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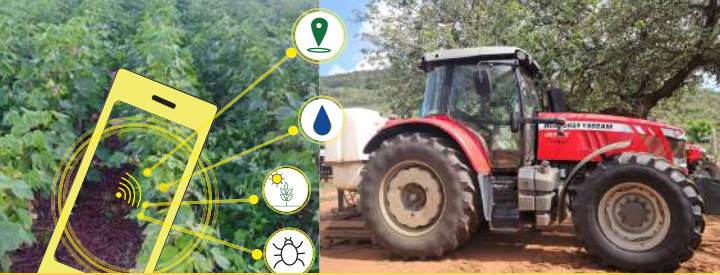
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# Building Africa's Future

Crop Research and Innovation for Agricultural Transformation, Resilience, and Inclusion

# BOOK OF ABSTRACTS

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# AGROECOLOGICAL INTENSIFICATION OF MIXED CROP LIVESTOCK PRODUCTION SYSTEMS OF SUBSAHARAN AFRICA: the need for biophysical agronomy to engage more into integrated assessments of agricultural systems

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Mixed crop livestock systems under semi-arid to subhumid climate of Sub-Saharan Africa largely predominate on the continent. Farm households belonging to this category of agricultural systems are the poorest on the planet. Crop yields in these farms are extremely low compared to the potential allowed by the climate - including rainfall- and the physical properties of soil, i.e. they are characterized by a large “yield gap”, that constitutes a poverty trap. Large yield increase is thus possible in these farms, and there is a consensus that it could be a major leeway to help these households out of poverty and have their farms contributing to food security at every level from local to global. Conciliating this intensification of agriculture with its environmental and social sustainability, i.e. aiming at its multi-dimensional sustainability, is the object of the “agroecological intensification”, a variant of the “agroecological transition” specific to this case with currently high yield gaps. However, two classic (but often overlooked) trade-offs need to be addressed for achieving agroecological intensification. The first one is the trade-off between low food prices and decent income of farmers. Low food prices are obviously antagonist to the income of farmers and are needed by consumers, especially in societies with large urban populations. The second trade-off is between ecosystem services: increasing the provisioning service (i.e producing more food, fuel, fodder or fibre) is necessarily at the expense of most other ecosystem services. The most conventional target of agronomic research when focusing at cropping system or production system level is to develop agricultural technology that would help reduce

these trade-offs. From studies we carried out with family farms in Latin America, Asia, and Africa, we extract examples of integrated sustainability assessments applied to currently observable mixed crop livestock production systems, as well as – ex ante then - to possible scenarios for their intensification. These examples show that the two trade-offs above are extremely dependent on the context, meaning the biophysical and economic environment of farms. They also illustrate how it is not likely that technology alone will resolve the trade-offs and that agricultural policy instruments are strongly needed. From these examples we also suggest biophysical agronomy should more directly engage into policy assessment and design, through collaborations with social sciences. The conceptual framework of integrated sustainability assessment is particularly well adapted to this end, especially when mobilizing both formal simulation models and participatory approaches.

**Keywords:** Agroecology, agricultural intensification, research methods, sustainability.