Science IMPACTS

Crop Improvement

The Challenge:

Heat stress in sub-Saharan Africa is a major constraint on wheat production. Low and inconsistent yields restrict farmer incomes and are pushing countries toward greater dependence on foreign imports as demand for wheat grows.

Heat-tolerant wheat transforms food production and policy for Sudan

An integrated wheat package introducing heat-tolerant wheat varieties that can withstand temperatures greater than 38°C is transforming farmer fields in Sudan and showing policy-makers a new road to food security.

Wheat production in Sudan is challenged by the intense heat during the wheat growing season, which often exceeds 38°C, severely limiting crop performance and yield. The national yield average for wheat is only 2 tons per hectare (t/ha) and can often be much lower. Climate change is predicted to make the situation worse and harsher conditions are already being felt – last year, only 11 successive cold days were recorded (calculated at 12-18°C).

Sudan currently produces only 30% of the wheat it consumes and relies on imports of some 1.5 million tons of wheat each year. With growing population, the dependence on imports is growing, exposing the country to the vagaries of global commodity markets.

ICARDA
Science for Better Livelihoods in Dry Areas

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SARD-SC

Issue: 5-OCT2015

Improving Crop Productivity from Seed to System

ICARDA partnered with Sudan's Agricultural Research Corporation (ARC) to generate and disseminate technologies and innovations that can help farmers overcome the abiotic and biotic stresses in the region. Starting out in 2012, the project, funded by the African Development Bank, developed and introduced improved wheat varieties tolerant to intense heat and rust disease. Building on the outcomes of ICARDA's ongoing global wheat research partnership with CIMMYT, the new varieties demonstrated an yield increase of up to 70% on fields of participating farmers over non-participating farmers. After a series of successful trials, 'Goumria-3' was released for wide cultivation across Sudan – a variety that can withstand temperatures >38°C and yield 4 to 6 tons per hectare (t/ha) compared with the national average of 1 to 2 t/ha.

Using an integrated 'systems' approach, the heat-tolerant wheat was disseminated alongside a package of interventions to improve the performance of the whole wheat production system; these included optimized land preparation and sowing dates, integrated pest management technologies, and more efficient irrigation systems.

Capacity building was an important component of the project. Over 350 farmers were trained through farmers' field schools, covering all aspects of wheat production, while more than 400 trainees learnt about various components of wheat value chain through courses.

Driving Change through Innovation Platforms

Bringing a meaningful and lasting change requires a fully participatory approach. The project established six innovation platforms to bring all the stakeholder groups together – farmers, scientists, policymakers, extensionists and the private sector – to jointly identify wheat production challenges and solutions. The interactions generated at stakeholder meetings in turn progressively stimulated dissemination of technologies and their subsequent adoption by farmers.

The project reached approximately 7500 farmers with the technological interventions, a number that is growing rapidly. Generating stable yields of up to 6 t/ha has significantly raised farmer productivity and incomes, and convinced policymakers to invest in wheat production as a means of reducing the country's growing dependence on imported wheat. The new varieties have also become a crucial component of Sudan's 'agricultural transformation' strategy for wheat – the farming area devoted to wheat is slated to increase from 300,000 ha to half a million ha over the coming three years.

Wheat was once considered not suitable for the hot, dry conditions of Sudan. The success of heat-tolerant wheat has changed mindsets, convincing many that wheat has a productive future in the country.

Additionally, the results from innovation platforms has inspired the Sudanese government to apply it as a model approach across all its major agricultural commodities, such as food legumes.

Field day at Innovation Platform site in Gezira, Sudan

> *We have proved that if you have the land and the right application of science and technology you can always grow wheat.*
>
> *Prof. Ibrahim Mahmoud Hamid, Director General of ARC (Sudan)*

Toward Greater Self-Sufficiency across Africa

The project in Sudan is implemented as part of a larger initiative to boost wheat production across 12 sub-Saharan African countries. Its implementation in Nigeria also led to similar large-scale impacts and triggered a shift in national strategy – Nigeria is set to expand wheat production and cut the cost of its wheat imports by 40-45% over the coming five years.

At a higher level, these projects are significantly contributing to the goals of their umbrella program, *Support to Agricultural Research for Development on Strategic Commodities in Africa* (SARD-SC). SARD-SC, funded by the African Development Bank, aims to strengthen food security and self-sufficiency across the African continent.

PROJECT IN NUMBERS:

- 7500 farmers reached with improved technologies
- 2-3 times increase in wheat yields on an average
- 1.67 times planned increase in area allocation for wheat over the next three years

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CGIAR RESEARCH PROGRAM ON Dryland Systems

Issue: 5-OCT2015