



Cultivation of Cowpea Challenges in West Africa: Analysis of Factors Driving Yield Gap in Benin



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Introduction

Feeding the world in 2050 requires us to find ways to boost yields of the main local crops.

Among those crops, cowpea is one of the grain legumes that is playing an important role in the livelihood of millions of people in West Africa, especially in Benin.

Unfortunately, cowpea on-farm yields are very low (Anago *et al.*, 2021)

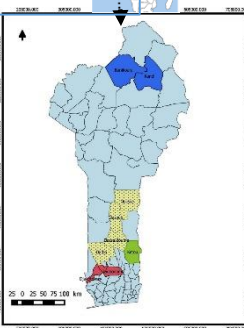
Research focus and Methodology

This study aims to understand the main causes of variability in yield and to identify opportunities for improving cowpea yield.

Eleven case-study villages were selected in Northern, Center and Southern Benin.



All cowpea fields were surveyed in a random sample Northern, Center and Southern Benin during the 2017, 2018 and 2019 rainy seasons.



At the beginning of the growing season, semi-structured interviews with farmers were conducted.



Interview data were cross-validated by own on-field observations.

Composite soil samples were taken at flowering stage.

Results

The average cowpea grain yield is low from south to north Benin over the three years 2017, 2018 and 2019 and rarely exceeds 750 kg ha⁻¹ (Figure 1). Moreover, the average cowpea grain yield is high in center and south Benin than North Benin (Figure 1).

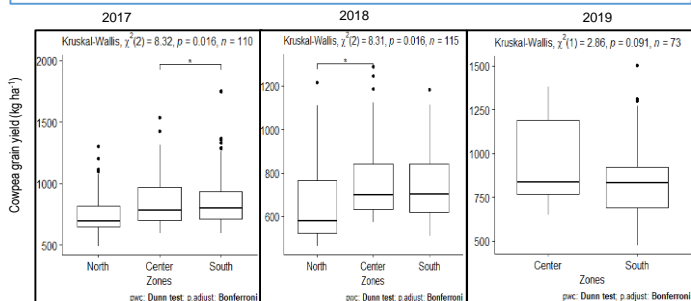


Figure 1. Cowpea grain yield in endogenous cropping systems in 2017, 2018 and 2019 from south to north Benin

Reference

Anago, F.N.; Agbangba, E.C.; Oussou, B.T.C.; Dagbenonbakin, G.D.; Amadjii, L.G. Cultivation of Cowpea Challenges in West Africa for Food Security: Analysis of Factors Driving Yield Gap in Benin. *Agronomy* 2021, 11, 1139. <https://doi.org/10.3390/agronomy11061139>

Phosphorus, potassium, nitrogen and the sum of cations are the main soil chemical characteristics that determine the grain yield of cowpea in central and southern Benin (Figure 2). On the other hand, In northern Benin, potassium does not influence cowpea yield.

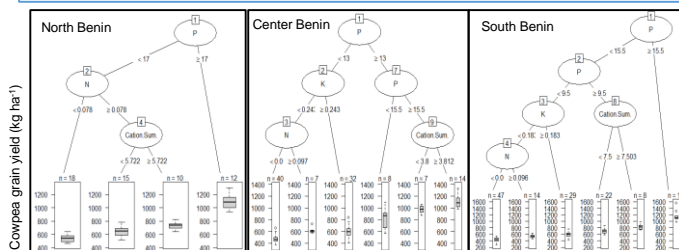


Figure 2. Model of regression tree of the agricultural practices driving cowpea grain yields from northern to southern Benin

Fertilizer application increased cowpea grain yields from southern to northern Benin (Figure 3). The more insect control, the higher the cowpea seed yield (Figure 3). In addition, the intercropping reduced the cowpea grain yield in center Benin (Figure 3).

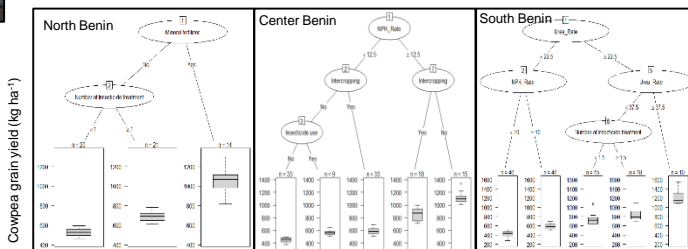


Figure 3. Model of regression tree of the agricultural practices driving cowpea grain yields from northern to southern Benin

From multidimensional preference analysis (Figure 4), in northern and central Benin the most important constraints were insect pests and diseases, soil fertility decline, unavailability of specific fertilizer and early drought, while in southern Benin, there were insect pest and diseases, soil fertility decline, unavailability of specific fertilizer, heavy rain, and early drought.

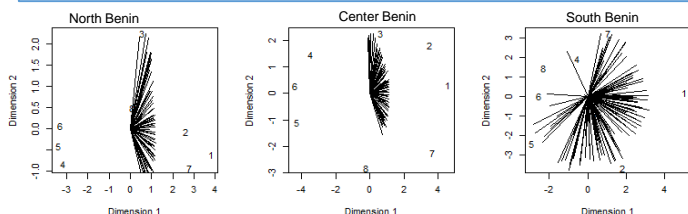


Figure 4. Most important items of cowpea cropping system and environment responsible for poor performance from northern to southern Benin: 1 = Insect pest and diseases; 2 = Soil Fertility decline; 3 = Unavailability of specific fertilizer; 4 = Unavailability of improved seed; 5 = Heavy rain; 6 = Late rain; 7 = Early drought; 8 = Weed proliferation. The constraints are labeled with consecutive numbers while the farmers are presented as vectors pointing from the origin to their most important constraint.

Conclusion

From northern to southern Benin, cowpea grain yields are very low and depended on management practices such as the use of mineral fertilization, insecticide sprays to control pests, and phosphorus, nitrogen, potassium and cation sum content into the topsoil. Insect pests, diseases and soil fertility decline are the major constraints that limit cowpea cultivation in Benin.