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JEL codes: Q18; Q28

NUDGES, SOCIAL NORMS AND PERMANENCE IN AGRI-ENVIRONMENTAL SCHEMES

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Abstract

The permanence of land management practices adopted under Agri-environmental schemes (AES) is often questioned. This paper investigates the drivers of farmers' decision to maintain or not the adopted practices beyond the duration of the contract, and especially the effect of social norms and framing on this decision. Our results, based on the stated intentions of 395 farmers, show that pecuniary but also non-pecuniary motivations drive farmers' decision, which is significantly influenced by information about the social norm. These results lead to recommendations for "nudging" farmers, by conveying information to them on other farmers' decisions concerning pro-environmental land management practices.

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1. Introduction

Agri-environmental schemes (AES) have been used in the EU, USA and Australia to address a wide range of environmental issues, from the conservation of biodiversity to water quality enhancement and landscape protection. These schemes are based on individual contracts signed with farmers who volunteer to implement pro-environmental management practices in return for an annual payment. This payment is calculated so as to compensate average compliance costs and foregone farming revenue due to the adoption of new management practices. Over the 2007-2013 financial period, total payments made by the European Union for agri-environmental schemes (AES)[1] amounted to 22.7 billion euros, with an approximately-equivalent amount of spending by Member states.

[1] Financial plan of the European Agricultural Fund for Rural Development (EARDF) axis 2 measure 214 (agri-environment).

All AES contracts have an end point, with contracts lasting from 5 years in French "territorialised agri-environmental measures", to 10 years in the UK Higher Level Stewardship scheme, 15 years for some of the contracts of the US Conservation Reserve Program, and 20 years in the now-defunct Environmentally Sensitive Areas scheme in the UK. At the end of the contract, farmers are free of any contracted commitment concerning their land management choices, and can therefore revert to environmentally-damaging practices even if this destroys the accumulated natural capital resulting from participation (Hanley *et al.* 1999). This issue has been referred to as the "end of the contract problem" (Whitby 2000), and is an important criticism to be made of AES and more generally of Payments for Environmental Services (PES) schemes (Swart 2003), especially when budget constraints are tight and under public scrutiny. Policy makers' interest in investing in AES would increase if the land management practices induced by the contract were permanently adopted. This is particularly problematic when these new practices are less profitable than less environmentally-beneficial alternatives. However, motivations other than profit can also be expected to influence farmers' choice to contribute to the provision of environmental services. Indeed a growing literature demonstrates that information about one's own behaviour relative to that of others (an indicator of a 'social norm') can influence individual behaviours (Croson and Treich 2014). Moreover, Thaler and Sunstein (2008) show that individual choices are influenced not only by information about what others in the same social group do, but also by the way this information is formulated and provided, the so-called "framing" of information. They introduce the concept of "nudge" as the use of a specific policy design, type of information and framing of information which influences people's decisions without changing the structure of economic incentives or restricting their available options.

A first objective of this work is therefore to investigate the drivers of farmers' land management intentions at the end of AES contracts. Will farmers keep providing enhanced environmental services even in the absence of any payment; or does a short term contract necessarily lead to a short term provision of services? This paper will review existing studies on this question and will focus more specifically on behavioural drivers which may induce a continuation of pro-environmental actions after the end of the contract, even when the new practices are less profitable. The second objective of this paper is then to investigate the effect of two nudges: *(i)* whether providing information about what other farmers do or intend to do, *i.e.* giving them an idea of what the prevailing "social norm" might be, could improve participants' willingness to maintain the land management practices they adopted under the AES after the contract ends, and *(ii)* whether the framing of this information matters to their stated intentions.

The behavioural motives underlying the decision to maintain pro-environmental practices beyond the duration of the contract and the effect of the two nudges are tested through a national survey conducted in France in 2013. We sampled 395 French farmers engaged in agri-environmental contracts. Our results show that information about what other farmers intend to do can greatly influence a farmer's stated decision whether to maintain or not the practices adopted during the AES after the contract ends in the absence of payments. However, changes in the framing of this information have no significant effect on their stated intentions.

The remainder of this paper is organised as follows. We provide first a literature review on the permanence of agri-environmental practices in section 2, and evidence of the role of social norms and framing in individual pro-environmental behaviour in section 3. We then describe in a fourth

section the method and data used. Finally we present and discuss the estimated effect of social norm information and its framing on farmers' stated intentions to continue with environmentally-friendly land management practices even in the absence of an agri-environmental contract.

