Diversity among smallholder farms and households – Consequences for trade-offs, trajectories, targeting and scaling

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Key messages

Farms are very diverse in size, structure and production orientation. Farmers' households strongly differ in ownership, division of tasks and benefits and in power relations. Moreover, the role of the farm enterprise in relation to off-farm activities and income differs. These differences have implications for:

✓ The window of opportunities for farm households to adjust their farm configuration and management, and the trade-offs that they face.

✓ The most appropriate sequence of steps to implement new practices and technologies to build up human, economic and natural capital.

✓ For the project the farm households to target to be efficient and effective in obtaining the desired project outcomes and to reach adoption and systems improvement at scale.

Objectives and approach

The main objectives are to characterize the existing diversity among smallholder farms and households, and to identify appropriate innovation pathways.

In the first phase of the Africa RISING project we have analyzed the diversity among smallholder farms and households, and performed analyses of trade-offs and synergies, using multi-objective optimization in FarmDESIGN.

In the second phase of the project this work will be continued and broadened to analysis of trajectories of change, using scenario-studies in FarmDESIGN. Moreover, we will assess the suitability of practices and technologies for individual farms, using statistical techniques in FarmMATCH.

Key results

A large diversity of farms was found in the Africa RISING communities in Ghana, Mali, Tanzania, Malawi and Zambia (illustrated for Eastern Zambia; Figure 1). The analysis showed that larger farmers had more room to maneuver and to improve farm performance (Figure 2). They would need different technology packages than smaller farms.

Significance and scaling potential

The classifications that have been developed and the analyses that are performed allow targeted innovation in smallholder farms, based on an understanding of requirements, possibilities and potentials. The FarmMATCH approach will inform project members, extension workers, researchers and policy makers about scaling and supports large-scale data collection (Figure 3).
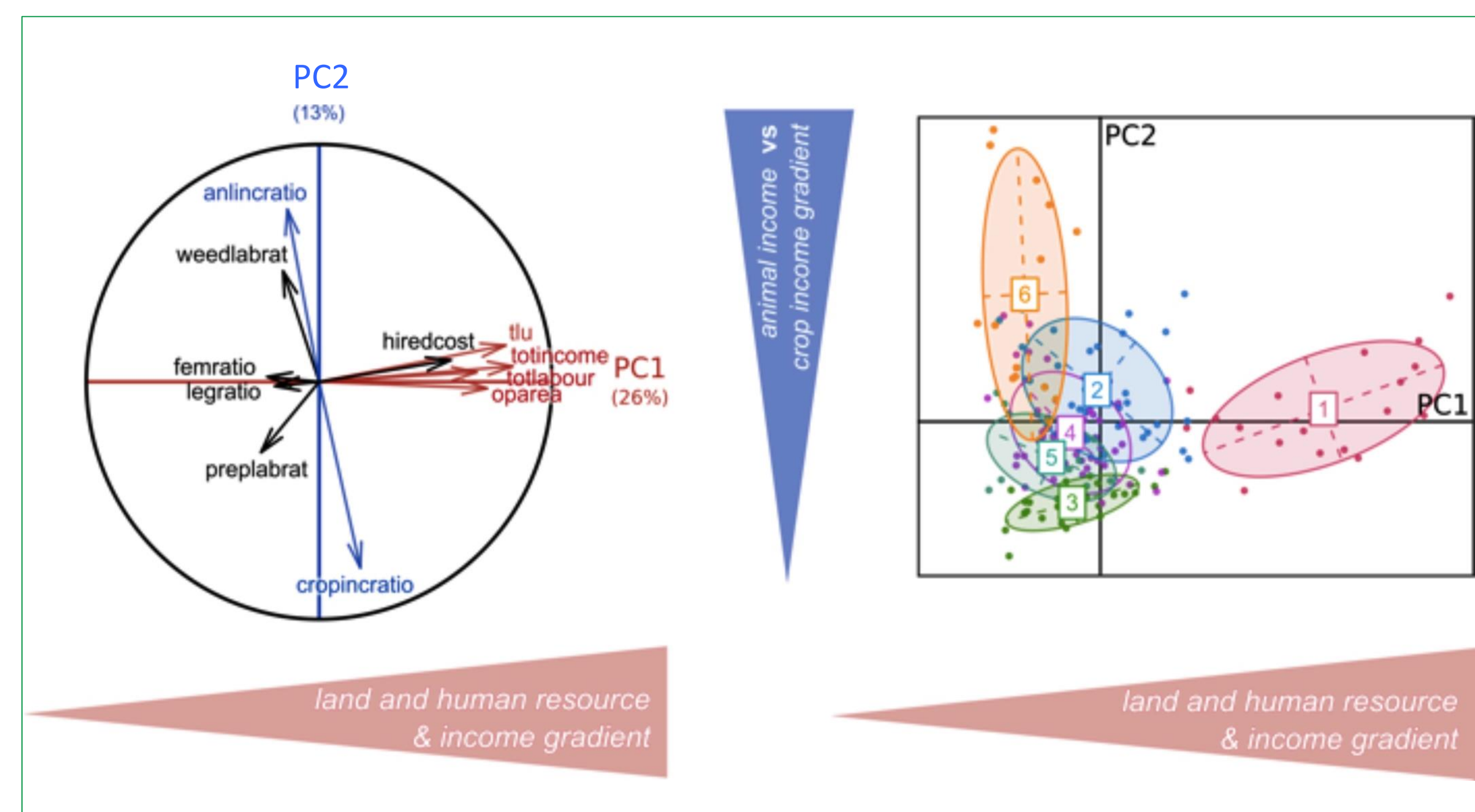

