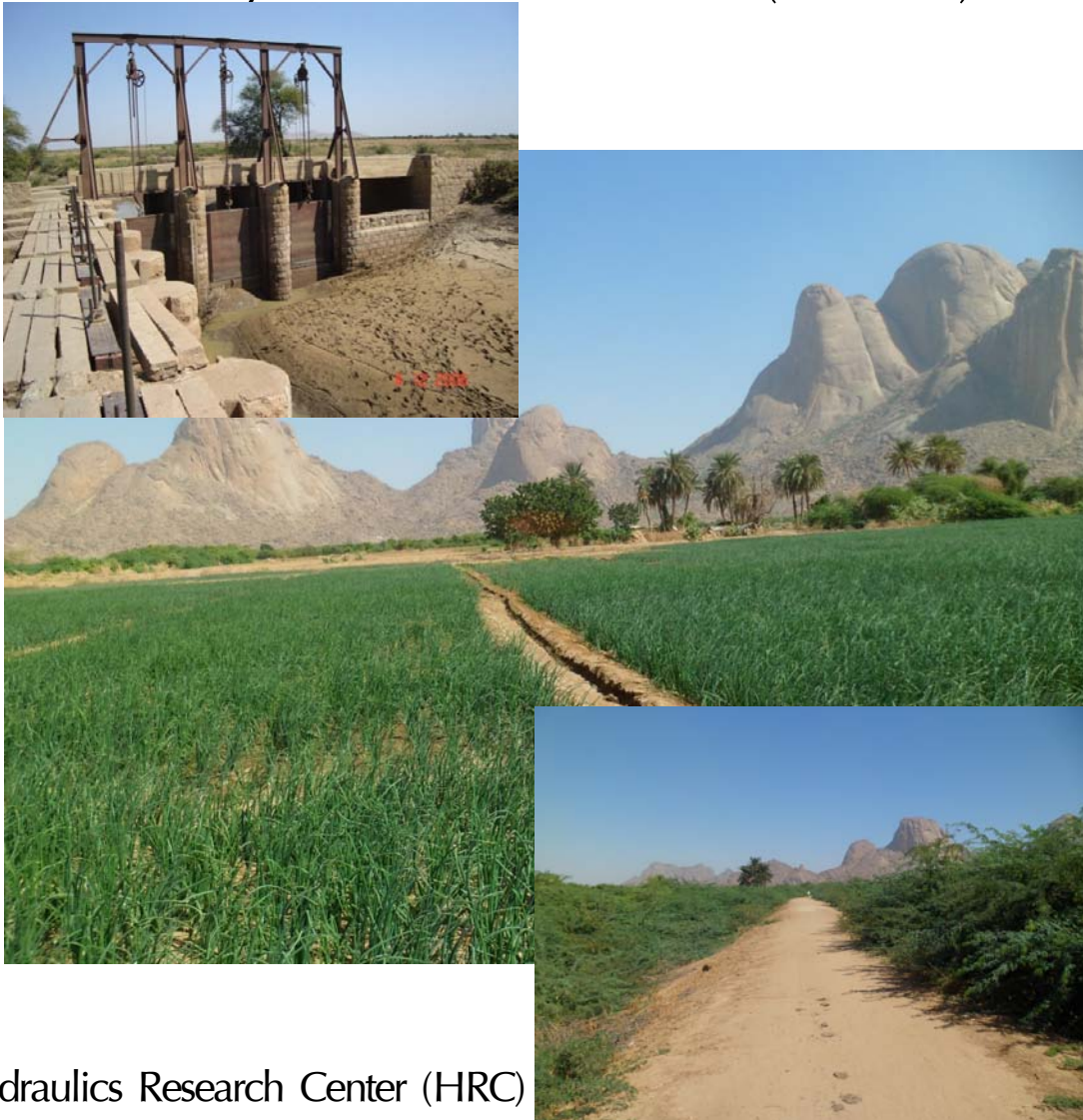


Spatte Irrigation for Rural Economic Growth and Poverty Alleviation in Sudan - (SIREGPA)



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Annual Report / Jun.2013 – Dec.2014

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0. Overview

The project Spate Irrigation for Rural Economic Growth and Poverty Alleviation (SIREGPA) has started in January 2011 in four countries Sudan, Yemen, Ethiopia and Pakistan. It is a four year project. The implementing organization in Sudan is the Hydraulic Research Center (HRC) of the Ministry of Water Resources and Electricity. SIREGPA aimed at improving livelihoods and agricultural productivity in spate irrigation systems in Sudan through different mechanisms namely by formation of communities of practitioners and professionals who are aware of the importance of the irrigation systems' development. Additionally, SIREGPA focused on conducting applied research to identify and to solve the problems of spate irrigation in the country, with emphasis on the Gash Agricultural Scheme. This report presents the accomplished activities of the project (SIREGPA) during the last phase of the project between June 2013 to December 2014. The report also describes in details the achievements of the main components of the project namely:

- ✓ Strengthening the spate irrigation network,
- ✓ Solutions oriented researches,
- ✓ Capacity building,
- ✓ Project management, and
- ✓ Cooperation with other governmental authorities and IFAD funded programs.

These achievements can be traced from the work plan given in the Annex (1).

1. Strengthening the Spate Irrigation Network (SpN)

1.1 Making the SSpN visible at national level

In this context, the first issue of the newsletter of Spate Irrigation project in Sudan was issued in November 2013 and distributed among the project partners, including:

- Ministry of Water Resources and Electricity
- The Gash Agricultural Scheme (GAS)
- Toker Delta Agricultural Scheme (TDAS)
- Khor Abu Habil Agricultural Scheme
- GASH River Training Unit (GRTU)
- Ministry of Agriculture – Kassala State
- Water Users Associations of GAS – Kassala
- Other partners at Universities and research institutes

The second issue of the newsletter was issued in June 2014. The newsletter usually used to reflect all activities undertaken by the project and updates the SSpN members on the outcomes of the scientific research conducted in spate irrigation schemes.

