

Water next Tuesday

eLEAF's irrigation-advice service in the Gezira Scheme in Sudan



The project

Project holder eLEAF BV, Netherlands, and Hydraulics Research Centre, Wad Medani, Sudan

www.eleaf.com, hrc-sudan.sd/index.php/portfolio/project-3/

Application FieldLook (irrigation advice)

CTA project Satellite based ICT for improved crop production in the Gezira irrigation scheme in Sudan

Location Gezira irrigation scheme, Sudan

Clients Smallholder farmers, scheme management, farmer association, government ministries

Topic Provision of crop management information to smallholder farmers

Project description This project piloted the provision of irrigation information to farmers in the Gezira Scheme in Sudan. It used a combination of satellite, meteorological and field-level data to give instructions to farmers on when to irrigate their crops by SMS text messages.

MANY PEOPLE IN Sudan communicate with text messages on their mobile phones – mostly with friends and family. But a small number of farmers in the Gezira irrigation scheme, near Khartoum, are testing a new service: a weekly SMS that tells them when to irrigate their crops.

The 44 farmers have taken part in a pilot project with support from CTA. The project tested an ingenious idea: it monitored the water needs of the farmers' crops by satellite and sent them a message telling them when to irrigate. The advice came as a clear instruction such as “you need to irrigate 5 days from now.” Such instructions are especially useful for the many farmers in the area who hold other jobs and cultivate their land part-time.

Most farmers in the Gezira Scheme have mobile phones and are able to read, so SMSs are a good way to communicate with them. The project also sends out information on crop development, nitrogen levels and soil moisture and evapotranspiration to help them monitor the growth and health of their crops and make management decisions. This and more information is also available through the project web portal for extension agents to use to identify potential problems and advise farmers.

Before they tried the advice service, the farmers were sceptical about the value of the

information that they would get. But for at least one farmer, the tips have meant he has harvested five times the amount of wheat from the same land – or a gross income of 12,500 Sudanese pounds (USD 1,900) per hectare.

Combining satellite-derived data with climate and field data

The project combines information from three sources:

- Satellite-derived information on crop growth and development, water- and nutrient management
- Meteorological information: rainfall, temperature, relative humidity and the like
- Field-level information: the soil type, field size and location, crop, planting date, irrigation dates, expected harvest date, etc.

The information is obtained from various sources by the Hydraulics Research Centre

of Sudan and eLEAF, which analyses them and combines them at its data-processing facility. eLEAF uses a software suite, named FieldLook, that it has developed over the last 15 years. This is based on a “surface energy balance” algorithm. This software enables eLEAF to quantify how much water a crop uses and if, and by how much, it is suffering from water stress. This is then combined with the derived amount of soil moisture and the amount of rain forecast by the weather service, allowing a recommendation to be made on when to irrigate.

If, for example, the weather forecast predicts rain in the next few days, the farmers will be advised to hold off on irrigating their crops. The information is customised automatically for each farmer based on records in the project database.

The project generates information that is useful not just for individual farmers, but for the Scheme management and farm advisors too. The FieldLook web portal (fieldlook.com) has a set of analytical tools that the Scheme management can use to improve overall water management. It also has information for advisors to develop agronomic advice, specific for each farmer, based on signs of developing problems – nitrogen deficits, poor crop development, as well as the crop-per-drop used and expected biomass production of the scheme.

During the pilot phase, staff of the Hydraulics Research Centre contacted the farmers every day by phone to check whether they had understood the information delivered by SMS. They made field visits each week to provide additional advice. This was part of the pilot project’s learning process, helping tailor the information provided to ensure that the farmers found it clear and immediately usable. The CTA grant made such intensive contact possible. Such a level of contact will be difficult when the service is rolled out to a larger number of farmers, unless cooperatives are included in the process. That makes it vital to ensure at the pilot stage that farmers can act on the information they receive with little direct support.

Gezira – the largest irrigation scheme in Sudan

The Gezira Scheme, located between the Blue and White Niles south of Khartoum, is one of the largest irrigation projects in the world. It covers an area of 2.1 million feddans (882,000 hectares) and serves up to 140,000 farmers. Most farmers own between 12 and 20 feddans (5–8.5 hectares). They grow wheat, sorghum, cotton, peanuts and other legumes, and a range of vegetables.

The Gezira Scheme provides farmers with irrigation water from the Blue Nile through a network of gravity-fed canals. Farmers open small gaps in the earth wall separating an irrigation channel from their field, allowing the water to flow onto the land. Once the soil is soaked, the farmer closes the gap again.

