

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 as to whether to maintain "pro-environment" practices beyond the duration of a contract, and in particular the effect of social norms. Our results, based on the stated intentions of 395 French farmers, show that both pecuniary and non-pecuniary motivations drive farmers' decision, which is also significantly influenced by information about a social norm. Therefore "nudging" farmers, by conveying information to them on other farmers' pro-environmental practices, appears as a means of maintaining the long-run benefits of AES.

Keywords Agri-environmental schemes; Permanence; End of Contract problem; Framing effects; Social norms.

JEL code Q18; Q28

Nudges, social norms and permanence in agri-environmental schemes

I. INTRODUCTION

Agri-environmental schemes (AES) have been used in the European Union (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. Budgets dedicated to AES are significant and are therefore under public scrutiny. 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 additional spending by Member states.

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 end-of-contract problem is particularly problematic when 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, even without monetary compensation. 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). Thaler and Sunstein (2008) show that individual choices are shaped 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. We use information on a social norm – specifically the behaviour of others in a reference group – as a behavioural nudge, and investigate its effects on stated intentions. We also investigate the impacts of changing the framing of this information on the social norm.

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 conservation benefits? 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 to the farmer. The main focus of this paper is to investigate the effect of: (i) providing information about what other farmers do or intend to

do, *i.e.* giving them an indication of what the prevailing “social norm” might be, in terms of farmers’ willingness to maintain the land management practices they adopted under the AES after the contract ends, and *(ii)* whether the framing of this information about the behaviour of others matters to individual’s stated intention.

The behavioural motives underlying the decision to maintain pro-environmental practices beyond the duration of the contract and the effect of these 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 they 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.

II. PERMANENCE OF AGRY-ENVIRONMENTAL PRACTICES AFTER THE END OF THE AGRY-ENVIRONMENTAL CONTRACT

Farmers engaging in AES can provide environmental services in two ways: through land retirement or by modifying their resource use or farming practices, that is, by “land sparing” or “land sharing” (Lipper *et al.* 2009 ; Balmford 2012). Land sparing options, such as wetland

or grassland creation on farmland, require setting the farm plot aside from production. Such options usually create 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 or fertilizer use. Typically, these changes also come at a cost in terms of profits foregone (Armsworth *et al.*, 2012) since they usually induce lower and more variable yields or may require higher management costs. Assuming that farmers make their decisions based on relative profits from alternative 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 Payments for Environmental Services) 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 more than 40% of farmlands engaged in the Conservation Reserve Program (CRP) would not have been returned to crops if the program had ended in 1997. Although this striking conclusion might be due to the context of their analysis (especially in terms of crop prices), it points to the fact that some newly adopted practices might be maintained by farmers even without monetary compensation. 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 possible explanations for 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 have provided 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 new practices can also be adopted permanently under AESs that have induced a true change. 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, in the case of land sharing options, the transition towards pro-environment practices may require short term additional costs, such as investments in mechanical weeding equipment to replace chemical weeding, but may reveal itself less costly in the longer run than conventional farming methods. The AES payment supports farmers during this investment period, along with opportunities for them 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 with no additional incentive. 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 (this is the case when a participant is motivated by gaining a better reputation, a warm glow feeling or enjoying social acknowledgment that he contributes to the public good) or purely altruistic, when the participant genuinely seeks to contribute to the improvement of the public good (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.

III. 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 may bear private costs whereas environmental improvements will benefit all 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. 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 the strategy method² in public good games where players choose their contribution depending on others' contributions, that about 50% of people are conditional co-operators. In other experiments, subjects 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 2008).

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).

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 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 dis-approved 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 Payment for Environmental Services 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-enrolled than if few farmers would do so (Chen *et al.* 2009). In a rather different context, Czajkowski *et al.* (2015) 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 the framing of information 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 lead to a more favourable judgment of the event/object. In order to test this framing effect on farmers' intentions, but also to avoid weakening the social norm effect of information, we tested the effect of a negative and a positive framing of information.