Also, the Spate chapter of the HRC-website (www.hrs-sudan.sd) is usually updated with the project news, information and relevant activities.

1.2 Bringing the SpN to the WUAs and farmers

Four farmers from spate irrigation schemes in Sudan (2 from GAS, 1 each from Toker and Khor Abu Habil) and four engineers (2 from HRC and 2 from GAS) attended the Regional WUA-to-WUA Knowledge Sharing Workshop during the period 24 – 28 November 2013 in Yemen. The workshop was organized by The Water and Environmental Center – Sana'a University in collaboration with the spate irrigation project.



The workshop was a good opportunity to share experience and disseminate knowledge among the participants from other countries like Ethiopia and Yemen. The participants have conducted several field visits to Yemeni spate irrigation schemes, where they closely observed the Yemeni experience on the ground.



1.3 Strengthening the membership of SSpN

The work has continued to increase the number of members of SSpN and to enlighten the interested farmers, specialists and stakeholders involved in spate irrigation systems about the importance of the project and its ongoing activities.

The number of the SSpN members is approaching one hundred members from different specializations in addition to farmers, list is given in Annex (2).

In the same context two activities were undertaken:

1. Distribution of 26 milk churners to water users associations in the GAS (12 units) and in Abu Habil scheme (14 units). The follow up from project staff has shown that some of the churners were properly functioning and users were very appreciative.



Photo 1: Distribution of a Milk Churner to a farmer in Gash

2. Distribution of (112) DVD-packages based on 10 video lectures on various topics related to spate irrigation systems to the relevant target groups of the project partners. This E-learning course material was received from the Spate Irrigation Network and MetaMeta in November 2014.

2. Solutions Oriented Research

2.1 Accomplished research studies

A. Spate Irrigation (Sudan)/Cranfield University collaboration

In year 2013, five postgraduate students from Cranfield University in England were offered financial support to conduct their field work in the GAS. This comes in the framework of collaboration between the Spate irrigation project in Sudan with Cranfield University. Their research works were for partial fulfillment of the requirements for the degree of Masters of Science. The themes were within the scope of the spate irrigation project and have covered the following areas:

- Morphodynamics of the Gash river
- Contribution of Water Users Associations in Gash for better water management
- Economic analyses of the spate irrigation systems
- Optimal approach for the design and management of on field water distribution structures for a more productive Gash spate irrigated scheme

Up to date, spate irrigation project has received four copies of the submitted theses. The titles of the researches are listed in the table below:

No.	Theme	Co-supervision from Spate Irrigation project	Date of submission
1	Application of a 1-d hydrodynamic model for flood protection from a torrential river in semi-arid environments: a case study of the Gash river in eastern Sudan	Dr. Ageel I. Bushara	Sep. 2013
2	Assessing the performance of water users associations in the	Dr. Ageel I. Bushara	Sep. 2013

	Gash irrigation project in Sudan		
3	Economics of the Gash spate irrigation in Sudan	-	Sep. 2013
4	Optimal design methodology and management of on field water distribution structure for a more productive Gash spate irrigated agriculture in Sudan	-	Sep. 2013

More descriptive information about these researches and their outcomes are given in Annex (3). We admit that the size of these researches is much smaller than MSc thesis from UNESCO-IHE. This is attributed to short duration of MSc research in the British system between 2 to 3 months.

B. Spate Irrigation (Sudan)/UNESCO-IHE collaboration

Also, one postgraduate from UNESCO-IHE has received partial financial support for conducting field work in the GAS. The title of his MSc thesis is as follows:

Mesquite tree infestation on gash spate irrigation system: impacts and remedial measure

Major outcomes from this research are given in Annex (3).



Photo 2: Blocked irrigation canals with Mesquite (left) and produced coal from Mesquite trees (right)

C. Competitive research

The research grant which was offered to Water Management and Irrigation Institute – University of Gezira in 2012 on competitive basis to conduct the research work on **“Strengthening Water Users Associations institutionally for sustainable participatory management of spate irrigated agriculture in Gash Agricultural Scheme, Sudan”** was finalized in 2013. A completed report was submitted with concrete results on the performance of the WUAs in the GAS, Annex (3).

Also, a scientific paper entitled "Assessment of Water Users Associations in Spate Irrigation Systems: Case Study of Gash Delta Agricultural Corporation, Sudan" is considered to be published in the International Journal of Sudan Research (IJSR).



Photo 3: Discussions with Water Users Associations in the Gash

2.2 Scientific and field guidance

The Students, who conducted sandwich research program, have been supported with scientific guidance and supervision from project staff as well as from external resource persons. Field assistants provided excellent support for students on field work and on other logistical matters (accommodation, transport, ec.).

3. Capacity Building, Knowledge Development & Dissemination

All planned activities on this component have been completed as described below:

- Preparation and dissemination of three practical notes by Sudanese academics and experts under the coordination of the spate irrigation project. Some of these notes were included in the recently published practical notes by the SpN.