2. Permanence of agri-environmental practices after the end of the agri-environmental contract

Farmers engaging in AES can provide environmental services in two ways: through land retirement or by modifying their resource use or technologies on farmed land, that is, by "land sparing" or "land sharing" (Lipper *et al.* 2009, Balmford 2012). Land sparing options, such as wetland or grassland creation, require setting the farm plot aside from production. Therefore, it usually creates significant and long-lasting opportunity costs for participants in terms of the net value of production foregone. Other options, pertaining more to the "land sharing" approach, offer payments to farmers who agree to reduce the intensity of agricultural production, such as a limitation in stocking rates or a reduction of chemical pesticide use. Typically, these changes also come at a cost in terms of profits foregone (Armsworth *et al.*, 2012). Assuming that farmers make their decisions based on relative profits of land management options, it is logical to expect that farmers will not maintain more costly practices without compensatory payments. This can be reinforced by a tendency to refuse to provide for free an environmental service for which they were paid during the contract period. As Engel *et al.* (2008) argue, "there cannot be any expectation of permanence in the absence of payments" as the logic of AES (as well as PES) turns public good supply into a marketable service.

However, some studies show that land management changes induced by AES become permanent. Roberts and Lubowski (2007) show that a large share (42%) of farmlands engaged in the Conservation Reserve Program (CRP) would not have been returned to crops if the program had ended in 1997. Other evaluations (ECA 2011) also find that there is only a partial reversal to previous management practices at the end of contracts.

There are several explanations to this observation. The first one is that farmers enrolling into agri-environmental schemes would have changed their practices even without any financial incentives for enrolment. In such case, AES contracts provide windfall gains to farmers without environmental additionality (Chabé-Ferret and Subervie 2013). Therefore, farmers have no reason to change their practices after the end of the contract. But changes can also be permanent under AESs that have induced a true improvement in practices. Since landowners base their choices on their beliefs about the relative pay-offs of alternative land management options they face, enrolling into an agri-environmental contract offers them with the opportunity to test the true costs and constraints associated with the adoption of new practices. For example, the transition towards low input practices may require short term additional costs, such as investments in mechanical weeding equipment to replace chemical weeding, but may reveal itself as being less costly in the longer run than conventional farming methods. The AES payment supports farmers during this investment period, along with the material and learning investments to acquire new skills and better knowledge of the risks. Assuming that these risks can be reduced with time and experience, and that the new practices are privately profitable after the fixed starting costs are overcome, the switch to low-input practices can become permanent. The payments provided by agri-environmental schemes represent thus an opportunity to learn more about such pay-offs and to change initial beliefs, to

break away from existing production "habits" and form new habits, potentially motivating the supply of environmental services even in the absence of AES payments (Hiedanpää and Bromley 2014).

Beyond financial motives, there are other drivers of changes. Motivations can also be non-pecuniary but selfish (reputation effects for example) or purely altruistic (Glaeser 2014). As we will discuss in the next section, social norms can "super-charge" these non-pecuniary motivations and thus increase the likelihood that farmers maintain pro-environmental practices despite the end of the financial incentives.

3. Social norms, framing and pro-environmental behaviour

Farmers' decisions whether to maintain pro-environmental practices after the end of an AES contract can be considered as a public good supply problem. Farmers who decide to maintain pro-environmental practices will bear private costs whereas environmental improvements will benefit other members of the community. A large amount of research effort has been focused on understanding why people contribute to public goods, when the main game theoretic prediction would be not to contribute at all. One interpretation is that a large proportion of people are conditional co-operators: people tend to contribute more when other people contribute too. In a seminal article, Fischbacher *et al.* (2001) demonstrate, using modified public good games where players can choose their contribution depending on others' contribution, that about 50% of people are conditional co-operators. In other experiments, people are even willing to pay to get information about others' contribution in a public good game in order to decide on their voluntary contribution (Kurzban and DeScioli, 2007).

These experimental results have been confirmed in the field. Frey and Meier (2004) carried out an experiment at the University of Zurich where students were all asked to contribute to a charity fund but were given different information on other students' contribution rates. This information had a significant effect: more students contributed when they had the information that 64 percent of the other students contributed than when they had the information that only 46 percent contributed. The choice to contribute or not was also significantly correlated with students' expectations of others' behaviour. This approach has also been used to analyse the phenomenon of tax evasion. Paying taxes can be considered irrational if the probability of detection and the penalty if caught are analysed. Tax evasion should therefore normally be much higher than what it is in most countries. Tax payers seem to be largely influenced in their tax morale by the perception that they have of the behaviour of others and can therefore also be considered as conditional co-operators (Frey and Torgler 2007). There are a number of interpretations to explain conditional cooperation: people may value conforming to a social norm, have some preference for fairness such as reciprocity, or could consider that contributions of others are an indicator of the quality/importance of the public good (Frey and Meier 2004). However, Bohnet and Zeckhauser (2004) show in an economic experiment that the main engine of conditional coordination may rather be a social norm.

