Prototyping crop management systems for specific cotton growing conditions

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ABSTRACT

Cotton cultivation has expanded throughout West African savannahs following relatively standardised growing recommendations. Occurring institutional changes result in more diverse growing practices, less favourable zones under cropping and an overall diversification of cotton growing conditions. Current recommendations are then showing limitations and we try to develop a methodology for conceiving entire cropping systems that could be more adapted to most usual combinations of major constraints. This methodology is based upon expertise, knowledge or experience, whether detained by researchers, extension agents, farmers or users. It involves three successive steps or "rendezvous" devoted to: (i) The diagnosis of major constraints (identification and typology), (ii) The elaboration of the cropping prototype adapted to a chosen set of constraints and (iii) the evaluation and adaptation of the initial prototype after field testing. We present a case where cotton is grown with very limited water available, either because rains are scarce or because of late sowing. The prototypes formed by the experts have been tested in ten locations scattered between Benin, Cameroon and Mali. First results show that they should be specifically adjusted to local constraints before entering a second year of testing. Because it aims at answering a quite complex and very applied question, this approach provides an opportunity for mixing researchers and other actors of the sector and it also draws a good frame for planning research activities within a multidisciplinary group or researchers.

Introduction

Cotton cultivation has expanded throughout West African savannahs under relatively standardized cropping recommendations. Socio-economic and institutional changes induced an increased variability of cotton growing conditions as far as soil fertility, climate and other practices were concerned. As a result, recommendations tend now to fall out of their initial goodness of fit domain. On the basis of the prototyping approach designed by Vereijken (1997), we are developing a holistic and multidisciplinary approach for proceeding to these adjustments and for elaborating and testing new crop management systems (CMS) that are better suited to specific sets of major constraints and farmers objectives.

Experimental procedure

From a set of scattered techniques, we intend to propose a CMS, which takes into account interactions between techniques, cropping constraints and growers objectives.

The prototyping approach has been adapted by Lançon *et al.* (2002) from Vereijken (1997). It is based upon expertise, knowledge or experience, whether detained by scientists, extension agents, farmers or users. It involves three successive "rendezvous" (RV; Figure 1) devoted to (i) the diagnosis of major constraints (identification, classification and priority setting), (ii) the elaboration of the crop prototype adapted to a chosen set of constraints and (iii) the evaluation and adaptation of the initial prototype after field testing.

At the end of each experimentation cycle, scientists decide how to modify the initial prototypes (adjustment phase) to better match the target value.

Preliminary results

Step 1: we present a case where cotton is sown late in the season because of labor force limitation. As a consequence of delayed planting, the amount of natural N and water available for the crop are reduced, and constraints such as insect attacks or labor competition occur at different periods of the plant growth (Figure 2).

Step 2: in the 2nd RV of the approach (Figure 1), scientists propose a CMS prototype (Figure 3), which greatly differ from the standard one (Figure 4) including earlier genotype, increased plant stand, use of herbicides, lower rates of fertilizers, growth regulators and less insecticide spraying.

Step 3: in 2002-03, the first prototypes are compared with standard CMS checks in ten locations scattered between Benin, Cameroon and Mali. Evaluation indicators have been recorded in order to qualify their agronomic, economic and social performance.

Discussion

This approach helps to organize multidisciplinary research and coordinate disciplinary activities in a more demand driven way. It offers a framework where scientists and other sector stakeholders can join their efforts to solve complex questions. To improve the prototyping methodology, we investigated an approach based on conceptual and systemic description of the farmer's field in combination with models used to simulate the effects of techniques (sowing date and density for example).

