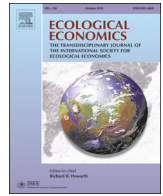




Contents lists available at ScienceDirect

Ecological Economics

journal homepage: www.elsevier.com/locate/ecocon

Analysis

Do European Agri-environment Measures Help Reduce Herbicide Use? Evidence From Viticulture in France[☆]Laure Kuhfuss^{a,b,*}, Julie Subervie^c^a University of St. Andrews, School of Geography and Sustainable Development, St Andrews, United Kingdom^b The James Hutton Institute, Social, Economic and Geographical Sciences Group, Dundee, United Kingdom^c French National Institute for Agricultural Research (INRA) and Center for Environmental Economics - Montpellier (CEE-M), Montpellier, France

ARTICLE INFO

Keywords:

Payments for environmental services
 Agri-environmental scheme
 Water quality
 Nonpoint source pollution
 Herbicides
 Pesticides
 Treatment effect

JEL classification:

Q15
 Q18
 Q25
 Q28
 Q53

ABSTRACT

Agri-environmental schemes (AES) are a central component of the European environmental policy, but few of these schemes have been carefully evaluated and doubts are often expressed about their effectiveness. We use original data collected from winegrowers who participated in an AES targeting non-point source pollution from herbicides in 2011 and 2012 in the South region of France. Using the variation in the implementation of the scheme across time and space and a matching approach, we show that the quantity of herbicides used by participants in the scheme in 2011 ranges from 38 to 53% below what they would have used without the scheme and this percentage is between 42 and 50% in 2012. Further, our results suggest that least demanding AES options are effective in avoiding pollution peaks when weed pressure is high, whereas more demanding AES options guarantee an overall reduction in herbicide use, even during relatively easy farming years in which less weed pressure is experienced.

1. Introduction

In the mid-1980s, increasing concern over the environmental impact of agriculture led to the introduction of agri-environmental schemes (AESs) in the European Union. AESs offer payments to farmers who voluntarily accept to adopt pro-environmental practices, and constitute a central component of the European Common Agricultural Policy (CAP).¹ However, doubts are often expressed about the effectiveness of these schemes. Indeed, because AESs are voluntary schemes whose requirements and per-hectare payments are generally uniform for all farmers, the potential for adverse selection is high (Fraser, 2009; Chabé-Ferret and Subervie, 2013). In the extreme case in which an AES

only attracts farmers who would have behaved the same way in the absence of payment, the additionality of the AES is nil.

Despite widespread interest and investment in AESs (Uthes and Matzdorf, 2013; Udagawa et al., 2014), few schemes have been thoroughly evaluated. Chabé-Ferret and Subervie (2013) demonstrate the additionality of French AESs that impose strong requirements, such as the AES subsidizing conversion to organic farming, with large effects. On the contrary, the authors find that for AESs with modest aims, such as the AES only requiring farmers to add one crop to the rotation, these additional effects are very limited. Pufahl and Weiss (2009) show that, overall, benefiting from AESs may significantly decrease the use of agrochemicals and increase grassland area in Germany. Arata and

[☆] Funding for this research was provided by the French Agency for Water and Aquatic Environments (1073/2012) (ONEMA) as part of the 2011 call for projects 'Changer les pratiques agricoles pour préserver les services écosystémiques' supporting the implementation of the French National Action plan Ecophyto 2018. Part of the data used in the study were made available by the French Department of Statistics of the Ministry of Agriculture (SSP) via the Secure Data Access Centre (CASD). This research would not have been possible without the full cooperation of the Regional Directorate for Food, Agriculture and Forestry (DRAAF) and the AES site operators from the Languedoc-Roussillon region. We are particularly grateful to M. Schill, A. Boscher, M. Comat, J. Druais-Levasseur, C. Garrel, L. Gaillard, M.D. Gras, P.A. Guérin, L.E. Lecoq, O. Liet, M. Lobre, S. Maret and J. Oustric. We want to thank Marc Voltz (INRA) for his invaluable comments and suggestions. This paper was partly funded by the Rural & Environment Science & Analytical Services Division of the Scottish Government. We also thank seminar participants at the French National Institute for Agricultural Research, Toulouse School of Economics, the School of Geography and Sustainable Development of the University of St. Andrews and colleagues from the SEGs group who reviewed the paper at the James Hutton Institute. All remaining errors are obviously our own.

