



'Game changers' in Ethiopian smallholder farming systems

Mirja Michalscheck, Wageningen University and Research Centre (WUR), Farming Systems Ecology Group, P.O. Box 430, 6700 AK Wageningen, The Netherlands, e-mail: mirja.michalscheck@wur.nl

Background

Small (1-5 ha) mixed crop-livestock systems generate about 98 % of Ethiopia's cereal production. Their individual farm performance is however typically poor with (wheat) yield gaps of 45-87 %, a low nutritional diversity in production and a severe lack of livestock feed.

Objective

This study aimed to investigate features, dynamics and potentials of smallholder farming systems in the wheat-belt of Ethiopia. An emphasis was set on identifying challenges and opportunities to improve their farm performance (profits, labour, soil organic matter).

Methods

A baseline data set (n = 488; 2014) was used to produce a statistical typology. The typology served to select representative farmers for a detailed consultation in 2015. The detailed data was entered into the static bio-economic model Farm DESIGN. By capturing the different dimensions of a farm system, the model allows an integrated analysis of the current farm performance, the performance after targeted modifications as well as a Pareto-based optimization to explore alternative farm configurations.

Basic Farm Features

To exemplify the use and results of Farm DESIGN: A case study farm.

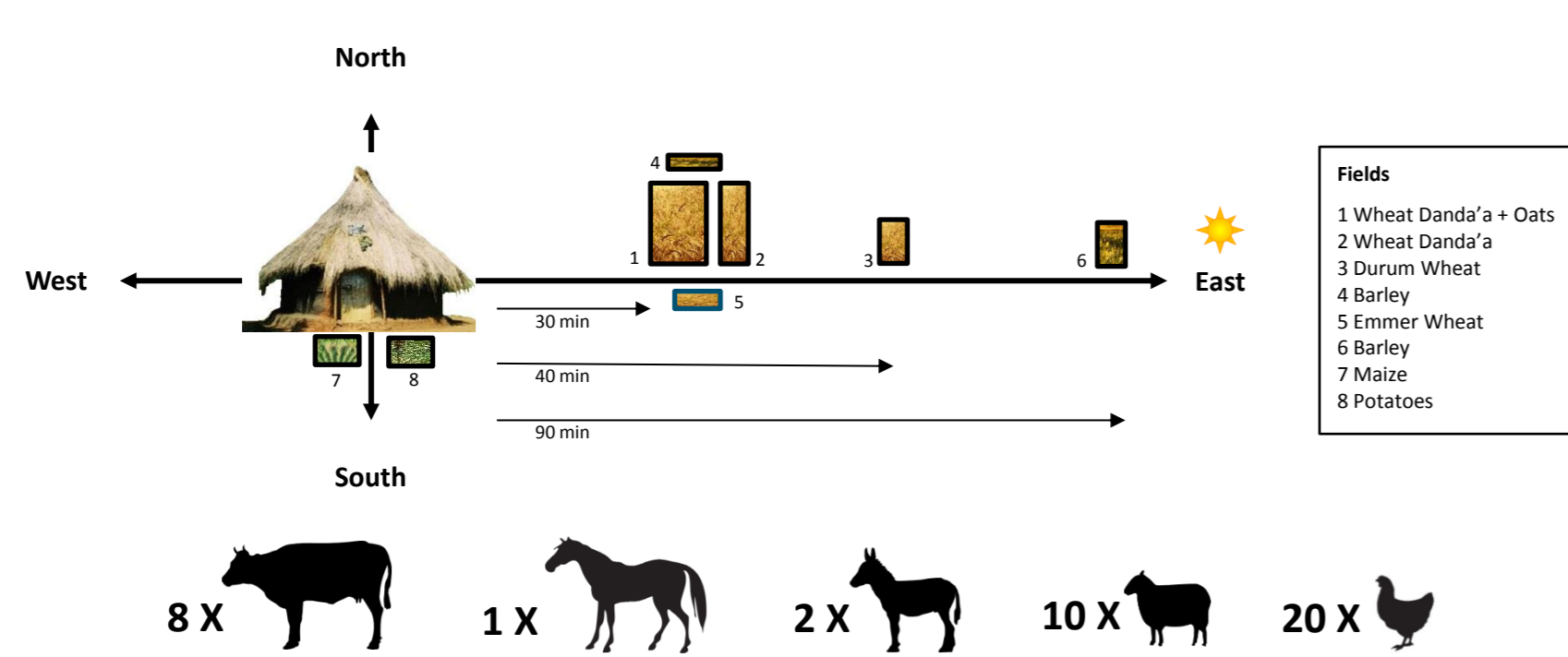


Figure 1. Basic farm features

Nitrogen Cycle

Despite being a market oriented, well resource endowed farm, the system is characterized by low inputs and low outputs.

