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Certified seeds or certified bags? Using genotyping-by-sequencing to validate the identity of maize in Ghana

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Abstract

Since the green revolution in Asia, the adoption of improved varieties is recognised as one of the most important contributions to agricultural productivity and as a critical measure to reduce poverty. Maize contributes largely to food security in sub-Saharan Africa despite persistently high yield gaps. In Ghana, the commercial maize seed market is dominated, for almost twenty years, by one high yielding variety called ‘Obatanpa’. The average maize yield is about 1.7 t/ha whereas its potential is about 4.3 t/ha. As seed quality plays a crucial role in yield performance, in this study, we investigate whether samples sourced from certified Opatanpa seed bags were actually containing the claimed genetic material. Genetic fingerprinting is increasingly used to assess the genetic purity of crop varieties found in farmers’ fields, however, this method has been barely applied to commercial seeds so far. In the present study, we used genotyping-by-sequencing (GBS) to compare the collected seed samples (56) from agro-input shops (34) in the north of Ghana, against the reference obtained from the gene bank at CIMMYT in Mexico. Different methods of population structure were performed using the SNP markers, which revealed high variation among the samples and about 11 % of the samples are not relatable to Obatanpa. This study does not explain the reasons for the poor quality of the certified Obatanpa seeds available in the market, however, entry points can be assumed along the entire production chain of the certified seeds and further analysis is needed to identify these shortcomings. Nevertheless, the study stresses the need to sustainably increase the purity of the genetic material available to small-scale farmers in the region, as it is one lever to improve yields.

Keywords: Generic fingerprinting, Ghana, maize, seed system, yield gap