Impact of the drought on the fodder self-sufficiency of organic and conventional highland dairy farms

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Key words: fodder self-sufficiency, drought, highland dairy farm

Abstract

Eight highland dairy farms in the French Massif Central (4 organic and 4 conventional) were surveyed from 2000 to 2005 to understand the forage system functioning and the specificities of organic farms. During this period two important droughts occurred, which highly affected the fodder self-sufficiency of the organic farms, having consequences on more than a year of production. The conventional farms were less affected than the organic ones, and the farmers developed varied strategies including a reduction of the LU and the use of more maize. To maintain the stability of the milk production, organic farms had to increase the reliance on external fodder resources. The lack of security forage stores can explain the sensitivity of these farms and their incapacity to recover a good level of self-sufficiency.

Introduction

The general context of global climate change and the more frequent occurrence of severe summer drought (high temperatures, low rainfall) in the last years (Itier & Seguin, 2007) bring the farm sensitivity to the climate accident up to date. When a drought occurs, with low rainfall at the highest herbage growth period, the grassland based systems are very impacted. The farmers have to manage at the same time the livestock pasture and the building-up of winter stores, with a lack of fodder.

The adaptation strategies of the farms will be different following their possibilities of fodder and concentrate purchase, growing forage crops or changing the grazing management (Lemaire & Pflimlin, 2007). It is therefore interesting to investigate witch strategies organic farmers have developed to adapt their systems to the drought. In this article we will not study their adaptability to a new climate, but we will valuate the sensitivity to the drought of organic highland dairy farms and study their capacity to recover a high level of fodder self-sufficiency by comparison with conventional farms.

Materials and methods

This study is based on 4 organic dairy farms (O1 to O4) and 4 conventional (C1 to C4), located in the highland granitic area of the French Massif Central (800 to 1000 m), on sandy-loam soils. Organic and conventional farms are neighbours, in similar soil and climate conditions, which allows us to compare their technical performances. These farms were surveyed since 2000 and for a long-term period, so their functioning is very well known. The technical and economical data were collected and analysed every year (Charroin *et al.*, 2005).

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The main culture is grassland (table 1). Cereals are cultivated on average 9% of the useable farm area for the livestock consumption. The milk production rests on a grazing period of 150 days without supplementation and a grass-based winter diet. The milk production per fodder area is lower in the organic farms (3400 L ha^{-1} *vs* 4800 L ha^{-1}), due to lower herbage yield in organic in relation with the fertilization levels (Bouscary, 2006 ; Capitaine *et al*., 2007). The conventional farms have a more intensive milk production than the organic ones, with + 1100 L per cow. The organic farms are more specialised with 67% *vs* 53% of dairy cows per livestock unit.

Tab. 1: Characteristics of the two groups of farms (average 2000-2005)

	Organic farms	Conventional farms
Useable farm area (ha)	53,0	59,2
% of grassland	88	87
% of cereals	12	7
Stocking rate (LU ha^{-1})	1,02	1,19
Dairy cow LU^{-1} (%)	67	53
Milk per cow (L)	5 100	6 300
Milk per fodder area (L/ha)	3 400	4 800

During the 2000 to 2005 period, two years were affected by an important drought : 2003 and 2005. The indicator we used to valuate the sensitivity to the drought is the fodder self-sufficiency: ratio between the fodder produced on the farm and the total fodder consumption of the year, in tonnes of dry matter. In the following figures, the fodder yield is assessed with the information given by the farmers (for example number of hay bales and hectares cut). The fodder consumption doesn't take in account the grass consumption during the grazing period. It only concerns the forage supplies and is calculated with the farming accounts: Fodder consumption = stock beginning + fodder harvested + fodder purchased – fodder sold – stock end.

Results and Discussion

The main objective of the farmers was to maintain the milk production even in years of drought. They have therefore chosen to use the fodders supplies and then to buy some forage (figure1) and also concentrates to feed their cows.