Social norms are traditionally considered to be divided into two categories: descriptive norms and injunctive norms (Cialdini *et al.* 1990). A descriptive norm describes behaviour which is in some sense "typical" within a group. People tend to comply with descriptive norms because they reveal useful information about the appropriate behaviour in particular situations: "if others do that it must

be a good thing to do". An injunctive norm refers to what constitutes morally approved and disapproved conduct, that is to say what ought to be done. Adherence to injunctive norms is linked to other people's ability to administer social punishment or rewards (Thøgersen, 2006). Bicchieri (2006) considers that people are influenced by their subjective beliefs about what the others do and think, rather than by the actual behaviour and opinions of others. These beliefs may change when new information is received. Providing social information about others' behaviour may therefore modify subjective estimation of norms and thus have a positive impact on the adoption of pro-social behaviour.

In the context of a PES scheme subsidising farmers for reforestation in China, Chen *et al.* (2009) show, through a choice experiment survey, that individual intentions to re-enrol can be positively influenced by the information that neighbours also intend to re-enrol. Farmers also stated that they would require lower subsidies to carry out environment protection activities if a large proportion of farmers re-enrol than if few farmers would do so (Chen *et al.* 2009). In a rather different context, Czajkowski et al (2014) find that adherence to a social norm co-determines the desire to engage in higher levels of home recycling for a large group of their sample of Polish households. The positive effect of social information on pro-social behaviour has also been demonstrated in other contexts mainly in the social psychology literature: dictator games in the laboratory (Bicchieri and Xiao 2009), charity giving (Croson *et al.* 2009), littering (Cialdini *et al.* 1990), energy consumption (Schultz *et al.* 2007) and student alcohol consumption (Neighbors *et al.* 2004).

However, many examples from the literature also show that information framing can significantly influence individual choices. Framing effects have been studied in psychology, in medical and clinical decision making, consumers' choices and bargaining behaviours (Levin *et al.* 1998). Framing can be defined as "*presenting individuals with logically equivalent options in semantically different ways*" (Krichnamurthy *et al.* 2001, p.383). One particular type of framing is of interest when a social norm is being presented to respondents, namely attribute framing (Levin *et al.* 1998). Attribute framing is a case of valence framing where one of the attributes of the choice is presented either positively or negatively. It is usually found that a positive attribute framing triggers a positive reaction. For example, experiments (Levin *et al.* 1988) show that respondents are more likely to wish for surgery if they are told that the technique used has a 50 percent success rate than if they are told that it has a 50 percent failure rate. The authors explain this effect by the way information is processed: positive framing creates positive associations in memory which leads to a more favourable judgment of the event/object. In order to test this framing effect on farmers' intention, but also to avoid weakening the social norm effect of information provided, we provided respondents with either negative or positive framings of the intentions of other farmers.

4. *Method and Data*

The survey was targeted at farmers eligible for the main French agri-environmental scheme, called *Mesures Agro-Environnementales territorialisées*, or MAEt. The MAEt scheme was introduced in France under the second pillar of the Common Agricultural Policy for the 2007 to 2013 period, to target agri-environmental efforts on environmentally vulnerable areas, *i.e.* the most sensitive areas for biodiversity conservation and water quality issues. Concerning water quality, the scheme is open to farmers located in the most contaminated drinking water catchment areas and/or in priority

watersheds, where the risk of failing to achieve Good Ecological Status for water bodies set by the European Water Framework Directive is the highest. Concerning biodiversity, the scheme is intended to attain the conservation objectives of the Natura 2000 network sites, defined by the Habitat and Birds European Directives. The MAEt scheme provides payments both for a change in farmers' practices or to maintain farming practices or activities that benefit the environment but are at risk of disappearing. In this scheme, farmers can adopt a wide range of land management options such as the reduction of input use (pesticides or fertilizers), the conversion of croplands to grasslands or the restoration of hedgerows. They get a compensation payment which is calculated so as to cover the average additional costs or/and income foregone associated with the chosen land management options.

