2iE Institut International d'Ingénierie

> CROP-NEWS SYSTEMS FOR IMPROVED SOIL AND WATER CONSERVATION IN THE AFRICA DRYLANDS

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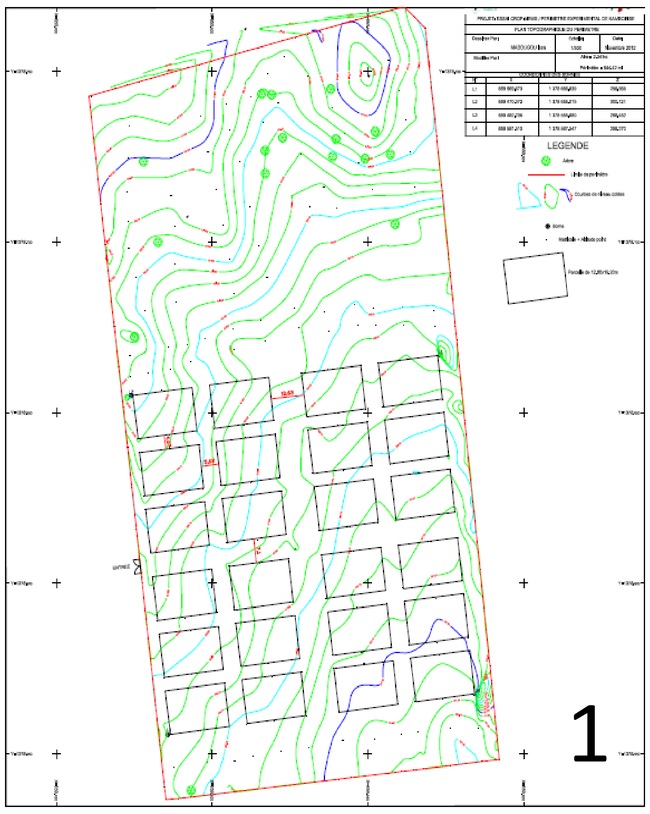
Wide spread of land degradation in Africa drylands

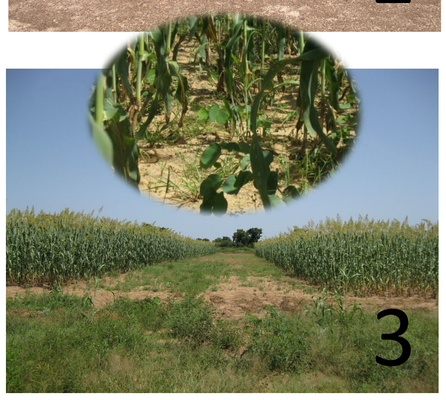
Introduction

> Cropping systems impact the water balance. In the Africa drylands, the steady increase of cropped area and the dominance of small-scale annual rainfed cereal-based cropping systems resulted in soil surface degradation, altering the soil water properties. Water infiltration is reduced while runoff is increased, which affects the crop production and the systems' resilience. Alternatively, appropriate agroecology-based systems associating annual crops and native evergreen woody shrubs (Crop-NEWS systems) are proposed. Building on existing research results and native knowledge and practices, it is hypothesized that these systems improve the soil water infiltration and storage, the crop rainwater use efficiency and, affect the underground water reserves recharge.

Material and Methods

> A Crop-NEWS Long-Term Experimentation has been set-up in kamboinsé, Burkina Faso [12° 28.031'N; 1° 32.929'W] in the setting of the 2iE campus, as a result of a partnership between the UE funded project ABACO-*Agroecology-based aggradation conservation agriculture*- consortium, the 2iE and CIRAD. It consists of a 2-factor randomized block design with 4 replications. Factor 1 is NEWS density i.e. 0, 488, 976 and 1953 shrub.ha^{-1}. Factor 2 is soil tillage i.e. no-till or zaï pits. The plot size is 13.6 x 20m; the NEWS is *Piliostigma reticulatum*, the crop is sorghum (*Sorghum bicolor* var Kapelga) installed at 0.8 x 0.8m spacing. The experimentation started in rainy season 2012.





The Kamboinsé Crop-NEWS LTE. The layout (1); natural savannah stand in the northern part (2); *P. reticulatum* - sorghum association in the southern part, during September (3) and October 2012 (4) and detailed vue of *P. reticulatum*.

The Kamboinsé Crop-LTE is designed to support multidisciplinary researches across a wide range of disciplines including soil, water, plant, agronomy, ecology, ecophysiology, agroforestry, socio-economics, etc. Undergoing studies intend to document the above- and belowground relationships and ecological mechanisms associated with the interaction between the NEWS and the annual crops e.g. water and nutrients allocation, mediation/facilitation, plant–plant competition, biotic and abiotic constraints etc.; the NEWS derived organic resources quality, decomposition and nutrient release, the tradeoffs between adequate provision of organic resources for mulching, shrub densities and the management of the system and; the dynamics of the system at temporal scale and related impacts on water balance, surface hydrology and underground water reservoirs as well as soil fertility replenishment and maintenance. Furthermore, the LTE supports graduate and post-graduate training and capacity straightening purposes and serves as a research operational platform aggregating and supporting the research community efforts targeting food security, soil, water, biodiversity and the environmental conservation and, the mitigation of climate change adverse effects. Up to date two additional projects joined their efforts: WASSA-*Woody amendements for Sudano-Sahelian agriculture*, SAFSE-*Recherche de compromis entre productions et services écosystémiques fournis par les systèmes agroforestiers*. Other initiatives are being developed.

The Crop-NEWS LTE is an operational platform for research and education

First results (2012)

> The total amount of rainfall over the April-October 2012 period was 717mm. The field operations performed to setup the layout are mentioned in the table 1. The figure 1 resumes the grain and dry matter yields obtained.

Table 1. Field operations carried-out

Operations	Timing
Soil subsoiling and uprooting of preexisting plants	2-4 June
Seeding *P. reticulatum* in a nursery	05 June
Hand line seeding of sorghum var Kapelga at 0.8x0.8m spacing	12-14 July
Separating the plots and blocks	7-9 August
1st hand weeding	8-12 August
Fertilization NPK (14/23/14) at 100kg.ha^{-1}	8-12 August
Transplantating *P. reticulatum*	10-12 August
Thinning sorghum seedlings	14-16 August
2nd hand weeding	25-28 August
Fertilization urea (46%) at 50kg.ha^{-1}	25-28 August
Hand harvesting	6-19 November
Hand grain threshing	3-19 December

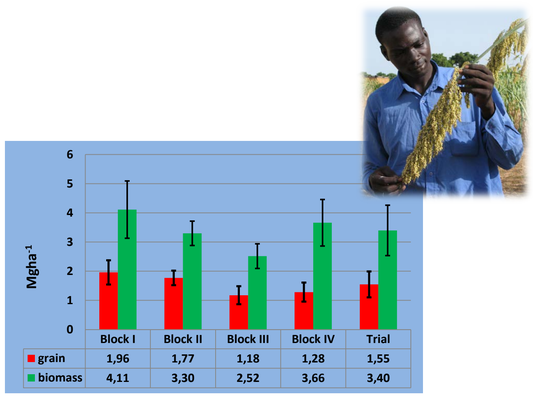


Figure 1. Grain and dry biomass yielded in 2012

References

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