Figure 1. Representation of the farm types of resulting from the Principal Component Analysis and Clustering Analysis on the planes defined by the first four principal components in Katete district, Zambia. The red colored variables are the most explanatory of the horizontal axis (PC1); those in blue are the most explanatory variables of vertical axes (PC2) and those in violet are variables correlated with both PC1 and PC2.
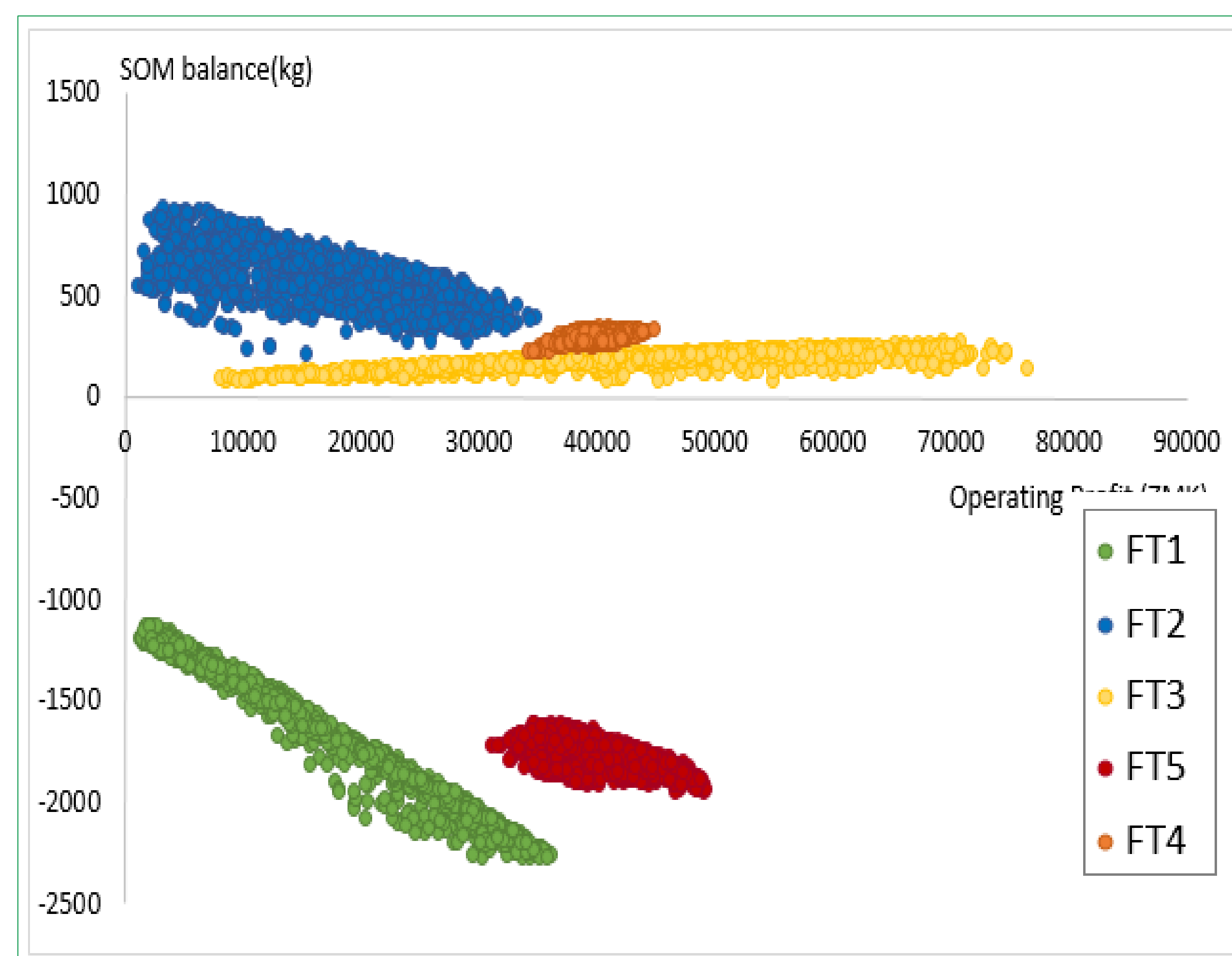