IV. 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 2007-2013 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 European Union's Habitat and Birds 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.

Survey and treatments

We used an online survey³ 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 by the government. In order to test the effect of the social norm and framing effects, we constructed 3 treatment groups within which the question on whether farmers intended to maintain their land management practices was put differently (Table 1):

[Table 1]

The software randomly selected respondents and affected them to 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 survey⁴ 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 groups 1 and 2 will have a positive impact on farmers' intentions to also continue with their newly adopted practices after their contract ends. However, considering the framing literature, we expect that the magnitude of this positive impact will differ depending on whether this information is put in a positive or negative framing. In our case, the impact of this information should be higher when highlighting the rate of farmers willing to continue, as in treatment 1, than when highlighting the rate of farmers NOT willing to continue, as in treatment 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 \mathbf{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 \mathbf{X} includes variables describing general farm characteristics: utilisable agricultural area (UAA) in hectares, the type of AES currently subscribed to, and type of farming activities. We assume that a higher UAA can increase the probability to maintain land sparing options and that the burden of continuing with better environmental practices without payment may differ across AES options and farming activities. Also included in vector \mathbf{X} are variables aimed at signalling potential low additionality of farmer's participation, *i.e.* whether the respondent states that he already (almost) complied with the scheme's requirement before joining, and to what extent he had to change his farming practices to comply with these requirements (low changes, medium changes or major changes). Indeed, as discussed in section 2, alternative hypothesis can explain why farmers may continue to use their pro-

environmental land management practices at the end of the program. First, we hypothesize that minor changes are easier and less costly to maintain than more important ones. However, if important investments have been done to comply with the AES option, it might be more difficult to revert to old practices. Second, 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 and non-pecuniary altruistic motivations. Farmers who could earn a higher gross margin, who could sell their products at a higher price and who faced no technical difficulties with the AES requirements might have pecuniary motives to maintain the adopted practices. Farmers who, during the AES, state that they experienced a better life quality (in terms of health, labour constraints etc.) and/or explain that they gained an acknowledgment that their farming activity contributed to the protection of the environment and to high quality 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.

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 intended to continue with these newly adopted practices when the payments ceased, 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 question⁵. 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. Farmers included in the sample have adopted 1.8 options on their farm on average (standard deviation 1.02), 80% being engaged in 1 or 2 options. The most common farming activity in the sample is field crops (41.3% of the sampled farmers), followed by mixed farming (31.7%), and livestock farming (20.3%).

There was a range of feedback from respondents on their experience with the MAEt scheme. 20% of them declared that joining the AES enabled them to sell their agricultural products at a greater price and 42% increased their total gross margin. But, almost half of them stated that they had experienced difficulties in relation with the technical constraints imposed by the AES contract⁶. On the other hand, a wide majority of respondents (89%) stated that their participation in the scheme provided them with greater social acknowledgement of their contribution to the protection of natural resources and to local land management, and they almost unanimously (96%) stated that their participation provided them with the individual satisfaction of participating in the protection of the environment⁷. Nearly fifty per cent have experienced an improvement in their quality of life due to their participation in AES. Some 68% of the farmers of our sample acknowledged that they joined the AES partly because their practices were already in line with AES requirements. Nevertheless all of them stated that

they have changed their land management 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]

Some of this feedback varies depending on the type of option chosen by farmers. For example, farmers who had to reduce their phytosanitary products use state significantly more often they have implemented major changes and had technical difficulties than farmers not concerned with this type of option. Farmers under land cover options seem to perceive more acknowledgement for their environmental effort from society, which can be explained by the better visibility of these practices, for example the management of pastures to prevent forest fires. We also find, not surprisingly, that those who chose to engage into an AES for the reduction of pesticide use experience better life quality than farmers who did not adopt this option type. In the following we will thus control for the effect of these differences.