The titles of the published practical notes are:

No.	Topic	Authors
1	Animal breeds of Sudan spate irrigation areas and their contribution to livelihood	Dr. A. Hafeez Osman Dr. Anwar M. Osman
2	Mesquite Impact in Spade Irrigation system, The case of Gash Area	Mr. A. Hakeem Elhassan
3	Practical notes on sorghum in Sudan	Dr. Mohamed K. Hassan

- The draft policy document, on spate irrigation development in Sudan as annex to the country policy on land and water management and development, has been included in the discussion of the IWRM committee for Sudan, setting a vision for IWRM in Sudan.
- Based on individual contacts and official meetings, two universities already approved to include the spate irrigation on their curriculum, namely University of Gezira and University of Kassala. Faculty of Engineering of University of Kassala will introduce the spate irrigation as a part of the irrigation engineering syllabus for the fifth year undergraduate students in November 2015. Also, Water Management and Irrigation Institute of Gezira University will introduce spate system as a part of the irrigation systems' course in its master program in June 2015.
- One HRC-staff, from IT section, has been trained on programs of creative design of brochures, leaflets, and report layouts.
- A Seminar to highlight the outputs of field work carried out by M Sc student has taken place at HRC, Wad Medani in December 2013.

- An advanced photocopier of high quality has been purchased by the project to enrich the HRC with the best equipments and to enhance the performance of secretarial work.
- A good digital camera of good performance is purchased by the project to support the HRC with the appropriate equipments for documentation purposes in various scientific events.
- Two senior staff, one from the Hydraulics Research Center and the other from Gezira University, have participated in the training course “Flood-Based Farming and Water Harvesting for Food Security” that held at UNESCO-IHE during the period 29 Sep. – 10 Oct. 2014. The two participants are of long experience in teaching in Sudanese universities. They will definitely contribute to mainstream the spate irrigation syllabus in the corresponding Sudanese universities.

4. Project Management

- Participation of the project supervisor in the annual project meeting held in Yemen.
- Internal project meetings are regularly held to follow up the progress of the project activities.
- A detailed work plan for year 2013 and the associated budget were prepared. The progress of the work plan is given in the Annex (1).
- Reporting of the project activities’ progress and regular checking of the budget allocation.
- Close following up of field visits of international students to facilitate their conducted field work.
- Facilitating international travel of project staff, guest students and also the Sudanese participation outside the country.
- Enabling good communications, contacts, etc... besides archiving and dissemination of the project outputs through the secretariat office.

5. Cooperation with Other Governmental Authorities and Regional Collaboration

- Collaboration with Gash River Training Unit (GRTU), Gash Agriculture scheme (GAS), Toker Delta Agricultural Scheme (TDAS), Khor Abu Habil Agricultural Scheme, Ministry of Water Resources and Electricity (MWRE), Hydraulics Research Center (HRC) has continued to facilitate and to optimize the outputs of the project.
- The Spate Irrigation project (Pakistan) has generously offered thirty Milk churners to the project in Sudan which were distributed among the spate irrigation systems' beneficiaries. The churners were effectively used by women in the GAS as documented by the project staff.



Photo 4: Milk churners in use by a woman in the Gash

6. Summary of Project Finance

The allocated budget of the Spate Irrigation project (June. 2013-2014) is distributed among the different components as shown by Figure (1) below. Annex (4) gives detailed descriptions of all expenditures.

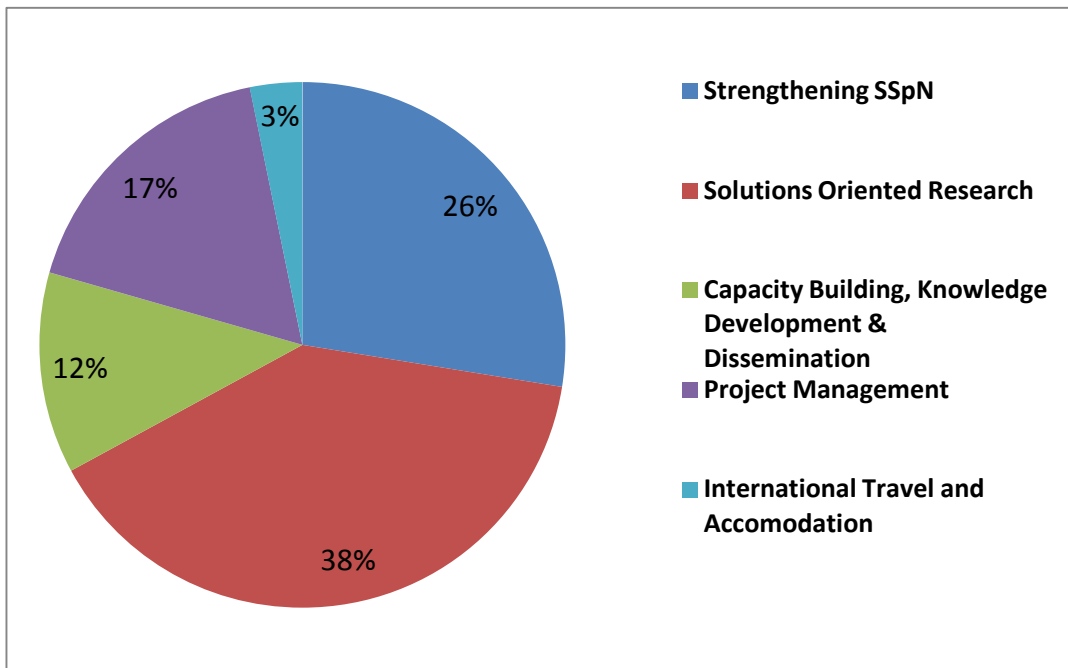


Figure 1: Distribution of project budget (30295 Euro) during June 2013 to December 2014