* Corresponding author at: University of St Andrews, School of Geography and Sustainable Development, St Andrews, United Kingdom.

E-mail addresses: lk38@st-andrews.ac.uk (L. Kuhfuss), subervie@supagro.inra.fr (J. Subervie).

¹ The European Agricultural Fund for Rural Development (EAFRD) has been allocated a budget of EUR 96.3 billion for the period 2007–2013 (20% of the funds dedicated to the CAP), of which EUR 1.8 billion has been allocated to French AESs. Figures are available on the site of the French Ministry of Agriculture.

Skokoi (2016) consider as well the overall impact of European AESs on a range of indicators, such as the per hectare expenditures on fertilizers and crop protection, the share of grassland, and the number of crops grown on the farm. They find that, overall, AESs affect more heavily the production choices of participants whose farm income rely on agri-environmental payments by > 5%. Despite the increasing literature on the effectiveness of AESs, to the best of our knowledge there are no studies that evaluate the effectiveness of AESs specifically targeting the use of pesticides. This article aims at filling this gap.

Contamination by pesticides from agriculture is a source of water quality degradation in several countries in the European Union according to Eurostat.² This occurs when pesticides used in fields are transported by runoff and deposited into lakes, rivers, wetlands, coastal waters, and underground sources of drinking water. These pollutants are of increasing concern because of their potential impacts on the environment, wildlife, and human health. During the 2007–2014 CAP programming period, AESs have been used in France to fulfill the objectives of the European Union water framework directive. Therefore, AESs have been implemented to reduce contamination by pesticides in catchment areas where water quality improvement has been identified as a priority from 2007. Farmers participating in these AESs commit to reduce their use of pesticides for five years in exchange for a predefined annual payment. These schemes are routinely monitored and evaluated on the basis of participation rates, spatial coverage and budget spending. However, they have received little attention with respect to their actual impact on agricultural practices. To answer this question, we focus on one emblematic case study: herbicide use in South of France vineyards.

Of all cropping systems in France, wine growing is the one that uses the pesticides the most, with an average application of 16 phytosanitary treatments per hectare in 2010 (Agreste, 2012). Among the pesticides used by winegrowers, herbicides are the most commonly detected in the ground and surface waters in South of France. Given the extent of winegrowing and its reliance on herbicides,³ incentivizing winegrowers to reduce their use of herbicides is a major challenge. This challenge has been addressed by the implementation of an AES called the “territorialized AES” that includes several options for herbicide use reduction. The objective of the present study is to estimate the additional effect of these options on the quantity of herbicides used by winegrowers who entered the scheme in the first four years of its implementation (2010–2013) in Languedoc-Roussillon, a region in Southern France.

The main concern when evaluating the impact of an AES arises from the fact that participants in the AES self-select into the scheme given its voluntary nature. To deal with this issue, we use the variation in the administrative eligibility of farmers to the scheme across time and space, an identification strategy commonly used in the microeconomic impact analysis literature (see for example Bruhn, 2013; Aker, 2010; Jensen, 2007; Galiani et al., 2005). In practice, we compare the use of herbicides of participants in the AES to that of non-participants displaying identical observable characteristics and who became participants once administratively eligible. We use a matching approach to estimate the average treatment effect on the treated (ATT), i.e. the impact of participating into the AES in 2011 and 2012. Specifically, we estimate the ATT for a given year through a comparison of the average use of herbicides of participants located on already-approved catchment areas with the average use of herbicides of, otherwise similar, future-participants located on catchments where the AES was not yet implemented. For this, we use data on herbicide use collected by local catchment operators from 153 winegrowers, who represent approximately 76% of the total area under contract in the region in 2013. Our matching procedure is based on a large set of pre-treatment individual-

specific characteristics provided by the French Agricultural Census.

