Designing and disseminating conservation agriculture according to context features: theory and practices.

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Introduction
Conservation Agriculture (CA) dissemination efforts around the world brought out different trajectories in adoption (Derpich, 2007; Napier and Camboni, 1993; Novak, 1987). Focusing only on agronomic key factors in designing CA technologies failed in providing suitable solutions for their final adoption and extension, whatever the context (Erenstein 2003; Giller et al., 2006). This paper provides a theoretical framework to identify the main features of each agricultural context. Based on four case studies within different soil conservation projects funded by the French Development Agency including Cameroon, Madagascar, Mato grosso in Brazil and France. The paper finally defines a practical framework to organize soil conservation interventions, developing theoretical basics for priorities in CA designing or complementary efforts programming.

Institutional principles for designing and implementing conservation agriculture are proposed to complete basic agronomic principles adopted by international organizations on conservation agriculture. A detailed approach is proposed with key monitoring factors, especially for small-scale agriculture.

Material and methods
To facilitate the emergence of a theory of designing and implementing system’s innovation in conservation agriculture, a qualitative approach in innovation adoption has been used, mainly through processual approach and case studies. Theoretical basis of the methodology was borrowed from Mukumurana et al. (2006); Dawson (1997) and Eisenhardt (1989). Processual approach in qualitative research on an iterative methodology to derive context impact on CA adoption. It is based on different case studies, each one characterized by specific features. The first step of the study consisted in identifying key factors influencing CA designing and adoption among different CA extension programs. A conceptual framework based on the three identified factors (agronomic constraints, institutional constraints and property rights definition) was used to verify the impact of these factors on a wide sample of Countries from Derpich (2007) and, thereafter, developed on four relevant case studies in different agro-economic contexts. Case studies were then considered in each of the three contexts distinguished by FAC, adding progressively new constraints (figure 1). Case studies included Brazil and France for the first class of modern intensified agriculture, Madagascar for small-scale agriculture with market imperfections class (both with or without failure in property rights definition), and finally Northern Cameroon for small-scale marked by both market imperfections and property rights definition failure.

Results
The study confirms that complementarily to agronomic designing of CA, institutional adaptation is necessary and strongly based on certain key institutional factors among which market failures and property rights definition. Market imperfections include failure of providing certain facilities like access to credit, agricultural inputs, or information, which, in certain conditions of financial constraints of farm units, may influence farmers’ ability to invest in soil conservation (Erenstein 2003; Scoones & Toulmin, 1999). Property rights addresses different types of rights to soil (access and withdrawal, management, exclusion) and alienation and the way soil conservation investments may be captured by the investor (Schlager and Ostrom, 1992).

Conclusion
Five general principles necessary to tackle CA adoption constraints:
1) Taking into consideration that system innovation is by definition concerned with both technical and institutional dimension of innovative process;
2) Providing diversified CA technologies and flexibility of the agronomic alternatives based on the three key agronomic principles. These alternatives should release as many socio-economic constraints as possible, address the plot scale objectives and farm unit preferences on time and reduce the risk;
3) Providing a global support (both technical and market supply) to make it possible for the farm unit to switch to a more favorable environment for soil conservation investments;
4) Identifying appropriate scale for property rights comprehension and facilitating local collective actions to derive suitable rules and collective incentives for soil conservation investments;
5) In the presence of the three constraints levels, addressing both by progressing from collective to individual constraints and scales of intervention.

Selected references