely deliver water – Security on water supply prompt farmers to invest in crop fertilizers and protection
Long term land sustainability	– Indication of physical and chemical land degradation – Impact of water governance on irrigation intensity
Short term land sustainability	– Sustainability of farming – Impact of certain small interventions
Short term water sustainability	– Changes of water resources availability – Over-exploitation of surface and groundwater resources

Methodology

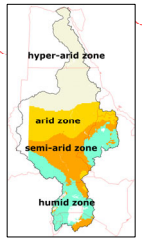
Satellite images have been used to compute all the irrigation indicators for 250 m x 250 m pixels that are identified as being irrigated land. The irrigation indicators have been separately studied for two growing seasons, if there were two distinguishable seasons present. Further to the separation into seasons, the indicators have been evaluated by 4 different climatic zones. The uncertainty of rainfall is for instance an influencing factor on good irrigation management. The climatology has an effect on crop water consumption and production.

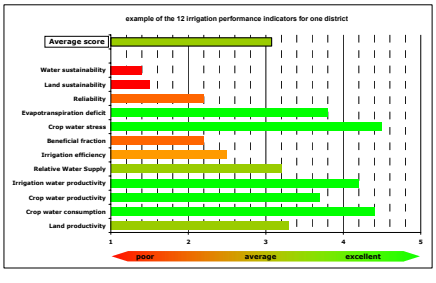
The various irrigation performance indicators have been combined by preparing an "Irrigation Score Report". Target values for good practices of every irrigation indicators have been defined by season and by climate zone. This allows a standardization of scores: all indicators received a score between 1 and 5. The average of all individual scores is taken as the overall indicator of good irrigation practices. The advantage is that:

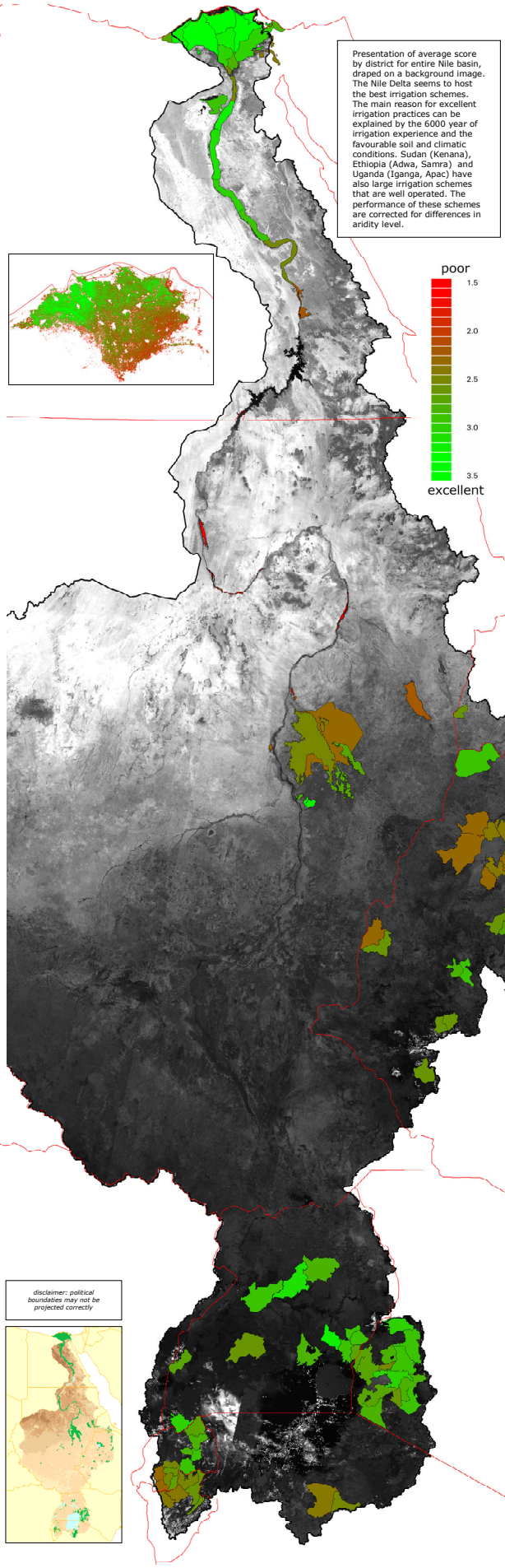
1. an overall rating can be established
2. the reasons for low and high rating can be detected



Example of an Irrigation Score Report for one given pixel of 6 ha. A score of 1 is related to poor management and a score of 5 to excellent management practices



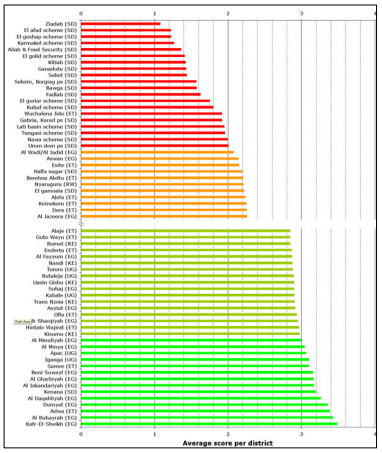




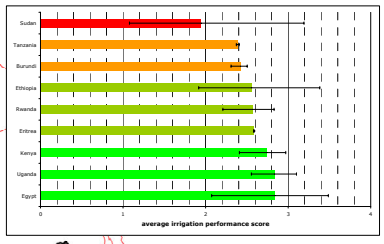
disclaimer: political boundaries may not be projected correctly

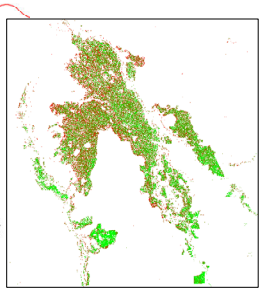
Presentation of average score by district for entire Nile basin, draped on a background image. The Nile Delta seems to host the best irrigation schemes. The main reason for excellent irrigation practices can be explained by the 6000 year of irrigation experience and the favourable soil and climatic conditions. Sudan (Kenana), Ethiopia (Adwa, Samra) and Uganda (Iganga, Apac) have also large irrigation schemes that are well operated. The performance of these schemes are corrected for differences in aridity level.

Top 30 for worst and best performing districts in the Nile Basin



The average score for each country has been calculated. It appears that Egypt, Uganda and Kenya have the best operating large scale irrigation systems. They are located in different climatic zones.





Priority actions

The reasons underlying poor irrigation management practices has been further investigated. The major concerns for each country are summarized in the table below. Only scores less than 2.0 are discussed. Various reasons for poor irrigation management can be found.

Country	High priority				Less priority
Burundi	Adequacy second season	Irrigation efficiency	Crop water productivity second season	Land productivity second season	
Egypt	none				
Ethiopia	Crop water deficit second season	Adequacy second season	Beneficial fraction second season	Irrigation efficiency	Land productivity second season
Kenya	Crop water deficit second season	Crop water productivity second season	Land productivity second season		
Rwanda	Land productivity second season	Irrigation efficiency			
Sudan	Land productivity second season	Adequacy second season	Relative water supply	Land productivity first season	Adequacy first season
Tanzania	Irrigation water productivity				
Uganda	Irrigation efficiency	Water productivity second season	ETdeficit second season		

Achievements

- Standard database for all irrigated land larger than 6 ha has been established and will be disseminated to the riparian countries
- Assessment of good and poor irrigation practices by climatic zone has been achieved
- Almost every country has locally very good irrigation schemes. These schemes need to get full attention for understanding the scope for improvement
- Reasons for poor irrigation management are identified, which is the fundament to establish an action plan for future directions