4.1. Survey and treatments

We used an online survey[2] to question farmers participating in the MAEt scheme about their land management intentions after the end of their contract. This survey was initially set up to evaluate the MAEt scheme over the 2007-2013 CAP programming period. One section of the questionnaire focusses on land use and land management changes that farmers made when joining the MAEt scheme and on their intention to maintain these changes after the end of the contract, in the event that it is not renewed. In order to test the effect of the two nudges "social norm" and "framing", we constructed 3 treatment groups to which the question on whether farmers intended to maintain their land management practices was put differently (Table 1):

Table 1: Treatments

	Treatment	Framing of the question	Number of respondents
Control group	T_0: no information	After your period of agreement ends, do you plan to maintain these changes without renewal of the contract?	128
Group 1	T_1: positively framed information	In a previous survey, **80%** of the respondents stated that they would maintain the new practices they had adopted, even without renewal of their contract. After your period of agreement ends, do you plan to maintain these changes without renewal of the contract?	126
Group 2	T_2: negatively framed information	In a previous survey, **20%** of the respondents stated they would **not** maintain the new practices they had adopted without renewal of their contract. After your period of agreement ends, do you plan to maintain these changes without renewal of the contract?	141

[2] Using the software Limesurvey®.

The software randomly selected respondents into one of the three treatments. Respondents from groups 1 and 2 were both given the same information, which states the results obtained from a pilot survey[3] that was implemented in the Languedoc-Roussillon region before the implementation of the national survey. However the framing of the information differed: it was positively framed for respondents from group 1 and negatively framed for respondents from group 2.

Considering the literature on conditional cooperation and on social norms, we expect that the information on rates of continuation of pro-environmental practices provided to group 1 and 2 will have a positive impact on farmers' intentions to also continue with their newly adopted practices after their contract ends. However, we expect that the negative framing presented to group 2 might reduce the impact of this positive social information.

4.2. Econometric specification

As the respondents were randomly assigned to the 3 groups, the treatment effects of information on the social norm and the framing of this information are causal, and can directly be identified. In order to distinguish the two effects, we proceed in two steps. First, we introduce the dummy variable *T*, which takes the value 1 if the respondent received information on the social norm (group 1 and 2), and 0 otherwise (control group). The effect of information on the probability that farmers decide to continue pro-environmental land management after the end of the contract (*y = 1*) is obtained through a maximum likelihood estimation of the α parameter in:

$$P(y = 1) = F(\alpha T) \quad (1)$$

where *F(.)* is the cumulative distribution function of the logistic distribution.

Next, we distinguish two framing effects: T_1 and T_2. T_1 is a dummy variable that takes the value 1 if the respondent received positively framed information on others' behaviour (group 1), and 0 otherwise (control group or group 2). T_2 is a second dummy variable that takes the value 1 if the respondent received negatively framed information (group 2), and 0 otherwise (control group or group 1). We run the following econometric specification in order to identify the effect of framing:

$$P(y = 1) = F(\beta_1 T_1 + \beta_2 T_2) \quad (2)$$

where *F(.)* is again the cumulative distribution function of the logistic distribution.

Finally, so as to control for the effects of individual characteristics *X* on farmers' decisions to maintain their newly adopted practices, we also introduce these characteristics as covariates in the regression:

$$P(y = 1) = F(\alpha T + X'\gamma) \quad (3)$$

Vector *X* includes variables describing general farm characteristics: utilisable agricultural area (UAA) in hectares, the type of AES currently subscribed to, and farming activities. Also included are variables aimed at signalling potential low additionality of farmer's participation, *i.e.* whether the respondent states that he already complied with the scheme's requirement before joining, and to

[3] Based on the responses of 91 farmers participating to the MAEt scheme.

what extent he had to change his farming practices to comply with these requirements (low changes, medium changes or major changes). Finally, we introduce proxy variables to capture different types of motivations for continuing MAEt practices after the end of the contract (Glaeser 2014): pecuniary, non-pecuniary selfish or non-pecuniary altruistic motivations. Farmers who could earn a higher gross margin, who could sell their products at a higher price and faced no technical difficulties with the AES requirements, might have pecuniary motives to maintain the adopted practices. Farmers who, during the AES, experienced a better life quality and/or an acknowledgment that their farming activity contributes to the protection of the environment and to land management might have non-pecuniary selfish motives to do so. Finally, farmers who state that protecting the environment through their participation in the AES is a source of satisfaction by itself are likely to have purely altruistic motivations.

4.3. Sample

525 farmers participating in the MAEt scheme answered the national online survey, from which 83 stated that their joining the MAEt scheme had not changed their practices and 442 who, on the contrary, have adopted new practices. These 442 farmers were asked whether they intend to continue with these newly adopted practices when the payments cease, and 395 answered the question. Hence, the answer rate for the question concerning the permanence of changes is almost 90% with only 47 farmers choosing not to address this question[4]. The sample used for analysis is therefore constituted of these 395 farmers randomly distributed among the 3 groups, with 128 respondents in the control group, 126 in group 1 and 141 in group 2.