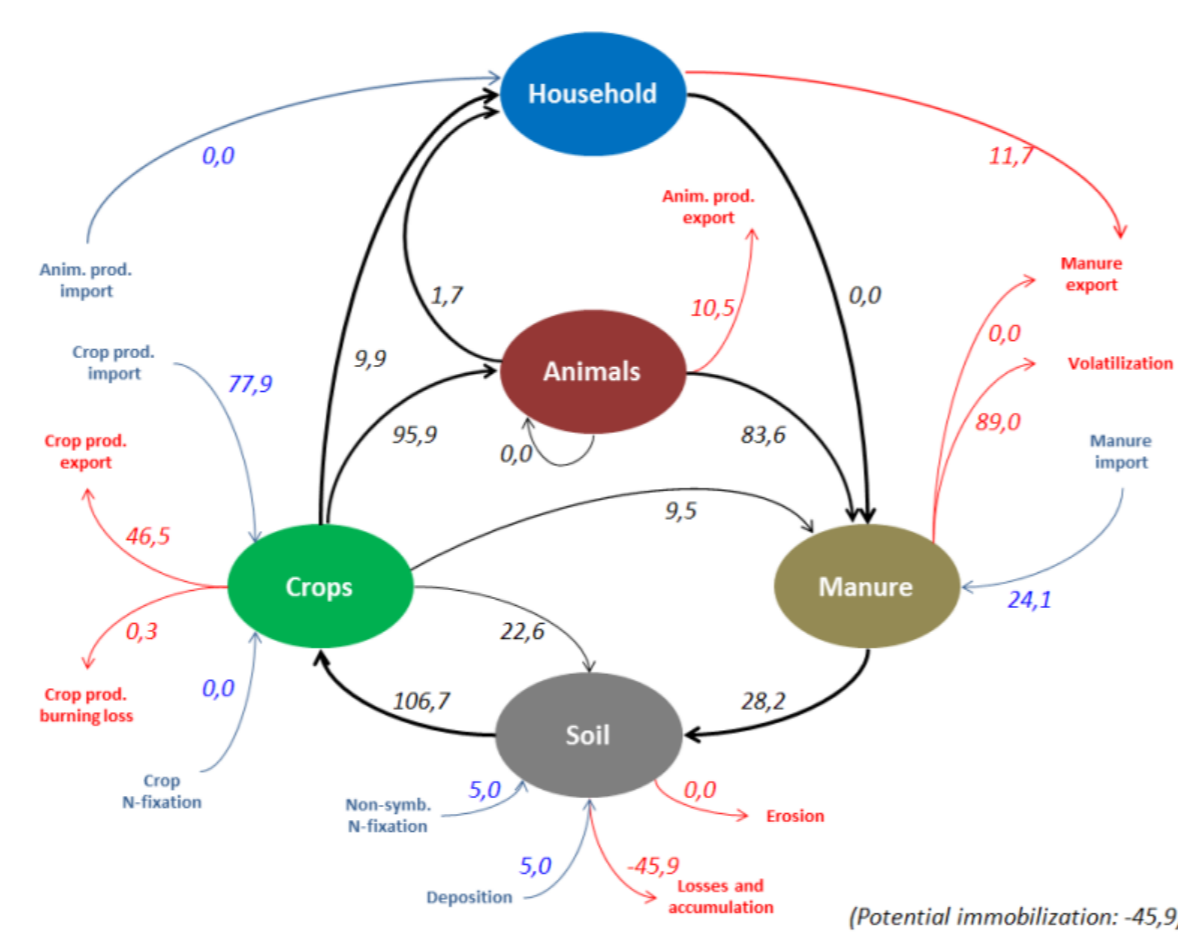


Figure 2. Nitrogen cycle of the case study farm

Scenarios

The farm performance would change if

- combine harvesters could also be used for other crops than wheat
- cropping areas were redistributed
- double cropping of faba bean and wheat was established
- fields were irrigated



Figure 3. Relative changes in model-determined basic farm performance under various system modifications

Trade-Offs

The model was given 'room to manoeuvre' to test the impact of a shift in crops as well as product use. Figure 4 illustrates the associated solution spaces. Each point represents an alternative farm configuration (AFC).