We first evaluate the overall impact of all AES options targeting herbicide use in the region. We find that the quantity of herbicides used by participants in the scheme in 2011 ranges from 38 to 53% below what they would have used without the scheme, and from 42 to 50% in 2012. All our results are robust to various matching estimators. We moreover perform a sensitivity test that provides support to our findings. Our results are also robust to the exclusion of participants in the most stringent measure (the organic farming option) which could have been suspected of driving the overall results. Our findings also hold when focusing on a sub-region of the study area, therefore accounting for spatial heterogeneity. We moreover evaluate the impact associated with the least stringent measure, which is also the most popular (the “zero herbicide between the rows” option). Our results show that the impact of this option alone was statistically significant in 2011 but not in 2012. This suggests that least demanding AES options are effective in avoiding pollution peaks when weed pressure is high (as in 2011), whereas more demanding AES options guarantee an overall reduction in herbicide use even during relatively easy farming years in which less weed pressure is experienced (as in 2012). The remainder of this article is organized as follows. We first present the scheme under study and the institutional rules governing the timing of its implementation in Section 2. We present the data used in Section 3, then the identification strategy in Section 4. Thereafter we present and discuss the results of the overall scheme evaluation and of one specific option - the so-called “zero herbicides between the vine rows” in Section 5. This section also provides a sensitivity analysis and various robustness checks. Section 6 concludes.

2. AES Targeting Herbicide Use

Languedoc-Roussillon contains more vineyards than any other region in France, covering some 236,500 ha and constituting 30% of the nation's vineyards. Two out of every three farms in the region grow wine grapes (Agreste, 2011). The AES options offered to winegrowers in this region between 2010 and 2013 focused exclusively on the reduction of herbicides use. These measures target the most environmentally-sensitive catchments and are implemented by local operators in 29 catchments in the Languedoc-Roussillon region, most of which exhibit levels of herbicide residues exceeding the regulatory limit. Fig. 1 shows the areas in the Languedoc-Roussillon region where water quality improvement has been identified as a priority by public authorities and therefore where farmers were offered to participate in the AES.

This AES relies on 5-year contracts, to which farmers apply voluntarily. The payments offered to participants are the same for all participants and are calculated with the view to compensate any income forgone and additional costs associated with the contracted farming practices. In practice, the income foregone calculation is based on a national price scale and accounts for an estimate of the increased workforce and equipment hire for alternative practices to chemical weeding, taking into account reduced spending on herbicides. The payments also cover the costs of annual on-farm follow-up visits by a certified technician. Farmers are able to choose one or more of four possible AES options: convert to organic wine growing for 350 € per hectare, eliminate all herbicide use for 243 € per hectare, reduce herbicides use by 40% of the regional standard for 141 € per hectare, and eliminate herbicide use between vine rows only for 165 € per hectare.

It is worth mentioning that AES implementation by local operators in priority areas required many administrative procedures that ended up delaying the availability of the scheme to farmers in some cases. As a first requirement, a hydro-geological diagnostic had to be established for each priority catchment in order to assess its vulnerability and accurately define the limits of the area targeted by the AES. An official decree then had to approve this delimitation. Next, a local operator was nominated to design an agri-environmental project based on a second diagnostic. This second diagnostic aimed to identify the current farming

² Figures are available on the site Eurostat provided by the European Commission.

³ Growing wine grapes indeed requires controlling competitive weeds in order to ensure adequate levels of production.

Download English Version:

<https://daneshyari.com/en/article/7344156>

Download Persian Version:

<https://daneshyari.com/article/7344156>

[Daneshyari.com](https://daneshyari.com)