Productivity & Profitability Evaluation of Agronomic Interventions in Smallholder Wheat Production in Arsi, Ethiopia

Pierre Ellssel[1]
Gerold Rahmann[2]
Bernhard Freyer[1]

[1] University of Natural Resources and Life Sciences (BOKU), Dept. of Sustainable Agricultural Systems, Austria
[2] Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH, Germany

Contact: pierre.ellssel@students.boku.ac.at

background

In Ethiopia average agricultural productivity can be considered low. Poverty and food insecurity are especially severe among the rural population. 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) with wheat production. 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.

research goals

The research goal was to enhance the understanding of wheat farming systems in Arsi-zone and to evaluate applied agronomic interventions regarding its impact on productivity and profitability in wheat production.

methodology

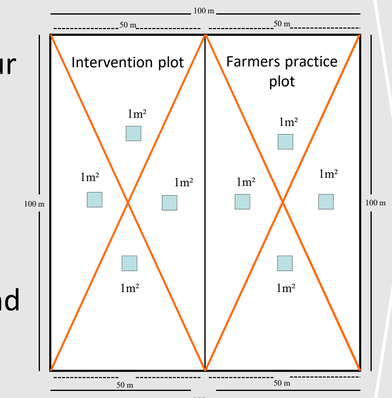
The research approach is mono-factorial. On each sampled wheat producing farm one farm section is "treated" with one intervention whereas the other part is still managed as before (control = oxen plough, broadcasting, inappropriate dosage/timing) in order to allow comparison ("with" and "without"). The harvest data was collected on 300 SHF in a pre- and from 323 SHF in a post-harvest assessment.

1. Data analysis

For the characterisation of wheat farming systems in Arsi, secondary data was analysed by using Microsoft Excel 2010 and the statistical program R version 3.2.2.

2. Pre-harvest assessment

Wheat samples were taken on four 1m² quadrants 2,5m from the centre - counting no. of heads per m², number of seeds per head and thousand kernel weights.



3. Post-harvest assess.

In order to cross check interviews were conducted after the harvest with farmers where they estimated wheat yields (n = 323). R version 3.2.2 was used to test for significance.

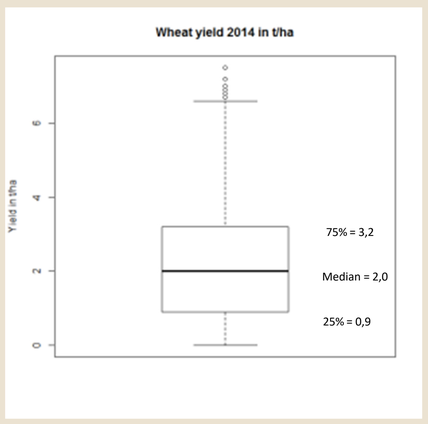
4. Gross margin

Gross margins were calculated for wheat production for different scenarios.

findings

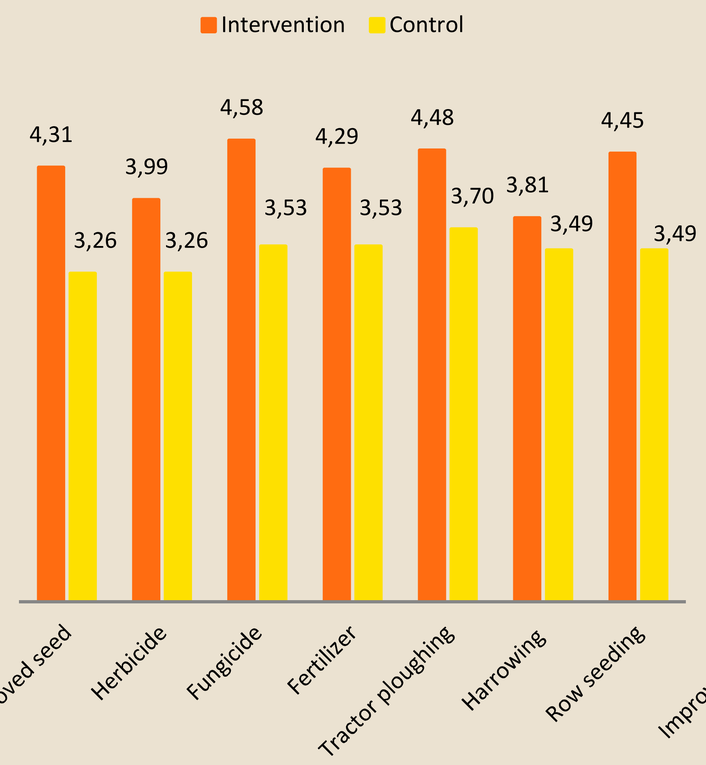
Key facts - Farming Systems Analysis - Arsi (2014)