As described in Table 2, the sample includes farmers engaged in AES options aiming at a reduction in fertilizers use (variable name *AES Fertilizers*), at a reduction in phytosanitary products use (*AES Phytosanitary*), at management of land cover, pastures and moors (*AES land cover*, introducing for example constraints on mowing periods to favour biodiversity conservation), at the creation or upkeep of grassland (*AES grassland*), at the management of specific structural landscape features, like hedgerows or ditches (*AES linear*) or finally AES options for conversion to organic farming (*AES organic*). Other minor options, concerning the management of specific environments (for example reed beds or salt marshes) or landscape are also represented in the sample, and have been grouped together under the "*AES other*" variable. The most common farming activity in the sample is field crops (41.3% of the sampled farmers), followed by mixed farming and breeding (31.7%), and livestock farming (20.3%).

There was a mixed feedback from respondents on their experience with the MAEt scheme. On the one hand, only 20% of the farmers questioned were able to obtain a better value for their products under the AES contract, and 42% increased their total gross margin. Almost half of them have experienced difficulties in relation with the technical constraints imposed by the AES contract. On the other hand, a wide majority of respondents (89%) state that their participation in the scheme provided them with greater social acknowledgement on their contribution to the protection of

[4] There are no significant differences in the answer rates of the 3 groups.

natural resources and to local land management, and they almost unanimously (96%) state that their participation provided them with the individual satisfaction of participating in the protection of the environment. Almost half of the sampled participants have experienced a better quality of life during their participation. Some 68% of the farmers of our sample acknowledged that they entered the AES partly because their practices were already in line with AES requirements. Nevertheless all of them stated that they have adapted their practices after their enrolment in the AES. 46 % of the interviewed farmers stated that they had to implement "low levels" of change in their practices to conform to the AES requirements, 39% have implemented "medium" changes and only 15% have implemented "major" changes. Remember that the 83 respondents who chose the fourth option (no changes) are excluded from our sample.

[Table 2]

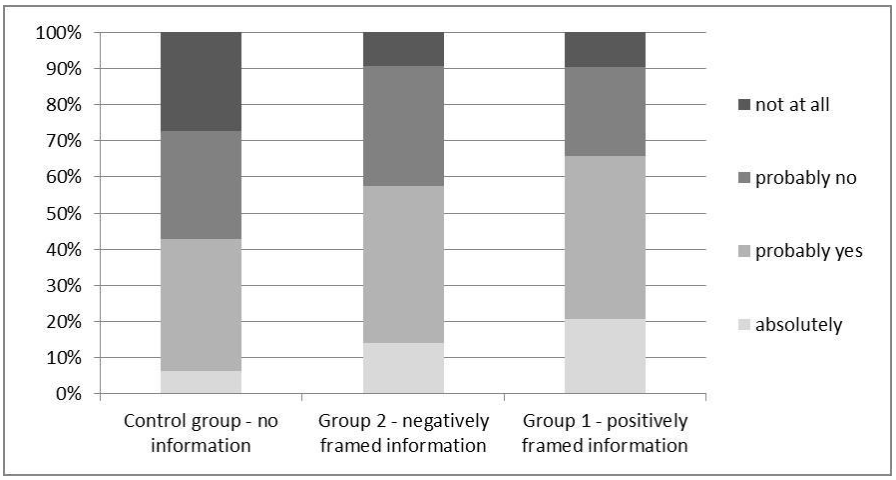
Table 3 shows that, overall, random assignment between treatment groups has created 3 groups with similar characteristics for most of the variables we control for. However, we observe a few differences that we have to account for during the analysis. Farmers who adopted options for structural landscape features management (*AES linear*) are over-represented in the group who received information (T=1), and especially in the group who received positively framed information (T_1=1), while those who adopted organic options are under-represented in the group with information. Farming activities as well as farmers under phytosanitary constraints (*AES phytosanitary*) are also unevenly distributed between the two framing groups (T_1=1 and T_2=1). Finally, fewer farmers have altruistic motivations in the group that received negatively framed information.

[Table 3]

5. *Results*

To the question "Would you continue the newly adopted practices after the contract ends" (see Table 1), farmers could choose one of the four responses: "absolutely", "probably yes", "probably no" or "not at all". Figure 1 shows the percentage of answers in the three informational treatments. We also observe in Figure 1 an increase in the percentage of respondents stating "probably yes" or "absolutely" between control group (no information), group 2 (negatively framed information) and group 1 (positively framed information). The second part on this section will therefore focus on measuring the effect of the treatments, in particular in testing the significance of the difference observed in Figure1. In the following analysis, we pooled responses to work with a binary variable: y=1 if the answer is "absolutely" and "rather yes", y=0 if the answer is "not at all" and "rather no".

Figure 1: Percentage of the answers according to the three treatments.



