Tropentag, September 17-19, 2018, Ghent

"Global food security and food safety:
The role of universities"

Transplanting Instead of Direct Seeding as an Option to Mitigate Abiotic Stress Conditions in Rainfed Lowland Rice in High Altitude Rice Systems of Ethiopia

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Abstract

Rain fed lowland rice in the high-altitude plains of Ethiopia is constrained by two major abiotic stresses (1) available precipitation during the cropping period and (2) low temperatures causing spikelet sterility towards the end of the cropping season. Current practice of direct seeding is constrained by water availability as fields are sown after the first rains which may be delayed or less intense than optimal. The productivity of rice is additionally restricted as only short to medium duration varieties can be grown due to the risk of spikelet sterility during flowering which coincides with the cold stress. The system could gain flexibility by changing from direct seeding to transplanting. For transplanting, rice is sown in seedbeds, which require much less space and water and thus allow for more variability in the sowing date. Depending on the seedbed duration, a share of the basic vegetative phase (BVP) is already happening before transplanting, which may offer an opportunity to also include long duration varieties by increasing seedbed time and transplanting older seedlings that may still reach flowering during optimal temperature conditions. Seedbed duration can also act as a buffer period in case the onset of the rainy season is delayed. A field study was conducted in the 2016 and 2017 cropping seasons with the aim of investigating variation the effect of the crop establishment methods on the phenological development and yield performance of contrasting rice genotypes. Ten genotypes contrasting in duration (110 to 175 days), were simultaneously direct dry seeded and transplanted as three weeks old seedling at the Fogera National Rice Research and Training Center research station. The experiments were carried out in randomised complete block design with three replications. Data on phenological development, yield, and yield components was recorded and analyzed. Differences in the rate of phenological development as well as yield performance were clearly observed between transplanting and direct seeding. The results of this study will provide information for the design of new or adapted crop calendars and crop management recommendations, thus helping to improve and stabilise yields of rain fed lowland rice farming systems.

Keywords: Cold stress, direct seeding, genotypes, phenology, transplanting, yield

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