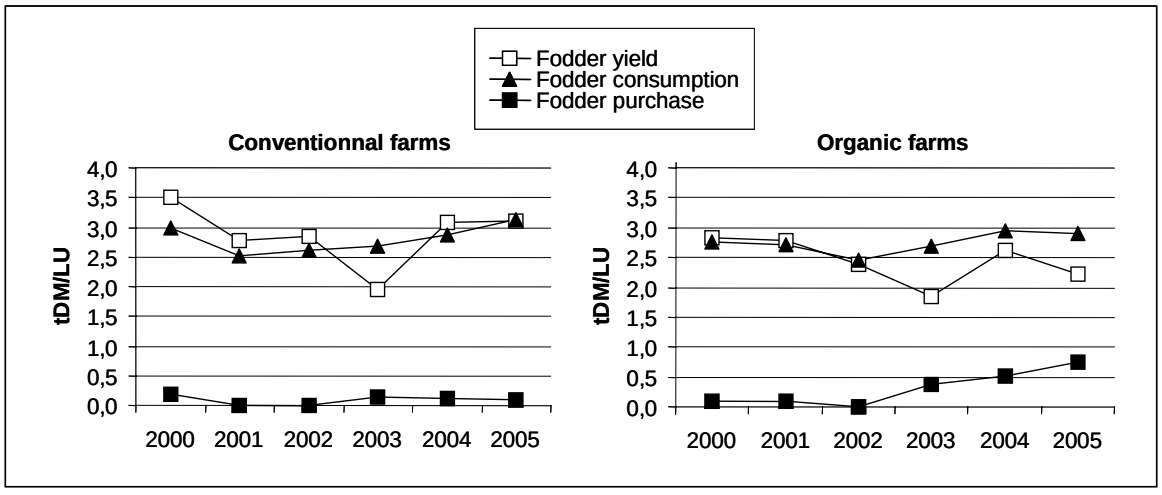

Figure 1: Evolution of fodder yield, consumption and purchase

From the year 2000 to 2002, the fodder purchase are nil or very low for the both systems. Only the conventional farms are able to maintain sufficient feed reserves, with a fodder yield surplus of 0,25 to 0,50 tDM LU^{-1} above fodder consumption. In 2003 the fodder yields fell down in both groups of farms (-1 tDM LU^{-1} and –36% in the conventional farms and -0,5 tDM LU^{-1} and –31% in the organic farms). The fodder consumption increased with the distribution of fodder during the grazing period. Only the organic farms had to purchase some fodder (0,5 tDM LU^{-1} and 14% of the consumption). In 2004, the levels of fodder yield were good again, but with still inferior to the needs in the organic farms. The second drought of 2005 did only affect the organic farms, with a new decrease of the fodder yield (-17%) and an increase of the fodder purchase (26% of the consumption).

In all farms the fodder self sufficiency (figure 2) was good before 2003 (almost always over 90%). The herd requirements were satisfied with the forage yields. In 2003 the conventional farms were affected with a loss of average 6% of self-sufficiency. Two farms were less affected (C3 and C4), but for C4 the fodder self-sufficiency has reduced in 2004: the fodder supplies were used in 2003 but not renewed in 2004, and the effect of the drought was deferred. The conventional farmers highly increased the concentrate use to maintain the milk production (+54% of concentrates in g L^{-1}). The organic farms were more sensitive with a decrease of the fodder self sufficiency from 7 to 41%, but they did not increase the use of concentrates during this first drought.

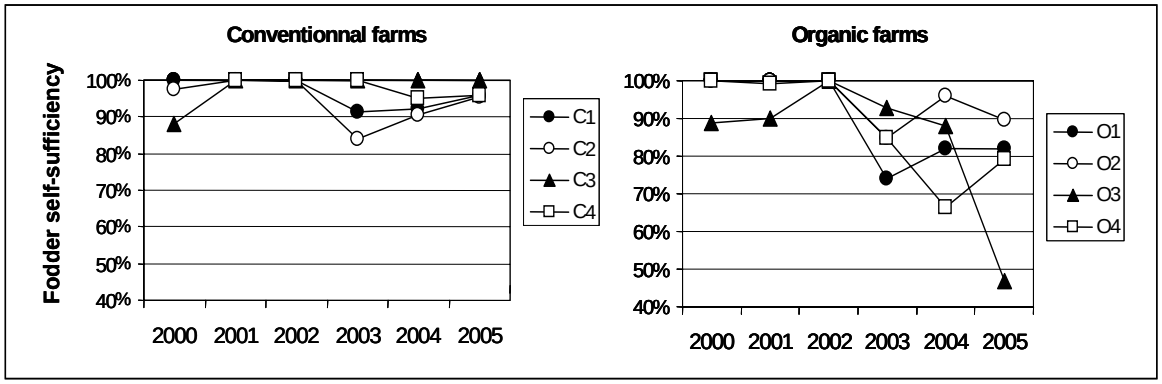

Figure 2: Evolution of the fodder self-sufficiency

In 2005, the conventional farms were not affected by the drought, and most of them had a better fodder self-sufficiency in 2005 than in 2004. Since 2003, they have developed various strategies to adapt their fodder need to the resources:

- decrease of the number of dairy cows, with an intensification of the milk production and use of more concentrates (C3 and C4)
- increase of the area of fodder maize, to increase the fodder stores (C2 and C3),
- stop of a fattening unit (heifers or beef steer) previously existing on the farm (C1 and C3),
- stop of fodder selling (C4).

For the organic farms, the situation of 2005 is very different. None of them was able to recover a good fodder self-sufficiency, in spite of a decrease of the number of cows since 2002 (average -13%). For two of them there is a new fall of this indicator. The situations are highly different between farms:

- O1 and O2 had a similar evolution, but not at the same level of self-sufficiency. O1 was more affected by the drought because of a lower security fodder stores and a higher level production (milk per cow, milk per fodder area).

- the O3 farm reaches the self-sufficiency only 1 year out of 5 (in 2002), and for the other years the average is 90%. This farm is in a period of decline, the farmer is near to the retirement and wants to reduce his workload.
- O4 suffered the most from the drought of 2003, with an effect on the years 2003 and 2004. In 2005, the fodder self-sufficiency has improved, thanks to the reduction of the fodder consumption and the milk per cow, but is still above 80%.

In organic as in conventional, we observed an intensification of the production level between 2000 and 2005 (+9% of milk per cow) with a greater use of concentrates (+20% of concentrates in g L^{-1}), even if this is not relevant in an economical point of view. The organic farms had less possibilities to reduce their fodder needs (they had no secondary unit) or to increase their fodder supplies (they did not grow maize), and the impact of the drought was therefore higher for them.

The analysis of the year 2006 will give us new indications on the ductility of the fodder self-sufficiency.

Conclusions

In highland situations, the organic farms have less possibilities to maintain their fodder self-sufficiency, in addition with their lower capacity to create fodder stocks. It leads them to a higher sensitivity to the climatic extremes. It is therefore relevant to study the strategic adaptations suitable for the organic farms to improve their self-sufficiency.

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