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## Transforming sorghum farming in semi-arid Burkina Faso through agroecological intensification

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### Abstract

Sorghum (*Sorghum bicolor* (L.) Moench) is the most crucial staple crop for rural households in Burkina Faso. The changing climate and declining soil fertility are reducing sorghum yields. In 2021, the average yield was 900 kg ha<sup>-1</sup>, and in the Plateau-Central it was only 625 kg ha<sup>-1</sup>.

In 2023, an inter-farm comparison trial was set up in the Plateau-Central of Burkina Faso in cooperation with the NGO Koassanga. This trial was supported by the European Research Area Network Cofund (ERA-NET) Food Systems and Climate (FOSC) of the project Nutrigreen. It quantified the yield gains by applying the Agricultural Production and Soil Restoration Process (PPARS) method used by the NGO in more than 300 villages. Their integrated strategy includes reducing risks related to climate variability and markets, intensifying agricultural yields and restoring degraded soils.

A randomised complete block design was used with four treatment plots of 10 × 10 metres (mother trial). The replication was done inter-farm in four villages under similar agro-climatic and soil fertility conditions. Soil samples were taken before planting and after harvest. The two-factorial trial was each combined at two levels: local sorghum seed/ Sorghum vr. Kapelga/Flagnon with manure (farmer-style) P1(control)/P2, with 2 t ha<sup>-1</sup> of composted manure P3/P4, respectively.

The farmers were trained to design the research, implement the PPARS system with seven agroecological practices, maintain the plots, and evaluate the harvests by measuring seven traits (number of plants, stem size, panicle length, panicle weight, 1000 grain weight, harvest weight of stem and grains). 36 farmers established copy fields (baby trials). The statistical analysis included normal distribution check, Levene's homogeneity test, ANOVA and post-hoc tests. The results show significant differences between treatments in all traits. In two villages with higher soil fertility, P4 yields tripled or increased fivefold compared to P1 (control). In plots with lower soil fertility, the control fields P1 suffered a total crop failure, while the P4 treatment yielded 500 to 800 kg ha<sup>-1</sup>. This study highlights the potential of the application of composted manure and improved seed to lift the rural population out of food insecurity in record time.

**Keywords:** Agroecology, Burkina Faso, ecological intensification, farmer-led research, food security, inter-farm comparison trial, sorghum