7. Annexes

Annex 1: Work plan June 2013/ December 2014

Item	Description/Activity	Key Deliverables	Allocated budget (Euro)	Actual budget (Euro)	Key responsible person(s)	Status
1	Strengthening the Sudan Spate Irrigation Network (SSpN)					
1.1	Make the SSpN visible	Preparation of a newsletter of Spate Irrigation project in Sudan and distribution among the project partners	1267	1099	SSpN Secretary with support from T.L and P.S	Completed - 1 st Issue Nov. 2013 - 2 nd Issue June 2014
1.2	Bring the SPN to the WUAs and Farmers	✓ 4 farmers (2 from Gash, 1 from each Toker and Khor Abu Habil) and 4 engineers (2 from HRC and 2 from GAS) attend and contribute to the Farmer-Farmer knowledge sharing workshop in Yemen that includes extensive 2-day field visit to spate irrigation systems	5068	6573	T.L	Completed, Nov. 2013
1.3	Strengthen the membership of SSpN	Increasing the membership of SSpN. Number of members is approaching 100.	422	283	SSpN Secretary, T.L	A spread sheet of names, titles, specializations of SSpN members is attached
2	Solutions Oriented Research					
2.1	Research topics: <ul style="list-style-type: none"> Economic analyses of the Gash spate irrigation system Assessing the performance of Water Users Associations (WUAs) in the Gash Irrigation Project (Sudan) 	3 technical reports to be presented	7602	8100	MSc students	Completed, Sep. 2013

	<ul style="list-style-type: none"> Best design methodology and management of field water distribution structures for a more productive Gash Spate Irrigated Agriculture in Sudan 					
2.2	Field support and guidance	Progress report of field work & facilitation of practical matters	1267	1359	F.As	Completed
2.3	Scientific guidance and supervision	Project staff, external resource persons	3379	1945	T.L, P.S	Completed
3	Capacity Building, Continuous Knowledge Development & Dissemination					
3.1	Two participants for spate short course at IHE: one from collaborating universities; and one from HRC	Each participants will complete short course in spate irrigation at IHE	-	-	T.L, P.S select the participants	Completed, Oct. 2014
3.2	Training of one HRC staff in Creative Design - Adobe Photoshop and related softwares.	One HRC staff has received training on creative designs of brochures, leaflets, report layouts	845	164	T.L	Completed , Apr. 2014
3.3	Preparation and dissemination of three practical notes: <ol style="list-style-type: none"> Animal breeds of Sudan spate irrigation areas and their contribution to livelihood. Mesquite Impact in Spate Irrigation system, The case of Gash Area Practical notes on sorghum in Sudan 	Three practical notes are prepared	2534	1605	T.L, P.S and other resource persons as necessary	Completed
3.4	Contribution to preparation of Spate program development charter as annex to the country policy on land and water management and development	Final policy document on Spate irrigation development in Sudan	845	-	P.S	Draft policy will be considered in IWRM vision of Sudan

3.5	Introduction of spate Irrigation in curricula of higher educational Institutes (Khartoum, Gezira and Kassala Uni.)	Curriculum preparation	2534	-	T.L,P.S, staff from Khartoum, Gezira and Kassala universities	Completed
3.6	Professional Camera for high quality documentation of workshops, and other events plus a photocopier and other equipments	One photocopier and one camera were purchased	845	1800	T.L	Completed
4	Project Management					
4.1	Project supervisor					
	Facilitating access to and maintain support for project activities by higher level relevant government institutions		845	-	P.S	Completed
	In kind support: provision of offices, telephones, equipments, guest house	Offered by Ministry of Water Resources	-	Cost not included		Completed
4.2	Project country staff activities					
	Detailed work plan for 2013	A work plan with budget and time of delivery	633	750	T.L	Completed
	Organize meetings & workshops	Meetings and \ or workshop conducted	633	159	T.L, P.S, F.A	Completed
	Financial statement preparation and facilitating auditing	Preparation of annual financial report	633	1654	T.L,	Completed
	Progress and final report writing	A progress or final report describing the project activities	1267	727	T.L, P.S	Completed
4.3	Running Secretariat office		845	1716		
	Facilitating effective communications	Effective communications through emails, telephones, personnel contacts			T.L,SSpN Secretariat	Completed
	Archiving project documents	Archiving project documents, dissemination of project outputs				Completed
5	International Travel and Accomodation	Participation in annual project meetings	1689	928		Completed

Annex 2: Sudan Spate Network database

No	Experience	Name	Address	Job Title	Mobile	email
1	River Engineering	Abdelazim Suliman	Zadna Scheme - North State	Executive manager, Msc	123959005	abdelazimsuliman.eisa@yahoo.com
2		Hatim Eltoom	Hydraulic Research Station/MoIWR	Hydraulic Engineer, MSc	912936719	wanja2003@hotmail.com
3		Eltayeb Mohamed Yousif	Gash River Training unit/MoIWR	Hydraulic Engineer	912861662	ellewaog@yahoo.com
4		Prof. Abbas Abdalla Ibrahim	Design of system network, spur & dykes	Hydraulic Engineer, PHD	122723281	abbasabdo@hotmail.com
5		Younis Abdalla gismalla	Hydraulic Research Station/MoIWR	Researcher	122607967	hrs_younis@hotmail.com
6		Dr. Salah Yousif	Ministry of Irrigation & Water Resources	MoIWR		
7		Dr. Yasir Abbas	Hydraulic Research Station/MoIWR	Researcher	916120615	Y.Mohamed@hrs-sudan.sd
8		Eiman Mohamed Fadul	Hydraulic Research Station/MoIWR	Researcher	122592564	E.fadul@hrs-sudan.sd
9		Adam Abaker	Ministry of Irrigation & Water Resources	Former under secretary, MoIWR		adambshr@yahoo.com
10	Water Management	Tahir mohamed Musa	Gash Agricultural Scheme, MoA	Metateib Block Inspector	0915275184	
11		Hashim Adam	Gash Agricultural Scheme, MoA	Agricultural manager	0960014535	
12		Kamal Ali Abdelgadir	Gash Agricultural Scheme, MoA	Director General, MSc	912861936	kamalgash2010@yahoo.com
13		Reham Banaga	Gash Agricultural Scheme, MoA	Irrigation Engineer, MSc	911262652	rehambannaga@yahoo.com
14		Omar Ali Osman	TDAS Agricultural Scheme, Red Sea State	Deputy Director General	915011336	omar.aliosman@yahoo.com

