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

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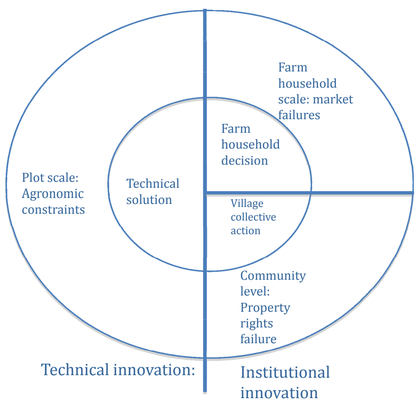
Introduction

Conservation Agriculture (CA) dissemination efforts around the world brought out different trajectories in adoption (Derpsch, 2007; Napier and Camboni, 1993; Nowak, 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., 2009). 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

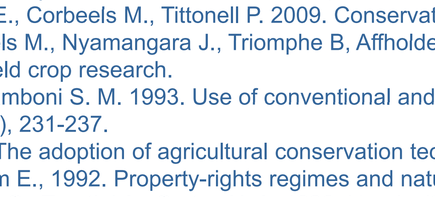
To facilitate the emergence of a theory of designing and implementing system's innovation in conservation agriculture, a qualitative approach in innovation adoption has been used, mainly through processual approach and case studies. Theoretical basis of the methodology was borrowed from Mukamurera et al. (2006), Dawson (1997) and Eisenhardt (1989). Processual approach in qualitative research relies 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, market imperfections and property rights definition failure) was used to verify the impact of these factors on a wide sample of Countries from Derpsch (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 FAO, 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.



Graphic 1: Conservation Agriculture, a two-component and three-scale innovation

1. Case study 1: Brazil, modern agriculture with little subsidies

Modern intensified agricultures of Northern Countries (Europe and America) and South America. Because they provide necessary incentives, they represent the most suitable environment for CA extension. In this context, efforts on CA designing consist of agronomic innovations according to soil conservation guidelines, since little institutional constraints (market imperfections and property rights failure) do exist (Seguy et al. 1996). The three key agronomic principles of CA (permanent soil cover, minimum soil disturbance and appropriate crop rotations), when properly implemented, are often sufficient to ensure emergence of efficient and thus profitable technologies, with economic efficiency being the key for acceptance (farm level decision).



Graphic 4: Northern Cameroon and Madagascar, with additional focus on collective action and market imperfections to adapt the context, in addition to agronomic issues on CA

3. Case study 3: Small scale agriculture with poorly defined property rights and several market imperfections (Cameroon and Madagascar)

3.1 Market failures or imperfections, which include access to credit, access to specific agricultural inputs, and access to information. In this specific context, technical innovations may fail to disseminate, due to their entry cost within financial constraints for farmers. It therefore often appears more profitable for agricultural producers to invest in other short run alternatives than in soil conservation. Projects in Madagascar dealing with this constraint therefore focused on low-input systems and/or included an institutional support to facilitate access to credits, inputs, and information. The appropriate intervention scale is the farm household scale.

3.2 Poorly defined property rights are mainly found in context were common property, free access rules on land and land products are practiced. Property rights definition failure is of crucial importance in soil conservation because it determines the way upcoming returns of conservation may be captured or divided by different stakeholders. In this case, CA designing and implementation must therefore include: i) technical support by designing CA systems taking into account agronomic and socio-economic constraints, ii) different types of institutional support, in relevance with market imperfections and iii) collective action which may enables emergence of efficient property rights.

Results

The study confirms that complementarily to agronomic designing of CA, institutional adaptation is necessary and should be 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).

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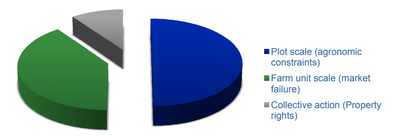
Graphic 2: Brazil, no collective action needed , but farm and plot management issues to adress



Graphic 3: France: farm unit rationale, related to agricultural subsidies affecting CA adoption

2. Case study 2: Modern agriculture with high level subsidies in agriculture

In addition to agronomic constraints, modern intensified agriculture, may also be subject to market failure, specifically due to different forms of agriculture subsidies. In this case, constraints in adoption are linked to the high level of subsidies, which create market failure between different technologic options or crop selection, and thus making certain technical alternatives less attractive, according to their relative profitability. In France, subsidies in fallows, and maize production for example makes it less attractive to invest in soil conservation based on mulching, since subsidies related to fallowing or maize production may be partly lost. These issues can be addressed including Conservation Agriculture impact on the environment as public good contribution, and thus providing consequent economic incitation for adopting CA. The appropriate intervention scale is the farm household scale, through appropriate public policies.

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 investment;

4)Identifying appropriate scale for property rights comprehension and facilitating local collective actions to derive suitable rules and collective incentives for soil conservation;

5)In the presence of the three constraints levels, addressing both by progressing from collective to individual constraints and scales of intervention.

Projet
Eau Sol Arbre

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