References

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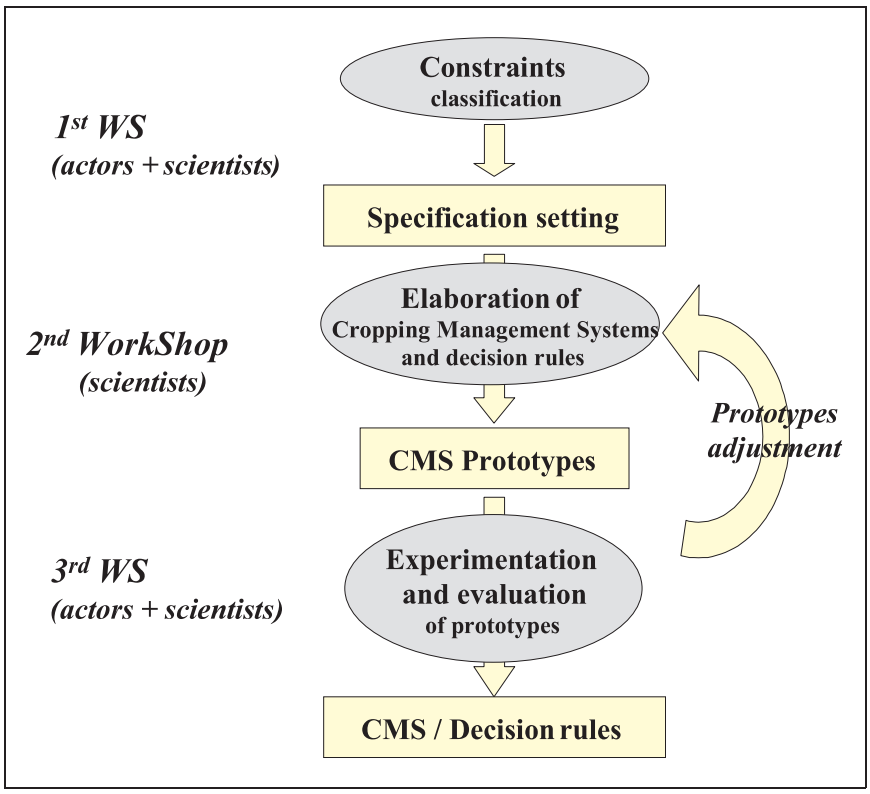

Figure 1.
Three steps for elaborating a CMS.

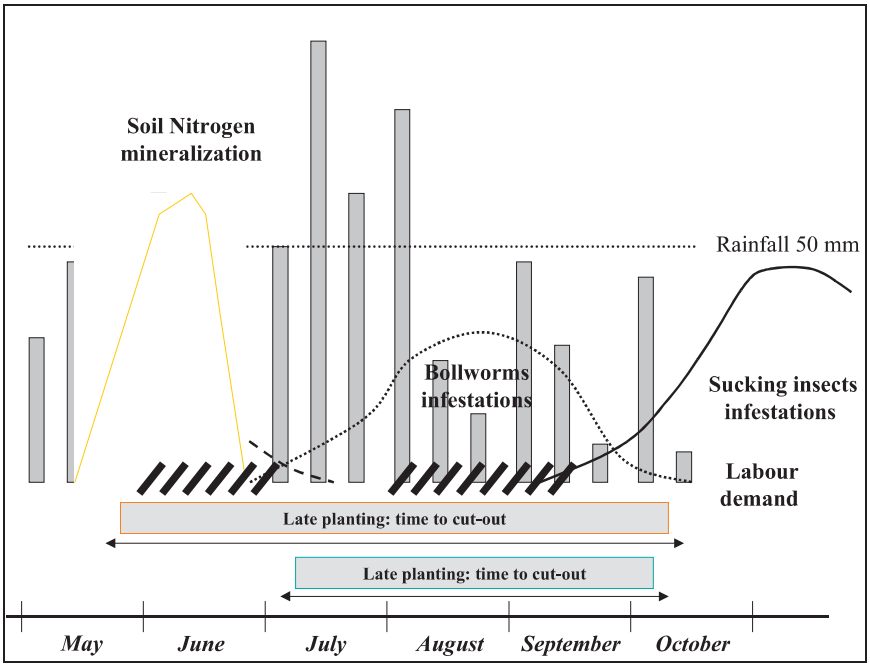

Figure 2.
Delayed planting results in new constraints to be managed by the cotton grower.