15		Mr. Hasan Eisa Artaigah	TDAS Agricultural Scheme, Red Sea State	Director General		
16		Mohamed Ali Mohamed Noor	Gash Agricultural Scheme		0911327101	
17		Ahmed Abu Tahir	GAS Scheme	Degain Block Inspector,	0913431359	ahmedabotahir@yahoo.com
18		Mohamed Abdalla Ahmed	GAS Scheme	Kassala Block Inspector,	0912411785	
19		Mohamed Abdelgadir Shanan	GAS Scheme	Mekali Block Inspector,	0914055533	
20		Ahmed Adam Omar Garad	Khor Abu Habil Irrigation Scheme, North Kordofan	General Manager	122371964	abbasbabikir@yahoo.com
21		Zeinab Abdalla Ali	Gash Agricultural Scheme, MoA	Agriculturist, Monitoring & Control	918322079	zienababdalla@yahoo.com
22		Abdalla Zakaria Mohamed	Gash River Training unit, MoIWR	Land surveyor Engineer	122915532	A.Z.M2003@yahoo.com
23		Khamees Salem	Hydraulic Research Centre	Surveyor Technician	0915663540	
24		Abbas Babikir	Khor Abu Habil Irrigation Scheme, North Kordofan	Irrigation Engineer		abbasbabikir@yahoo.com
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27	Spate Hydrology	Iyad Haider Awad Maki	Irrigation Engineer, GAS		0917756954	
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30		Ahmed Alsidig	Hydraulic Research Centre	Researcher		

31		Ageel Ibrahim Bushara	Hydraulic Research Centre	Researcher	0125766990	
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34	Land Management	Dr. Ali Elteib Shamseldeen	Agricultural Resarch Cooperation kassala	Agriculturist, PHD, Mesqite control	915223997	ali.shamseldin@yahoo.com
35		Prof. Mohamed Elnaseeh Mohamed	Agricultural Resarch Cooperation kassala	General Manager/retiered, PHD	910502655	naseehconsult@hotmail.com
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37		Moawia Abdelfatah Mustafa	Agricultural Resarch Cooperation kassala	Agriculturist Researcher, MSC	903602818	moawia72@yahoo.com
38	Agronomy	Abdelhakeem Ahmed Elhassan	Ministry of Agriculture, Forestry&Irrigation	General Director, Agriculturist	912674877	hakeemtea@yahoo.com
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40		Mohamed Alnazeer Alfadil	Agricultural Research Cooperation-Kassala	Researcher,	0912918918	
41		Ahmed Haj Yousif	Gash Agricultural Scheme			
42		Aljaali Ibrahim Mohamed	Extension and technology transfer	Ministry of Agriculture	0911245710	
43		Abdelgadir Haj Ali Khalid	Ministry of Agriculture, Forestry & Irrigation	Agricultural Engineer, Mesquite control		abdelgadir2006@hotmail.com
44		Mohammad Ahmed Mirgani	Khor Abu Habil Irrigation Scheme	Agricultural Engineer	0918099337	Mohammedmirgani82@gmail.com
45		Albushra Jabir Albushra	Khor Abu Habil Irrigation Scheme	Agricultural Engineer	0122909301	
46		Maha Abdullah Doleeb	Khor Abu Habil Irrigation Scheme	Agricultural Engineer	0122834898	

47		Salim A. algadir Mohammad	Khor Abu Habil Irrigation Scheme	Agricultural Engineer	0121402619	
48		Nada Omer Abdullah	Khor Abu Habil Irrigation Scheme	Agricultural Engineer	0911188859	
49		Um Salama Musa Hammad	Khor Abu Habil Irrigation Scheme	Agricultural Engineer	0113433909	
50		Amjad Ahmad Hamad	Khor Abu Habil Irrigation Scheme	Agricultural Engineer	0114648535	
51		Mohamad Ahmad Mohamad	Khor Abu Habil Irrigation Scheme	Agricultural Engineer	0121410445	
52		Mohammad Abdullah Aljack	Khor Abu Habil Irrigation Scheme	Agricultural Engineer	0917362068	
53		Mohammad Imam Ali	Khor Abu Habil Irrigation Scheme	Agricultural Engineer	0911248724	
54		Badreldeen Mohamad Musa	Khor Abu Habil Irrigation Scheme	Agricultural Engineer	0128517739	
55		Badr Mohammad Ahmad	Khor Abu Habil Irrigation Scheme	Agricultural Engineer	0916491973	
56		Rahel Brair Albushra	Khor Abu Habil Irrigation Scheme	Agricultural Engineer	0129426263	
57		Sahar Adulsalam	Khor Abu Habil Irrigation Scheme	Agricultural Engineer	0911268833	
58		Abeer Adam Mirgani	Khor Abu Habil Irrigation Scheme	Agricultural Engineer	0915475075	
59		Alfatih Ahmad Fadllah	Khor Abu Habil Irrigation Scheme	Agricultural technican	0908599788	
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61		Mohammad Hassan Ibrahim	Khor Abu Habil Irrigation Scheme	Agricultural Engineer	0915339100	
62		Ibrahim Mohammad Ahmad	Khor Abu Habil Irrigation Scheme	Agricultural technican	0915651308	
63	WUA	Dr. Eltigani Elnoor Bashir	University of Gezira, Irrigation & Water Management Institute, Wad Medani	Agriculturist, WUA specialist, PHD	122896551	tigani12002@yahoo.com