Most smallholders get seed, fertiliser and pesticides from the Scheme on credit, paying for the inputs after harvest. Water-users’ associations represent the farmers’ interests in discussions with the Ministry of Irrigation and Water Resources, which manages the Scheme.

In recent years, though, productivity of the farms has declined, in part due to poor irrigation management. Farmers have faced losses as a result.

This pilot project has tested a way to help the farmers get the most out of the irrigation water, boost yields and generate a reliable income. In the initial stage it has worked with the 44 pilot farmers in five blocks spread across the Scheme.

More crop per drop

The 44 pilot farmers experienced an average 60% increase in their wheat yields, as well as increases in water-use efficiency. Where previously they flooded their fields with huge amounts of water every 15 to 20 days, they could now they apply less water but more often – every 8 to 17 days. This reduced the overall water use while increasing their income. The farmers are eager to see the information service continue and say they would be willing to pay for it.

Neighbouring farmers watched closely what the pilot group did and followed suit, with similar productivity gains. This bodes well for future adoption of the project’s services, with farmer-to-farmer extension already showing promise. If such gains were replicated across the Gezira Scheme, output would rise and water use would be more efficient. This would

increase the crop-per-drop efficiency and might reduce the amount used.

Strong partnership

The project benefited from a partnership between eLEAF, the Netherlands-based company that provided the data-manipulation and analysis service and led the project, and the Hydraulics Research Centre, which provided local knowledge and connections with government agencies and the farming community. eLEAF and the Hydraulics Research Centre also conducted three training workshops to explain and promote the services, as well as field visits, farmer field days and on-farm demonstrations. Gezira Scheme agricultural advisors helped select the project farmers and followed up on agronomic advice to them. In total, the Sudanese team comprised four researchers,

Business model

eLEAF (a satellite-based information service provider) and its partners (who deal with training and support) provide irrigation advice ① to farmers ② so they can increase their crop yields. They also supply information to the irrigation scheme management so it can improve its services. They maintain relationships with their customers through training and by relying on farmers passing on the advice to others ③. They provide their services via the FieldLook web-suite and via text messages delivered to the clients’ mobile phones ④. To generate this advice, eLEAF crunches data from satellites, weather stations and field observations ⑤ using specialized software ⑥. Important business services and partners include the management of the irrigation scheme, the government and the mobile phone operator ⑦. This has been a pilot trial, so it has not charged a fee, but farmers say they are willing to pay up to USD 11 per hectare for the advice. If the service were expanded to the whole Gezira scheme and even a small percentage of the 140,000 farmers were willing to pay for the information, this would bring in significant amounts of revenue ⑧. The costs are mainly for the information sources, telecommunication connections, staff, support and promotion ⑨.

⑦ Business services and partners	⑤ Key activities	① Product or service	③ Customer relationships	② Clients
Mobile operator Government Irrigation scheme management Local value-adding partners	Earth observation data processing Data gathering, input and validation Monitoring and evaluation	Irrigation advice via SMS Training Monitoring and evaluation tooling	Training events Customer to customer Provide farmers support Promotion	Management: ■ Irrigation board ■ Agronomists Farmers: ■ Smallholders ■ Associations
	⑥ Key resources		④ Channels	
	FieldLook analysis software Service provider ICT data/field support Satellite-derived information		SMS Internet Phone calls Local support training	
⑨ Costs		⑧ Income		
Information sources Connections Staff, support Promotion		No user fee currently, but users willing to pay SDG 15–30 per feddan (USD 5.50–11.00 per hectare) Donors Government		

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one technical assistant, one information technology engineer and two support staff.

eLEAF provided the irrigation advice using its data-processing infrastructure, the web portal and the SMS delivery service, and provided local hands-on training during the workshops. Field-level data were collected by staff from the Hydraulics Research Centre and the Gezira Scheme's agricultural advisors.

Serving the whole Scheme

The project increased the income of participating farmers and showed the potential for increasing water use efficiency across the Gezira Scheme. It also revealed off-farm water management issues with the Scheme's

water distribution network that might benefit from the service when it is rolled out across a wider area. This would address technical and institutional challenges that arise from managing such a large scheme.

Plans are under discussion to roll out the project to a whole section of the Scheme, covering several thousand farmers, to test innovations in management of the water network as well as on-farm water management. In the meantime, a service based on the same concepts is being offered to stakeholders in countries all over the world. In Uganda, for example, a similar project, also with CTA and eLEAF involvement, aims to reach 350,000 farmers within 3 years: www.cta.int/en/news/muiis-project.html.

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