Abstract

Reducing the consumption of chemical inputs, fertilisers and pesticides has become a major issue in France in the wake of the *Grenelle de l’Environnement* Forum. The challenge facing the country is quite considerable as France is the leading European consumer of inputs in terms of volume and the third largest consumer worldwide (Aubertot *et al.*, 2005). In 2009, the legislator set a target of reducing consumption by 50% by 2018, a figure which was then adjusted per crop following the “EcoPhyto Report” (Butault *et al.*, 2010).

The effort required is all the greater as inputs are an integral part of the production processes due to their capacity to accelerate the development of crops while protecting them from biological risks (Just and Pope, 2003). The use of these products nevertheless raises questions concerning the sustainability of an approach relying on these factors of production. Inputs are indeed at the origin of environmental pollution affecting both the soil and the water table (Craven and Hoy, 2005). They are also at the root of health problems affecting both the people who handle them and consumers (Etienne and Gatignol, 2010).

Winegrowing represents 4% of useful farming land in France while accounting for 14% of spending on inputs, making it a prime sector for studies relating to our investigation. Our article focuses precisely on the study of winegrowers which consume excessive doses of inputs in relation to the recommendations made by input manufacturers and/or imposed through legislation. Highly dependent on inputs, these producers are among those most affected by the planned reduction targets.

This article adopts a suitable methodological approach in order to obtain precise measurements of overdosing practices. This enables us to understand the rationale of the farmers concerned and to draw lessons relating to the prospects for reduction. A relatively large number of works in the fields of agricultural economics and management have focussed on the determinants conditioning the use of pesticides (Smith and Goodwin, 1996; Enjolras *et al.*, 2012). In contrast, the body of literature focusing on the practice of overdosing is very small (Bürger *et al.*, 2012). There are numerous reasons for this, primarily linked to the problem of measuring overdosing practices. The process involves comparing the doses actually used by farmers with the recognised references. However, the data, when they exist, are limited to about ten farmers or refer to proxies (Sattler *et al.*, 2007).
For the very first time, we match four main databases so as to offer the possibility of understanding the complete processes at work in input overdosing by examining a significant number of farms:
- The cropping practices survey (PK) provides details of treatments applied in each vineyard identified, thereby taking part of the problem into account.
- To measure overdosing, we cross these data with recognised references such as the “e-phy” database, created and published by the Ministry of Agriculture and Food, which identifies the authorised doses per input.
- The data from the “Farm Accountancy Data Network” (FADN) provide some elements of the structural and financial parameters.
- The meteorological databases of Météo France provide the additional climatological elements.

We obtain a sample of 106 observations which are representative of French winegrowers and are highly detailed with regard to their structural and financial characteristics, their exposure to climatic hazards and their practices when using inputs. The different matches implemented make the newly created database a major boon for our work, strengthened by the fact that it is representative of French professional farms listed in the FADN.

This matching is then used to estimate an econometric model which explains overdosing through the structural and financial parameters identified in the literature: size of the farm, education of the farmer, performance and solvency of the farm, subscription of insurance policies, unfavourable climate as well as the presence of health protection means and the age of the spraying equipment.

The econometric model indicated that the level of dosage of the treatments depends neither on the level of diversification of the farms nor on the weight of the wage labour. The decisive factors of overdosing practised by the farmers are more related to short-term financial factors. Thus any increase in production per hectare in the business year and in the company’s cash flow one year is reflected by a greater probability that overdosing will be practised the following year. Conversely, the long-term indebtedness resulting from the company’s investment decisions play absolutely no role in overdosing practices. Yet, being insured does not explain overdosing to any significant extent.

Beyond the financial elements, we observe that the age of the spraying equipment is positively linked to the practice of overdosing inputs. The poor state of repair or obsolescence of the equipment is reflected by less precision in the treatment resulting in a practice of overdosing. Conversely, using health protection equipment has no impact on the doses applied. While temperature deviations have a considerable impact on the doses applied, neither rainfall deviations nor wind deviations figure significantly in our analysis. The analysis would appear to show that the practice of overdosing results more from short-term calculations linked to the climate and the financial situation of the farm than from long-term considerations linked to their structure.

These different methodological and empirical contributions demonstrate the advantage of creating databases which are as comprehensive as possible at farm level. In particular, it is important to include criteria as fundamental as the structure of the farm and its financial situation (based on the FADN model) and to combine these with more precise data concerning the farm at plot level (based on PK model, input use and weather data). Only by combining such data can we increase our knowledge of input overdosing practices. Exploring these different elements would help to improve our knowledge of overdosing practices with a view to ensuring the global reduction of input consumption in the field of agriculture.

Main references