64		Dr. Abdelhafiz Osman Alhaj	GSLRP, Ministry of Agriculture (MoA), Kassala State	Registrar, Community Based Organizations	912462022	ahafeezob@hotmail.com
65		Abdu Abbas Al Rafeig	Ministry of Agriculture, GSLRP, Kassala	Project Coordinator, Msc Agricultural Development	912306102	alrafeig@yahoo.com
66	Socio Economic	Hanan Ali Salih	Ministry of Agriculture, Forestry & Irrigation, Kassala State	Agriculturist, MSc	122107318	hanansalih27@yahoo.com
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68		Dr. Sayed Zaki	Freelance Consultants, Khartoum	Socio-Economist	912302691	alizaki@hotmail.com
69		Dr. Ibrahim Eldukheiri	Ministry of Agriculture & Irrigation, Neyala	Minister	912392372	dukheri@yahoo.com
70		Dr. Omer Abdullahi Egemi	Department of Geography, Faculty of Literature, U of K, Khartoum	Lecturer, PHD	910089818	Omer.egemi@hotmail.com
71		Mohammad Bashir Eisa	Khor Abu Habil Irrigation Scheme		0911248724	Mohammedbaashier65@yahoo.com
72		Anwar Adam Mohammad	Khor Abu Habil Irrigation Scheme		0114734077	Anwaradam74@gmail.com
73		Nissreen Nasser Ibrahim	Khor Abu Habil Irrigation Scheme		0915468848	
74	Farmers	Adam Alhaj Yousif	WUA leader, GAS	Farmer,GAS scheme	0918013479	
75		Mahmoud Ahmed Ali	WUA leader, GAS	Farmer,GAS scheme	0906333026	
76		Mohamed Seedna Alamin	WUA leader wagar,GAS	Farmer,GAS scheme	0917756954	
77		Ali Omer Ahmed Isa	WUA leader-Makkali	Farmer,GAS scheme	0960106485	
78		Mohamed Hassan	WUA leader Tendali-GAS	Farmer,GAS scheme		
79		Abdalla Mahmoud Mohamed Degain	Farmer,GAS	Farmer,GAS scheme		

80	Mohamed Abdalla zaroog	Farmer-Toker Delta Agriculture Scheme	Farmer, Toker scheme	0914396600	
81	Mohamed Sheiba alhassan	Farmer-Toker Delta Agriculture Scheme	Farmer, Toker scheme	0913564854	
82	Abdelrahim Adam Abdallah	Khor Abu Habil, WUA Leader- Alsemieh project	Farmer, Abuhabil Scheme	0122796682	
83	Mohamed albedawi M. Ismaeel	Khor Abu Habil, WUA Leader- Alrahad project	Farmer, Abuhabil Scheme	0913528339	
84	UmBaleena Ali	Khor Abu Habil, Women farmer	Woman Farmer, Abuhabil Scheme	0911499095	
85	Bashir Mohamed Ali	WUA leader, GAS	Farmer-GAS scheme	0918846919	
86	Ahmed Mohamed Omer	WUA leader,GAS	Farmer-GAS scheme	0919022021	
87	Bareer Adroob Mostafa	Higher Council WUA, Appex	Farmer-GAS scheme	0912813699	
88	Mohamedeen Hassan Ohag	Higher Council WUA, Appex	Farmer-GAS scheme	0908623388	
89	Ohaj Idris	WUA leader, Tendali-GAS	Farmer-GAS scheme	0915742232	
90	Mohamed Musa Mohamed	WUA leader-Tendali-GAS	Farmer-GAS scheme	0911362720	
91	Mohieldin Abdalla	WUA leader-GAS scheme	Farmer-GAS scheme	0915029866	
92	Omer Mohamed Adam	Gash scheme	Farmer-GAS scheme	0915741386	
93	Mohamed Hussien Kajar	WUA leader,GAS	Farmer-GAS scheme	0911327280	
94	Adam Mohamed Adam	WUA leader Makali,GAS	Farmer-GAS scheme		
95	Mahmoud Adam	Secretary,Higher Council WUA-Appex	Farmer-GAS scheme	012636326	mhmods99@yahoo.com
96	Mohammed Issa Adam	WUA Tendali leader, GAS scheme	Farmer-GAS scheme	0913799807	

Annex 3: Oriented research outputs

1) Application of a 1-D hydrodynamic model for flood protection from a torrential river in semi-arid environments: a case study of the Gash River in eastern Sudan

By: Marine Chalnot

Abstract

Historically, floods are the most common environmental hazard worldwide and also one of the most threatening to human society. The Gash River is unique in that it flows torrentially between July and October whilst the rest of the year it is dry. Despite this characteristic, the river is the main source of water for domestic water and agricultural supply for Kassala city.



A hydrodynamic model, HEC-RAS was made to evaluate the existing protection structures of Kassala through two simulations in steady and unsteady state.

These simulations support the conclusions that the existing protection structures are effective at 76% for a flow rate of 700m³/s which is the most common according to historical data. The effectiveness of the existing protection structure fall to 51% for significant flows as 1000m³/s (in 2009 for example) and 34% for a flow of 1500m³/s (in 2007). Finally, this thesis put in evidence two critical zones where the flood risk is more important. In these areas, the large amount of sediments and depots and erosion need extensive monitoring and to strengthen and increase the size of the river bank to protect effectively the city.

The limitations of the model and the HEC-RAS software discovered during this study have been acknowledged in several recommendations.

This thesis is part of a modelling project which will cover the entire Gash River to understand the extreme flows and mitigate the effect of the floods from a torrential river in semi-arid environments.

2) Assessing the performance of water users associations in the Gash irrigation project in Sudan

By: Lee Aristotle Ngirazie

Abstract

Globally, water users associations (WUAs) have been entrusted with the obligation of managing irrigation systems with the aim of improving the irrigation services. But their level of performance varies within the context of institutional arrangements. Spate irrigation systems are also going through the same development. In this study, the performance of WUAs in the Gash Spate Irrigation Project in Sudan was assessed 10 years after they were first formed. This assessment comes following their impact on water management and contribution to poverty alleviation that has been reported to be marginal.

