Enhancing Livelihoods through Integrated Soil Fertility Management in the Highlands of Ethiopia

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Introduction

- Land degradation and declining productivity are serious problems in the Ethiopian Highlands, the major cause being a decline in soil fertility resulting from topsoil erosion, soil nutrient and organic matter depletion and often increased soil acidity. At the same time Ethiopia is being adversely affected by climate change weather patterns.
- Integrated Soil Fertility Management aims to improve soil fertility and productivity of small-scale farmers by promoting locally adopted combinations of various integrated soil fertility management technologies (ISFM).
- For farmers it is crucial to know if their investment is also financially viable.

Quick-Win Technologies

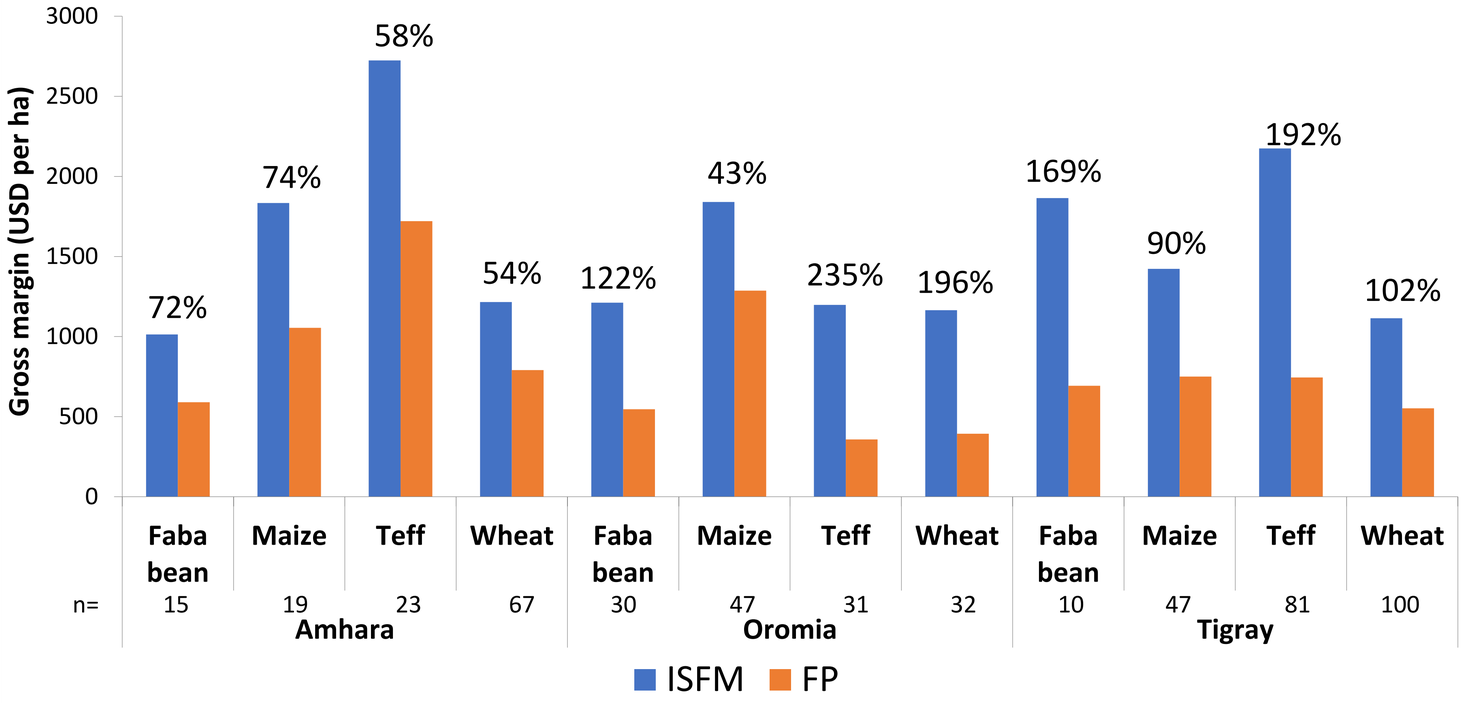
Figure 1: Quick win technologies

Methods

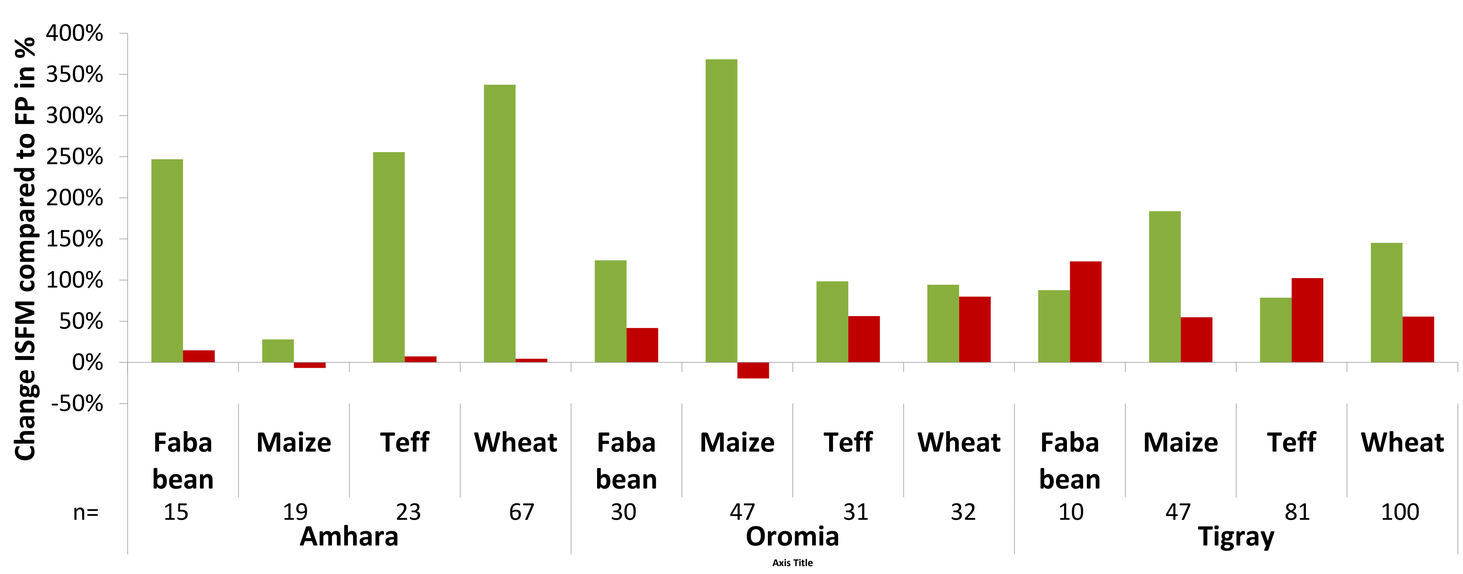
- Data from 700 farmer-led field demonstrations of four major crops, faba bean, maize, wheat and teff, across Amhara, Oromia and Tigray regions in 2016.
- 20m x 20m plots using various combinations of ISFM quick win technologies (see Figure 1) compared to similarly sized plots under usual farmer practices (FP).
- Grain and crop residue yields measured from each plot were analyzed using Residual Maximum Likelihood (Patterson and Thompson, 1971).
- Gross margins ha^{-1}, returns to labour day^{-1} and a benefit-cost ratio were calculated based on average yields, local prices for inputs, average type and amount of input, labour and outputs as well as work duration standards for operations obtained from farmers, literature and expert opinion. This involved a participatory analysis with farmers allowing them to evaluate the economic effect of ISFM technologies under their conditions (Figure 2 and 3).

Results