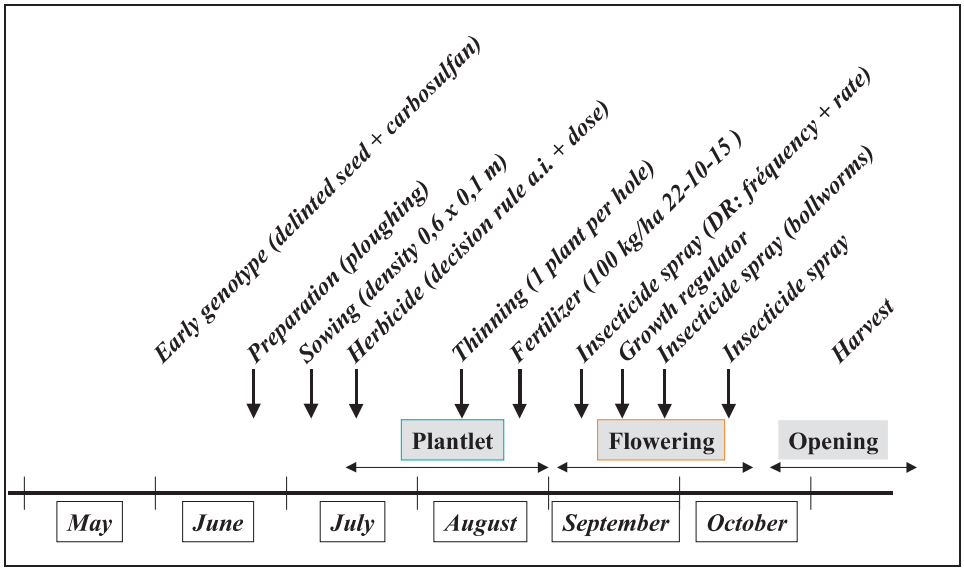

Figure 3.
An example of a CMS prototype for late planting.

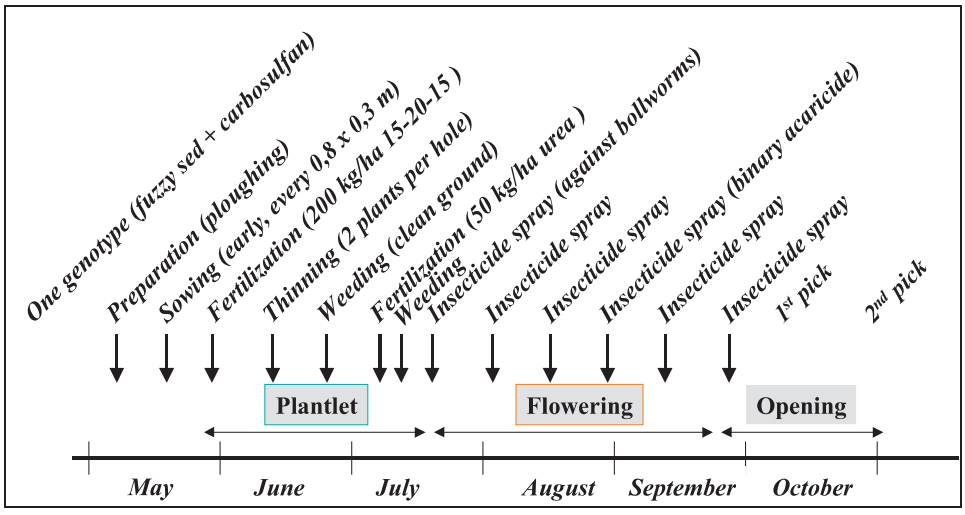

Figure 4.
An example of standard CMS recommendation.