A comprehensive scientific literature was done to establish how WUAs form and function. In addition, the factors leading to the performance and methods of assessing WUAs' performance were reviewed. Field data collection was done at the project site in Sudan via a farmer household survey, focus group discussions, key informant interviews and SWOT analysis. The results were analysed using SPSS and Excel and thereafter synthesized within the framework of selected irrigation performance criteria and indicators. The five principles of WUA management and performance by Wang et al (2010) and the WUA performance indicators by Bos et al (1994) were used to determine the overall performance of WUAs in Gash.

The aggregate performance of WUAs in Gash for all blocks was found to be "average" with variations from poor to excellent across the five principles. Two principles on WUA jurisdiction over hydraulic boundaries and water deliveries contributed significantly to the average performance as they were found to be poor. Poor institutional arrangements and lack of rules and regulations were found to be the key factors affecting the performance of WUAs in the Gash project. Additionally, the land ownership issue was found to affect the performance too due to lack of motivation by farmers. The land issue is aggravated by the fact that mesquite is reducing the cultivable land thereby affecting production. Furthermore, the little production realized is not marketed in an organized manner. Above all, the management system involved in the coordination of the WUAs is not coherent and straight forward. Therefore addressing the aforesaid performance issues including establishment of rules and regulations by the WUAs themselves and re-definition of WUA mandate would enhance the performance the WUAs in Gash.

3) Economics of the Gash spate irrigation in Sudan

By: Ukadike V. Nwaobi

Abstract

The river Gash is an ephemeral river used for irrigation near the city of Kassala in Sudan. The spate flow recharges groundwater, provides water for livestock, and water for mesquite trees used for firewood and charcoal. Farmers in the Gash Agricultural Scheme (GAS) mostly cultivate varieties of sorghum “Aklamoyei” and “tabit” with little economic value beyond the Gash catchment area. Previous researchers have suggested that introducing cash crops would enhance the viability of the scheme, improve farmers’ livelihoods and ultimately increase willingness to pay for water use. There is also interest in the wider socio-environmental benefits not typically considered while evaluating spate irrigation schemes.

The research aimed to evaluate the economic viability of the GAS under the current and alternative cropping patterns. In addition an assessment of the entire scheme over a 20 year timescale was undertaken discounting future revenues and cost. Finally to appraise the impact of the socio-environmental benefits of the River Gash on the economic appraisal of the entire scheme using the millennium ecosystems approach.

A field study identified stakeholders and gathered relevant cost and benefits data. The cost benefit analysis suggests cash cropping would result in a 30% increase in net present value over 20 years from 22,127 SDG per feddan to 31,670 SDG per feddan, while the flood control and soil cycling benefit have a net present value (NPV) over 20 years of 20,628 Sudanese pounds (SDG) per feddan and 919 SDG per feddan respectively. The value of livestock rearing was found to be 323 SDG and NPV per head of 4,707 SDG over 20 years.

Based on these results, an introduction of suggested cash crops would increase the economic feasibility of the GAS. In addition to cropping, it is proposed that the impact of livestock rearing, currently omitted, needs to be incorporated into economic evaluations of Gash spate irrigation schemes. Furthermore the environmental benefits of the Gash spate irrigation schemes are economically significant and should be considered in policy formulation.

4) Optimal design methodology and management of on field water distribution structure for a more productive Gash spate irrigated agriculture in Sudan

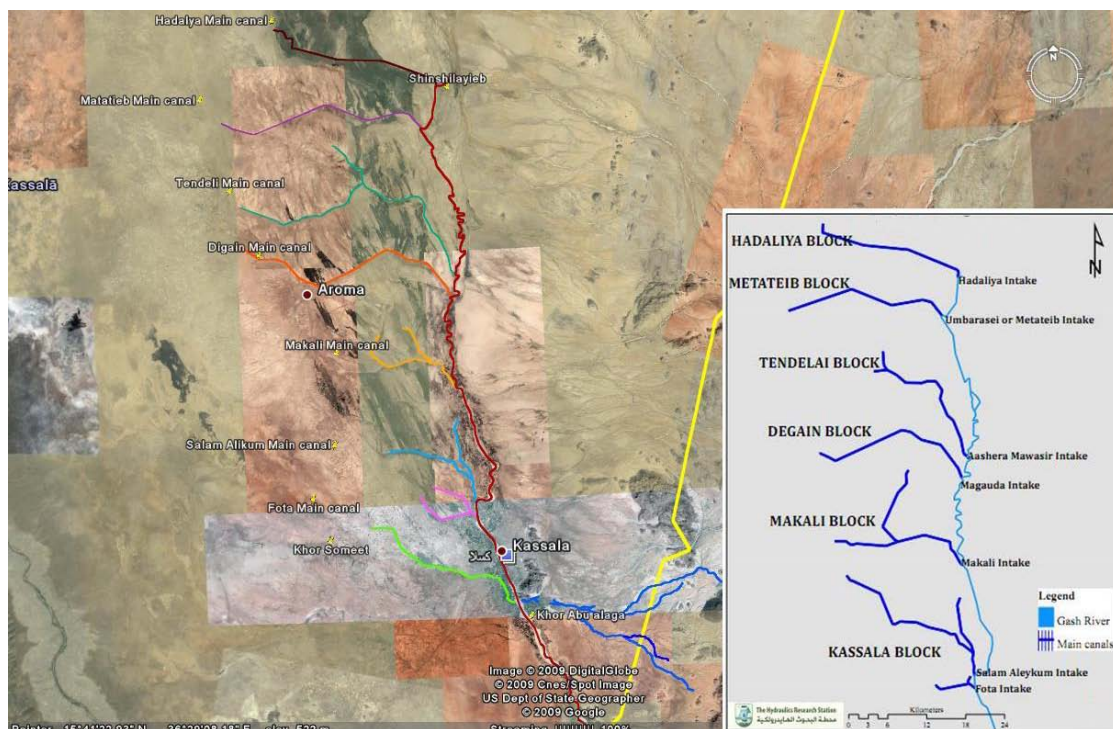
By: Joshua Elugbadebo

Abstract

Irrigation has the capability to enhance agricultural yields by as much as 50% and above. Past Interventions on the GAS Spate irrigation have concentrated on improving the diversion of the flood flows but with limited success. However, this research work aims to improve the situation by paying attention to field water application through improved field water distribution structures. In the study, the water delivery efficiency was calculated using Spreadsheet modelling.