5.1. *Permanence*

On average, 55% of farmers (219 of the 395 who answered this question) were willing to maintain the practices adopted during the AES after the end of the contract. This percentage remains high, 43%, when we consider the control group only, excluding the influence of the treatments. Table 4 presents the results of the logit models. Since the marginal effects of each variable cannot be directly observed from the coefficients of the logit models, the two last columns give the odds ratios with their standards errors. The odds ratio indicates the effect of an increase of one unit of the considered independent variable on the odds that farmers intend to continue the AES land management practices rather than abandon them. Logit 1 and logit 2 present the results on the effects of the information on the social norm and on the framing of this information. Results will be discussed in the next subsection. To analyse how farmers' characteristics (X) impact their intention to continue the AES land management practices, let's consider now the Logit 3 model in Table 4.

[Table 4]

As expected, the likelihood of continued implementation of AE practices post-contract decreases if farmers have experienced technical difficulties during implementation. The odds of continuing the new practices are more than 50% lower in that case. Conversely, if the new AE practices have

generated a better sale value for production, the odds of continuing these are more than doubled (but this effect is significant at only 10%).

Farmers who experienced acknowledgment for their contribution to the protection of the environment or a better life quality are more likely to maintain the adopted practices even in the absence of payment, which indicates that they might have non-pecuniary selfish motivations to do so. Farmers who experienced acknowledgment may value external positive judgments and might fear social disapproval if they go back to their less environmentally-friendly practices. On the other hand, farmers who did not experience acknowledgment may feel fewer qualms to revert to their old practices.

No significant effect of altruistic motivation was detected, but this can be explained by the low variability of this variable, as almost all respondents answered that one on the satisfactions of their participation in the AES was to contribute to environmental quality (Table 2). Farmers were more likely to continue AE practices if they implemented small rather than major changes to conform to the AES requirements or if they already conformed before joining the AES (Table 4, Logit 3). This result confirms the intuition that a long term upkeep of the practices is linked to a low additionality of the scheme.

Finally, and surprisingly, farmers who participate in an AES phytosanitary option (aiming at a lower use of pesticides) display a greater propensity to maintain the adopted practices while options of grassland management or reduction of fertilizers use decreases it. This is rather counter-intuitive since the reduced use of pesticide may result in greater yield variability. However, it can be explained by the fact that farmers have to invest in greater knowledge of pest and weed management techniques in order to comply with the AES requirements. Once such investment has been made, it might be less profitable to revert to previously-used techniques.

5.2. Effect of social norm and framing

The results also show that being provided with the information that a majority of farmers would not revert to their old (detrimental) practices is sufficient to trigger a higher proportion of positive responses concerning future commitment to maintain AE practices. Indeed, α is positive and significant (Table 4, Logit 1) and the odds ratios show that the odds that farmers maintain the adopted practices is more than twice higher (2.1 in Logit 1) when information about the social norm (*T=1*) is given than without such information. This effect is even stronger, with an odds ratio of 2.8, when controlling for the observable characteristics of the respondents in Logit 3 (Table4) which were slightly unbalanced between treatment groups (Table3). This effect is directly observed in the rates of farmers who state that they would maintain the AES practices after the contract ends: 61% of farmers who received information, compared with only 43% in the control group.

However, a test of equality of parameters in equation 2 reveals that there is no significant difference between the two estimates of the parameters β_1 and β_2 as defined in equation 2, which means that the way information is framed, positively or negatively, has no effect here. This is contradictory with the literature where an attribute framing effect is considered ‘‘a reliable phenomenon’’ (Levin *et al.* 2002, p. 413). Note that in our survey the information about the social norm is quite strong since the

rate of farmers stating that they would maintain their AE practices at the end of the contract was 80% in our pilot survey. This may lessen the impact of the negatively framed information (only 20% do not continue with the newly-adopted practices). A 50% rate might have captured a much stronger framing impact.

In an attempt to identify if some of the characteristics included in *X* might influence positively or negatively the susceptibility of farmers to social norms, interaction variables *T*X* have been included in other versions of regression 3. We can in particular expect farmers with non-pecuniary selfish motivations, in our case those who experienced social acknowledgement, or farmers with purely altruistic motivation to be more sensitive than other farmers to the information that other farmers intend to maintain the adopted practices. Indeed if farmers are sensitive to societies' judgement on their contribution to the environment they might equally be sensitive to their peers' judgement, and have an increased preference for conforming to the social norm. Purely altruistic farmers might also be more likely to maintain the adopted practices if they know that others do so as it increases the chances of having an impact on the environment. However, we could not detect any significant effect of these interaction variables, suggesting that farmers' sensitivity to the social norm is not dictated by these motivations nor by any other observable variables included in *X*.

