

gron. Sustain. Dev. 27 (2007) 101-110
DOI: 10.1051/agro:2006037

An improved methodology for integrated crop management systems

Jacques Lançon^a, Jacques Wery^b, Bruno Rapidel^{b, c}, Moussa Angokaye^d, Edward Gérardiaux^{b, e}, Christian Gaborel^{a, d}, Dramane Ballo^c and Blaise Fadegnon^e

^a Centre Coopération Internationale en Recherche Agronomique pour le Développement, avenue Agropolis, BP 5035, 34032 Montpellier Cedex, France

^b Unité Mixte de Recherche SYSTEM (Agro.M-CIRAD-INRA), bât. 27, 2 place Viala, 34060 Montpellier Cedex, France

^c Institut d'Économie, Rurale, BP 258, Bamako, Mali

^d Institut de Recherche Agronomique pour le Développement, Centre Nord, BP 22, Maroua, Cameroun

^e Institut National de Recherches Agricoles du Bénin, CRA Coton et Fibres, 01 BP 715, Cotonou, Bénin

(Accepted 18 December 2006; published online 23 March 2007)

Abstract - Designing innovative combinations of techniques to improve the sustainability of a cropping system is a major challenge in many regions of the world. The available techniques are often added together, and assessed for yield only, rather than combined in an integrated approach. We then developed here a methodology to design and assess a sustainable crop management system adapted to a specific set of constraints. Based on the prototyping approach, this methodology takes advantage of expert knowledge on cotton cropping techniques such as no-till, cover crop, varieties and growth regulator, with innovative potential but which are not yet properly simulated by actual crop models. It involves four successive steps: (1) identification of the local sets of constraints to crop production, and selection of relevant criteria for sustainability assessment, (2) elaboration of a cropping system prototype and its assessment indicators adapted to a target set of constraints, (3) on-station assessment and adjustment of the prototype, and (4) on-farm evaluation and adjustment of the prototype. We describe here the methodology, and how its first three steps were implemented to build and test a prototype for late-planted cotton with low input availability in West Africa. A new cropping system was designed, which included new genotypes, increased plant stand, lower rates of fertilisers and the use of herbicides and growth regulators. Fourteen indicators were selected to assess the economic, environmental and social performance of the prototype. The prototype was then tested in Mali, Cameroon, and Benin in 2002 and 2003. Our findings show that this prototype improved farmers' income by about +35% in 2002 and +20% in 2003, and increased labour productivity by about +5 to +20%. It achieved a satisfactory environmental performance, similar to the control, with positive mineral balances. The prototype still requires extra labour, skill and money to implement, and therefore requires further adjustment.

Key words: sustainable cotton management system / west Africa / prototyping / multi-criteria evaluation

Corresponding author: jacques.lancon@cirad.fr