The results indicate that to meet a conveyance efficiency of 80%, the canals at Degain block should be designed for a command area of 12,000 feddan irrigated per rotation with a unit flow of 2.0m/sec at the intake for 100-200ha land size.

These design results coupled with excellent land levelling and diligent system management will improve the overall system efficiency and crop yield.



Layout of the Intakes, the Blocks & the Main Canals along the Gash River

5) Mesquite trees infestation of the Gash Spate Irrigation system in Kassala state, Sudan: Impacts and Remedial Measures

By: Hamisi Said Nzumira

Research objectives

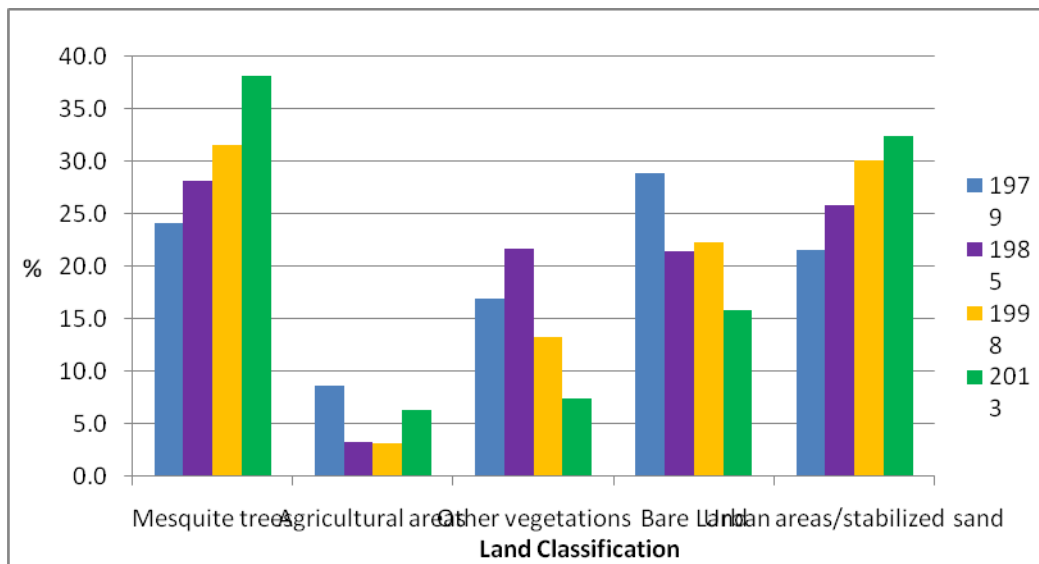
- To quantify spatial and temporal land cover changes of the Mesquite tree in the GAS using satellite imageries from 1979 to 2013
- To analyze the impact of mesquite tree infestation on the agricultural production in GAS
- To assess the effectiveness of measures used to control Mesquite trees in Gash area
- To recommend alternative technical and economical feasible control measures of mesquite tree infestation in Gash area

Conclusions

- Mesquite infestation has increased from 89,000 ha in 1979 to 142,000 ha in 2013 i.e. 14% total increment
- Landsat MSS, TM and OLI have been reliable (Mesquite invaded much on the canal, river banks and farm road sides).
- Existing measure have been ineffective because of lack of land ownership (land tenure), lack of institutional backing from central and local governments, and non connectivity between eradication/control program and benefit generated.
- Mesquite has several uses to its credit: salinity control, land reclamation, charcoal, wood chips, fodder, bio fuel, biomass to generate power, honey and gum, pods for animal food, medicinal purposes , timber, fencing, bread productions.

Recommendations

- Eradication and control to maximize the income to citizens.
- Cost benefit analysis is an essential component of a noxious Mesquite management strategy.
- Preventing land rotation and promoting long term permanent land user right.
- High resolution satellites (ALOS, RapidEye, Meteosat, GeoEye, DigitalGlobe, ERDAS, ASTER) could be used to monitor the expansion of Mesquite.
- Establishment of a national management programme that select the appropriate management procedures.
- Regular monitoring and annual evaluations to determine adequacy of the plan.



Land Cover Change on GAS, Kassala state in Sudan (1979-2013)

6) Assessment of Water Users Associations in Spate Irrigated Systems: Case study of Gash Delta Agricultural Corporation, Sudan

By: Eltigani Elnour Bashier

Ali Mohamed Adeb

Hassan Mohamed Ahmed

Abstract

Water Users Associations (WUAs) in Gash Delta Agricultural Corporation (GDAC) in Sudan were established in 2004 to participate in spate irrigation system management. WUAs have been partially involved in water management and agricultural activities with minimal capacities. WUAs were assessed using questionnaire, direct observation and focus group discussion. Based on criteria identified, WUAs were categorized into very poor, poor, average, good and very good. The results indicate that technically and financially, WUAs in GDAC are poor.

Administratively, WUAs classified as average. WUAs located in the upper spate system perform better than that located in the middle system.

Annex 4: Financial statement