6. Conclusion

The first result of this paper is that the "end of the contract" problem in AES might not be as dramatic as previously thought. Indeed, 43% of the surveyed farmers intend to maintain the practices they have adopted under the AES requirements, even in the absence of financial incentives or knowledge of others' intentions. This result conforms with that obtained by Roberts and Lubowski (2007) and in the study by ECA (2011). We show that pecuniary and non-pecuniary selfish motivations, like social acknowledgement or a better life quality, can partly explain this intention. However, we also show that low levels of land management change are more likely to be permanent than major changes. Therefore, the long lasting change towards more environmentally-friendly practices in agriculture can be expected to be slow and incremental. This means the decision to renew contracts should be partly based on the environmental additionality of schemes: schemes which produce bigger changes in farm practices are more likely to suffer a reversion to pre-contract management than those which produce smaller changes.

More interestingly, we find that farmers participating in the French MAEt scheme are conditional co-operators, so that information on what others intend to do, as an indicator of a social norm, can be a powerful nudge to increase the permanence of pro-environment practices. As such, this paper adds to a series of results which are increasingly inspiring public economists for more ambitious policies targeted at farmers (DEFRA 2008). Much attention has been granted to the design of incentive policies such as taxes or subsidies to reduce polluting activities. The recent economic crisis in Europe, which makes green taxes more politically sensitive and reduces the margin of manoeuvers for public spending, has given momentum to a new kind of policies relying more on suasion and psychology than on monetary incentives.

One potential limit of this paper is that it relies on stated intentions rather than actual behaviour to study the social norms effect. For strategic reasons, farmers might over- or under-state their

intention to maintain the adopted practices and more (or fewer) farmers than were found through the survey will actually maintain them. However, there is no reason to think that the treatment effects of giving information on others' intentions influence this strategic behaviour, nor that strategic behaviour will vary systematically across treatments. As the treatment is randomly assigned, we can then expect that the impact we capture by comparing the relative levels of permanence between the treatment and control group reflects its likely actual impact on farmers' decisions.

To conclude, this paper contributes to the literature showing that in general, people have preferences for following social rules and may suffer disutility when violating these norms. Farmers are no different: their individual behaviour is likely to be influenced by the behaviour of others. This should be kept in mind when designing an agri-environmental scheme. As shown in this paper, informing a farmer on the choices made by her peers can induce her to conform. Communicating the average adoption rate of an agri-environmental contract –through articles in agriculture magazines or information via farmers' organizations- could thus help to persuade more farmers to enrol, if this average adoption rate was high enough. Proposing contracts which include a specific reward for a collective success (for example a monetary bonus paid to all contractors if the adoption rate is above a given target) can help to signal the social norm to farmers (Kuhfuss *et al.* 2015). In such case, combining a financial incentive with a behavioural nudge can increase the efficiency of public policy with no added costs. This type of intervention is increasingly studied and evaluated, both in the developed countries context (Defra 2008) and in the developing world (World Bank 2015).

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Tables

Table 2: Descriptive statistics of the sample

Variables	Obs.	% of Obs. / Mean (*Std. Dev.*)
Pecuniary motivations		
Increased gross margin	360	41.7%
Higher value	343	20.1%
Technical difficulties	384	48.2%
Non-pecuniary selfish motivations		
Social acknowledgment	376	88.8%
Better life quality	348	49.4%
Non-pecuniary altruistic motivations		
Contribute to environment	384	96.1%
Additionality		
Already conform	357	67.8%
Low changes	395	46.1%
Medium changes	395	38.5%
Major changes	395	15.4%
Farm characteristics		
UAA (ha)	382	153.30 (*97.76*)
AES fertilizers	395	50.6%
AES phytosanitary	395	44.8%
AES land cover	395	30.9%
AES grassland	395	23.0%
AES linear	395	16.5%
AES organic	395	4.1%
AES other	395	12.2%
Vine or arboriculture	385	4.2%
Livestock farming	385	20.3%
Field crops	385	41.3%
Mixed farming and breeding	385	31.7%
Other agricultural production	385	2.6%

