



Tropentag, September 20-22, 2017, Bonn

“Future Agriculture:
Socio-ecological transitions and bio-cultural shifts”

Evaluation of Agronomic Interventions Regarding Productivity and Profitability on Smallholder Farms with Wheat Production in Arsi, Ethiopia

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Abstract

In Ethiopia average agricultural productivity can be considered low. The production methods are basic, labour intensive, and with low capital and external inputs. To improve efficiency in terms of productivity and profitability different agronomic interventions are tested on 593 randomly sampled smallholder farms (SHF). The types of interventions comprise tractor ploughing, harrowing (tractor mounted), row seeding (tractor mounted), improved seeds/varieties, recommended dosage and timing of fertiliser, herbicide and fungicide application.

The aim is to enhance the understanding of wheat farming systems in Arsi and to evaluate the agronomic interventions regarding productivity and profitability.

The research approach is mono-factorial. On each sampled wheat producing farm one farm section is “treated” with one intervention whereas the other part is still managed as before in order to allow comparison (“with” and “without”). The harvest data was collected on 227 SHF in a pre-harvest field assessment by collection of wheat samples counting number of heads per m², number of seeds per head and thousand kernel weights. In order to cross-check, farmers were additionally surveyed in a post-harvest assessment. To analyse data Microsoft Excel 2010 and the statistical program R version 3.2.2 were employed, the latter to test for significance by applying t-tests.

The results of the farming systems analysis show a mean land size of 1.7 ha with a mean wheat yield of 2.64 t ha⁻¹ (2014).

The results for the pre-harvest assessment display a mean wheat yield of 4.3 t ha⁻¹ for intervention and 3.4 t ha⁻¹ for control plots, the post-harvest assessment 4.7 t ha⁻¹ for intervention and 3.9 t ha⁻¹ for control plots (2016). For all interventions highly significant ($p < 0.001$) differences in regards to productivity were found when compared to the control plots. The average wheat yields of intervention plots indicated following increases: tractor ploughing 21% higher wheat yields, harrowing 9%, improved seeds 32%, row seeding 28%, fertiliser application 21.5%, herbicide application 22.5%, and fungicide application 30% higher wheat yields, respectively. Therefore, the gross margin increased by about: 24% through the application of tractor ploughing, 0.4% for harrowing, 36% for the use of improved seed, 30% for row seeding, 25% for fertiliser-, 27% for herbicide-, and 38% for fungicide application.

Keywords: Ethiopia, interventions, productivity, profitability, smallholder, wheat

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