- Yield analysis from the demonstrations showed a significant ($P<0.001$) increase in both grain and crop residue yields using ISFM compared with FP, 66% and 42% respectively.
- Comparative gross margin analysis of the acidic soils of Amhara and Oromia with the non-acidic soil of Tigray showed a substantial increase in gross margins in all cases, with a wide variation between both crops and regions, increases varying from 54% to over 200% (Graph 1).
- In general the greatest change in percentage in benefit to cost ratio occurred in Tigray and the lowest in Amhara, reflecting the increased quantities and cost of lime required (Graph 2).



Graph 1: Gross margins for individual crops across Regions comparing ISFM and FP (USD per ha), with change in percentage



Graph 2: Change ISFM compared to FP in percentage for labour returns (USD per day) and Benefit: Cost ratios

- The costs of lime have been spread over a five year period as successive crops will also benefit over this time period. Where the cost of lime is written off a single year, increased gross margins and increased returns to labour are maintained, but increases in benefit-cost ratios are reduced.

Figure 2 and 3: Farmers discussing work duration for field operations.

Conclusion

- ISFM considerably increases gross margin.
- It can be financially attractive for small scale farmers to invest in soil fertility enhancing technologies.
- ISFM can create a win-win situation for both the environment and improving livelihoods in the long-term.
- As labour is not a limiting factor technologies like compost have positive impact for both, soil health and gross margin.
- Nevertheless, the availability of inputs, finance and labour, as well as knowledge about ISFM, remain critical to long-term sustainability.

Figure 4: Teff demonstration field with FP (left) and ISFM (right).

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