Table 3: Balancing tests

Group →	Control	T=1		T_1=1		T_2=1	
	N=128	N= 267		N=126		N=141	
	Mean	Mean	p-value[1]	Mean	p-value[2]	Mean	p-value[3]
Pecuniary motivations							
Increased gross margin	0.482	0.386*	0.085	0.412	0.909	0.364	0.120
Higher value	0.171	0.216	0.338	0.252	0.103	0.182	0.509
Technical difficulties	0.508	0.469	0.476	0.468	0.704	0.471	0.745
Non-pecuniary selfish motivations							
Acknowledgment	0.911	0.877	0.339	0.849*	0.098	0.903	0.501
Better life quality	0.487	0.498	0.846	0.536	0.287	0.463	0.395
Non-pecuniary altruistic motivations							
Contribute to environment	0.976	0.954	0.308	0.984	0.109	0.927**	0.011
Additionality							
Already conform	0.713	0.661	0.327	0.655	0.524	0.667	0.738
Medium changes	0.359	0.397	0.472	0.397	0.737	0.397	0.707
Major changes	0.156	0.154	0.945	0.159	0.871	0.149	0.822
Farm characteristics							
UAA (ha)	157.623	151.169	0.545	160.308	0.344	143.105	0.130
AES fertilizers	0.531	0.494	0.493	0.500	0.863	0.489	0.615
AES phytosanitary	0.430	0.457	0.610	0.381*	0.066	0.525**	0.022
AES land cover	0.305	0.311	0.901	0.333	0.471	0.291	0.562
AES grassland	0.219	0.236	0.704	0.214	0.603	0.255	0.380
AES linear	0.086	0.202***	0.004	0.278***	<0.001	0.135	0.234
AES organic	0.078	0.022***	0.009	0.024	0.249	0.021	0.149
AES other	0.133	0.116	0.634	0.143	0.374	0.092	0.184
Vine or arboriculture	0.032	0.046	0.501	0.049	0.610	0.044	0.870
Livestock farming	0.230	0.189	0.348	0.238	0.243	0.146**	0.040
Field crops	0.444	0.398	0.382	0.320**	0.011	0.467	0.109
Mixed farming and breeding	0.262	0.344	0.106	0.377*	0.084	0.314	0.925
Other agricultural production	0.032	0.023	0.619	0.016	0.421	0.029	0.768

Note

1: reports the p-value of the test that the mean values for both groups T=1 and control are equal

2: reports the p-value of the test that the mean values for both groups T_1=1 and T_1=0 are equal

3: reports the p-value of the test that the mean values for both groups T_2=1 and T_2=0 are equal

*p<0.01; **p<0.05; ***p<0.01

Table 4: Models results

Logit 1					
Y		**Coef.**	**S.E.**	**Odds ratio**	**S.E.**
T		0.748***	0.218	2.113***	0.461
_cons		-0.283	0.179	0.753	0.135
N	*395*				
Log likelihood	*-265.49*				
Pseudo R2	*0.0219*				

Logit 2				
Y	**Coef.**	**S.E.**	**Odds ratio**	**S.E.**
T_1 (ref: T_0)	0.941***	0.259	2.562***	0.664
T_2 (ref: T_0)	0.583**	0.247	1.792**	0.018
_cons	-0.283	0.179	0.753	0.135
N	*395*			
Log likelihood	*-264.49*			
Pseudo R2	*0.0256*			

Logit 3				
Y	**Coef.**	**S.E.**	**Odds ratio**	**S.E.**
T	1.030***	0.321	2.801***	0.900
Pecuniary motivations				
Increased gross margin	0.434	0.329	1.543	0.507
Higher value	0.778*	0.440	2.177*	0.957
Technical difficulties	-0.757**	0.323	0.469**	0.151
Non-pecuniary selfish motivations				
Acknowledgment	0.931*	0.480	2.537*	1.218
Better life quality	0.705**	0.335	2.023**	0.679
Non-pecuniary altruistic motivations				
Contribute to environment	0.506	0.902	1.659	1.496
Additionality				
Already conform	0.722**	0.329	2.059**	0.677
Medium changes (ref: low changes)	-0.460	0.341	0.631	0.215
Major changes (ref: low changes)	-1.030**	0.503	0.357**	0.180
Farm characteristics				
UAA (ha)	-0.002	0.002	0.998	0.002
AES land cover	0.482	0.356	1.620	0.576
AES phytosanitary	1.027***	0.364	2.792***	1.016
AES fertilizers	-0.654**	0.304	0.520**	0.158
AES organic	0.499	0.850	1.648	1.401
AES linear	0.808*	0.441	2.244*	0.990
AES grassland	-0.866**	0.354	0.421**	0.149
Vine or arboriculture (ref: other agric. prod.)	0.082	1.513	1.085	1.642
Livestock farming (ref: other agric. prod.)	-0.296	1.373	0.743	1.021
Field crops (ref: other agric. prod.)	-0.462	1.333	0.630	0.840
Mixed farming and breeding (ref: other agric. prod.)	-0.453	1.341	0.636	0.853
_cons	-1.711	1.668	0.181	0.301
N	*287 (due to missing observations for X)*			
Log likelihood	*-145.09*			
Pseudo R2	*0.2673*			

*p<0.1; **p<0.05; ***p<0.01 ; S.E.: Standard Error