



“ Effects of climate variability and climate change on crop production in southern Mali”

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Since the early 1990s the Intergovernmental Panel for Climate Change (IPCC) has provided evidence of accelerated global warming and climate change. However, in West Africa predictions of future changes in climate and especially rainfall are highly uncertain. Rainfed agriculture produces nearly 90% of food and feed, and is the major livelihood activity for 70% of the population. This agricultural sector is negatively affected by climate change and climate variability. The objectives of this study are to quantify historical changes in climate and crop production over 30 years in southern Mali and to quantify the effect of annual climate variability and change on crop production.

We analysed long-term trends in climate variability at N'Tarla and Sikasso in southern Mali using a daily weather dataset from 1965 to 2005. Climatic variables and crop productivity were analysed using data from an experiment conducted from 1965 to 1993 at the Research Station of the Institut de l'Economie Rurale at N'Tarla and from farmers' fields in ten cotton growing districts of southern Mali.

Minimum daily air temperature increased on average by 0.05°C per year during the period from 1965 to 2005 while maximum daily air temperature remained constant. Seasonal rainfall showed large inter-annual variability with no significant change over the 1965-2005 period. However, the total number of dry days within the growing season increased significantly at N'Tarla, indicating a change in rainfall distribution. The length of the rainy season was significantly correlated to the seasonal rainfall.

Yields of cotton, sorghum and groundnut at the N'Tarla experiment varied (30%) without any clear trend over the years. There was a negative effect of maximum temperature, number of dry days and total seasonal rainfall on cotton yield. The variation in cotton yields was related to the rainfall distribution within the rainfall season, with dry spells and seasonal dry days being key determinants of crop yield. In the driest districts, maize yields were positively correlated with rainfall. Our study shows that cotton production in southern Mali is affected by climate change, in particular through changes in the rainfall distribution.

The most important rainfall characteristic determining crop production is the rainfall distribution, which is related to the number of dry days during the rainy season. The significant increase of the number of dry days during the rainy season over the period 1965-1993 and its impact on yield makes it one of the most important characteristics of climate change in southern Mali. A high average total rainfall in Sudano-Sahelian regions is not necessarily synonymous with a good rainy season or with good crop production. In our study, which is based on an analysis at field level, it appears that the effects of declining soil fertility are as important as those of climate variability and change. However, disentangling effects of climate and soil fertility is not straightforward, and results depend on the spatial scale of analysis.

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Figure 1 - maize after 10 days dry spells

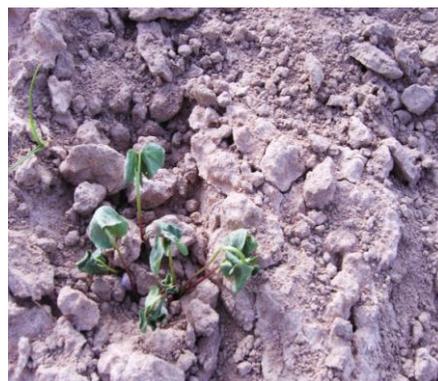


Figure 2 - cotton after 10 days dry spells