Figure 2. Model-based relationships of trade-off and synergies between farm performance indicators (operating profit and organic matter balance) after exploration of alternative farm configuration considering new entry points for five farm types (FT) in eastern Zambia.
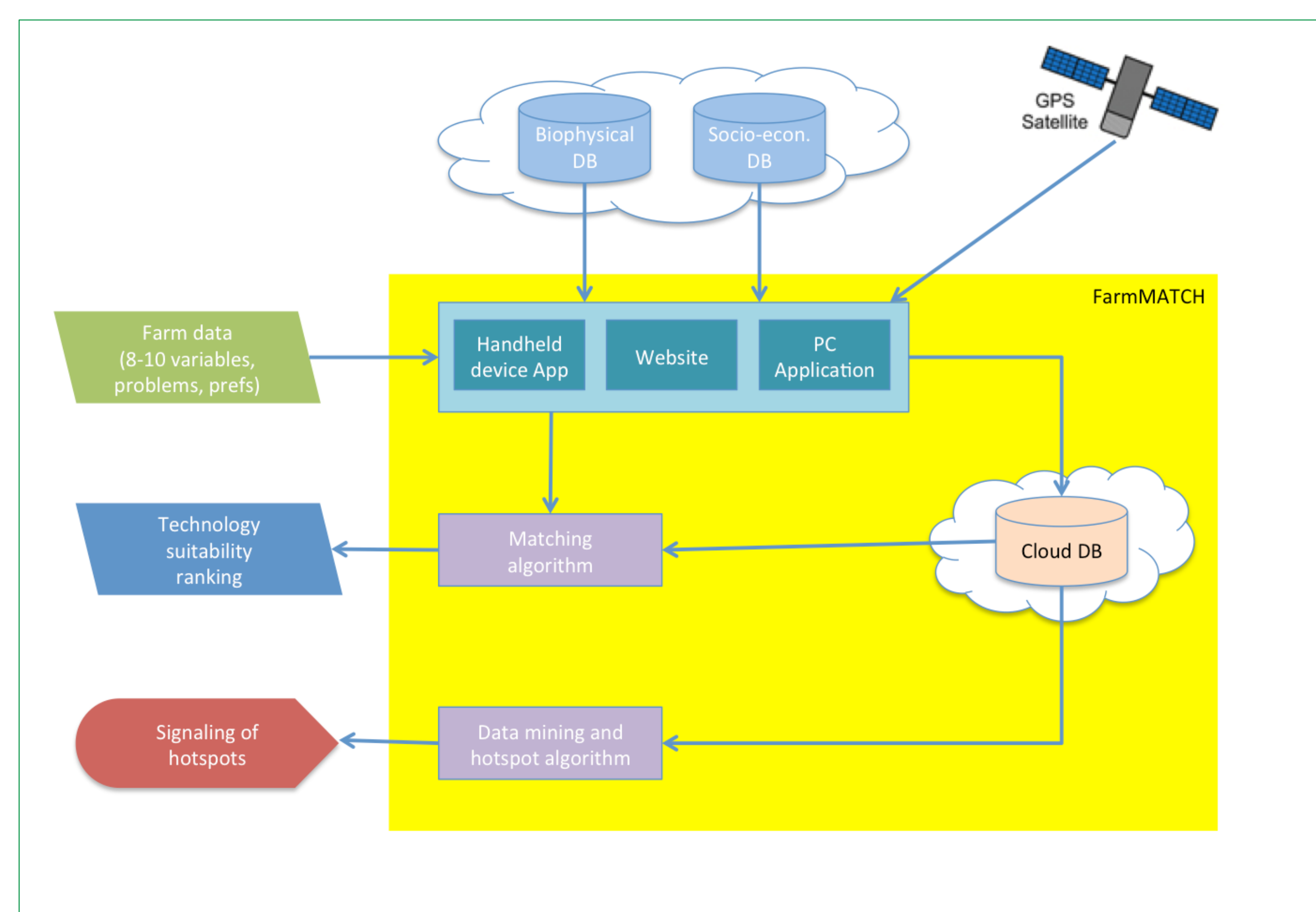

Figure 3. Technical structure of FarmMATCH, indicating the core of the framework (shaded yellow) and interactions with external data sources.