- ∅ Land size: 1,7 ha
- ∅ Wheat yield: 2,27 t/ha
- ∅ Household size: 6,3
- ∅ Farmers age: 46
  Main cash crop: wheat
- ∅ Wheat price: 362 US$/t



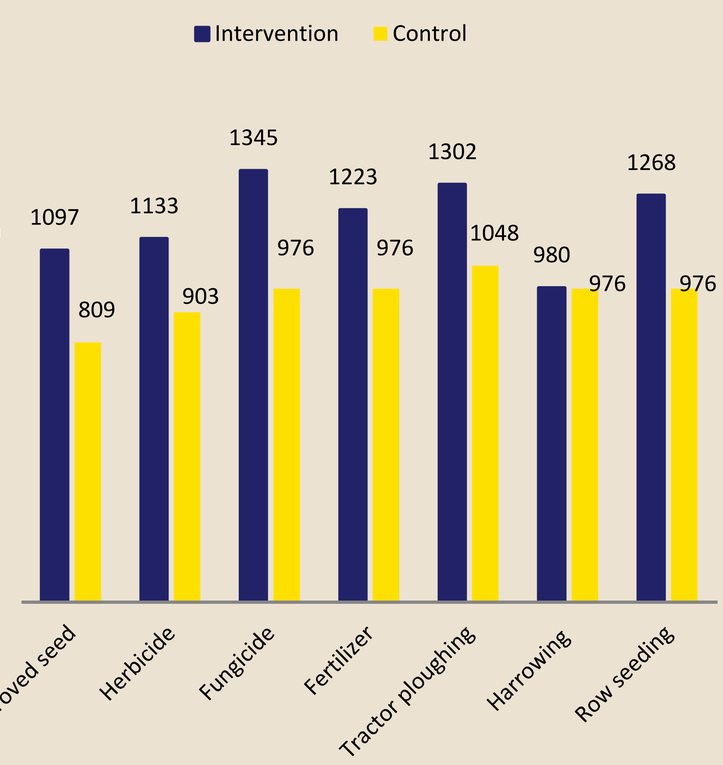
Productivity Comparison (2016)

(Mean: tons per hectare)



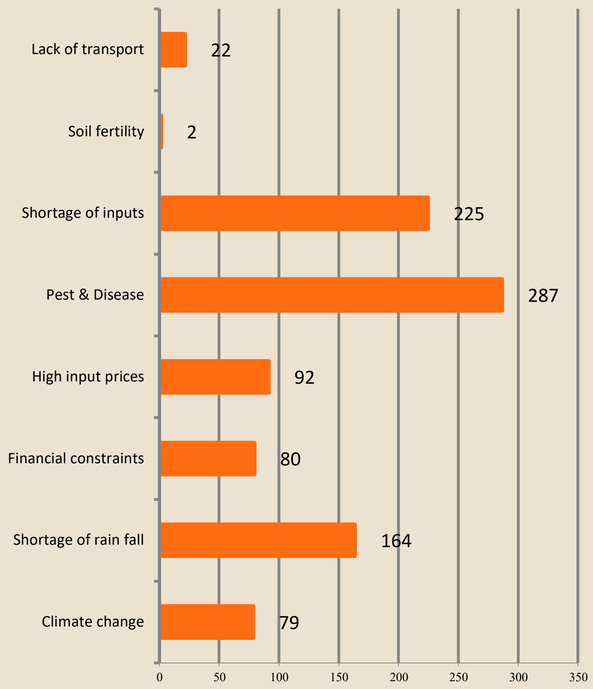
Gross Margin in US$ (2016)

(Mean: US$ per hectare)



Farmers' Challenges

n = 543/Multiple statements possible



conclusions

Most applied agronomic interventions show significant increases in productivity and profitability – thus may contribute to poverty and food insecurity reduction. However, other factors such as volatile precipitation might have unexpected adverse impacts on the production. Furthermore, financial and insurance services might be crucial for successful implementation along with education in application of inputs as well as appropriate quality, timely and quantitative availability. Increasing monoculture of wheat due to various reasons leads to surging pest and disease pressure, thus increasing the need for pesticides. An appropriate crop rotation management might reduce the use of agro-chemicals while increasing productivity. More versatile crop rotations, integrated pest management and/or agro-ecological methods – among other measures - might be crucial for sustainable perspectives with regards to climate change as well as productivity.

Acknowledgements: Many thanks to the participating farmers and to GIZ GmbH for the overall support. Data and rights belong to GIZ.