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Sustainable intensification of rain-fed mixed farming systems in Senegal: From diagnosis to co-construction of ideotypes

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Abstract

In the eco-geographical zone of Eastern Senegal, as in sub-Saharan Africa as a whole, rain-fed agriculture is of paramount importance for the food security and livelihood of rural households, particularly in areas where access to irrigation is limited. However, rain-fed cropping systems in this region have been experiencing a downward trend in yields for several decades, attributable to a complex combination of biophysical and agronomic factors. In this study, we introduce cropping system Ideotyping, a new co-design method that was conceived and tested for the first time in Senegal, at Koussanar.

An agronomic diagnosis carried out in 2021 highlighted the low diversification of local farms and limited use of inputs. Spatial organisation is concentric: hut fields, close to dwellings, are dedicated to cereal crops (millet and maize), enriched with organic matter thanks to livestock, while bush fields, further away, are dedicated to groundnuts, whose residues are exported. Poor soil fertility, weed management and the absence of structured markets hamper production and diversification. To address these issues, an Ideotyping workshop was held from May 2022, bringing together 61 participants from the agricultural, research and development sectors.

In total, four agricultural ideotypes were co-constructed, integrating different innovation paths according to the socio-economic capacities of producers: the “Intensive” ideotype aims to optimise resources through organic fertilisation, crop rotation, residue management and better weed control. The “Extensive” ideotype seeks to reduce labour and inputs by stabling animals. The “Innovator” ideotype advocates crop diversification and integration of ecosystem service trees to improve economic resilience. Finally, the “Diversified” ideotype seeks to develop off-season market gardening, piloted by women.

Ideotyping is proving to be an effective tool for the co-design of farming systems adapted to local realities. The process highlighted the value of integrating local knowledge with scientific expertise to overcome structural obstacles and foster adaptability. Finally, ideotyping is a first step towards gradual support for change. It serves as a framework for producers to experiment and adjust their practices in line with local opportunities,

underlining the need for contextual innovation and helping to evolve design approaches to enable the transition to resilient agroecosystems in Africa.

Keywords: Ecological intensification, ideotyping, innovation and adaptation