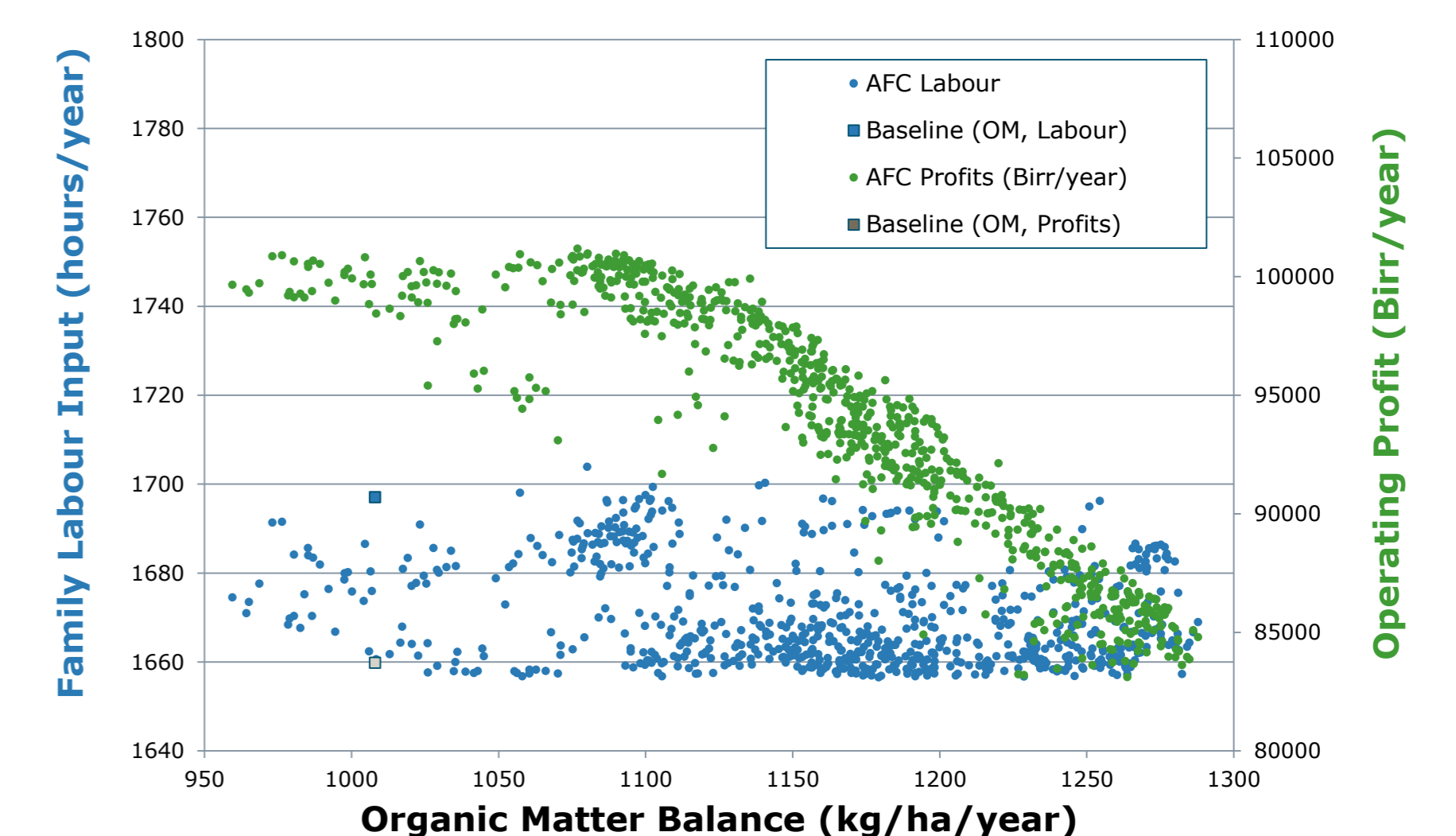


Figure 4. Solution spaces, revealing trade-offs between operating profit, labour and the organic matter balance

Conclusions

The extended use of combine harvesters, double cropping of cereal-legumes, irrigation and the prevention of post-harvest losses seem to bear considerable potential to improve the current farm performance. A broader sustainability assessment of the suggested measures is recommended, including the determination of sustainable rates of water abstraction as well as gender-specific impacts.

Acknowledgements

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Ask the Author