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 ($T_I=1$), 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]

V. RESULTS

To the question “Would you continue your 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 of this section will therefore focus on measuring the effect of the treatments, in particular in testing the significance of the difference observed in Figure 1. In the following analysis, we pooled responses to work with a binary variable: $y=1$ if the answer is “absolutely” and “probably yes”, $y=0$ if the answer is “not at all” and “probably no”.

[Figure 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, we present the odds ratios. 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. Therefore an odds ratio lower than 1 indicates a negative effect of the variable on the dependent variable. 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, we now consider 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 return 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 (captured by "Contribute to the environment"). Indeed, over 384 responses, 369 respondents (96 %) state that they enrolled in the AES to participate to the preservation of the environment. Altruism is one of the drivers of participation for almost all respondents. This lack of variation across farmers in our data prevents us from giving any conclusion about the effect of this motivation on farmers' choice

to maintain the adopted practices at the contract end (Table 2). Not surprisingly, farmers are 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 more 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.

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 (Table 4) which were slightly unbalanced between treatment groups (Table 3). This effect is also directly observed in the proportion 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 (Table 3). The treatment variable T stays also highly significant when we run logit regressions by type of option (AES fertilizers, AES phytosanitary, AES land cover and AES grassland).

However, a test of equality of parameters for variables T_1 and T_2 in logit 2 (Table 4) 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 significant 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 practices at the end of the contract was 80% in our pilot survey. This may lessen the impact of the negatively framed information (that only 20% do not continue with the newly-adopted practices).

In an attempt to identify if some of the characteristics included in \mathbf{X} might influence positively or negatively the susceptibility of farmers to social norms, interaction variables $T*X$ have been included in Logit 4. 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 influenced by the information that other farmers intend to maintain the adopted practices. Indeed if farmers state that social judgement on their contribution to the environment is important for them, they might equally be sensitive to their peers' judgement and have a strong preference for conformity to social norms. 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 their own actions having an impact on the environment. However, we could not detect any significant effect of these two interaction variables, “Acknowledgment*T” and “Contribute to the environment*T”, suggesting that farmers' sensitivity to the social norm is not dictated by these motivations.

VI. CONCLUSION

The first result of this paper is that the “end of the contract” problem in AES might not be as problematic 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 to 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 transition towards more environmentally-friendly practices in agriculture can be expected to be slow and incremental. This means that 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. They are more susceptible to suffer from a relatively higher rate of loss of environmental capital once contracts expire.

More interestingly, we find that farmers participating in the French MAEt scheme are conditional co-operators. Hence providing 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 ; World Bank 2015). Much attention has been granted to the design of incentive policies such as taxes or subsidies to reduce polluting activities from agricultural activities. The recent economic crisis in Europe, which makes green taxes more politically sensitive and reduces the margin of manoeuvres for public spending, has given momentum to a new kind of policies relying more on suasion and psychology than on monetary incentives.

Of course, this can raise ethical issues, extensively discussed by Thaler and Sunstein (2008), since there is a risk for public authorities to “manipulate” citizens’ choices in a “paternalistic” manner which does not coincide with what their choices under free will would be. Whilst much of the social nudge literature is focused on changing behaviour towards a mode that is deemed better for the subject’s own well-being by those implementing the policy (e.g. encouraging children to eat more healthily), our use of the term involves a different context. We use information on a social norm to nudge farmers into continuing with pro-environment practices at the end of an agri-environment contract. Note that such behaviour is entirely voluntary for the farmer, as indeed was their uptake of the contract in the first place. We also assume that the continuation of pro-environmental benefits yields a social benefit in terms of enhanced water quality and human health. However, farmers are not being coerced into stating that they would continue with these practices: it is entirely free choice made by them, which they presumably arrive at by comparing the utility to themselves of alternative actions. Moreover, it can be underlined that this utility can include a pay-off from bringing one’s own behaviour closer to the social norm, as Czajkowski *et al.* (2015) show.

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 across participants, we can then expect that the impact we capture by comparing the relative levels of permanence between the treatment and control groups reflects its likely actual impact on farmers’ decisions to maintain pro-environment land management practices after AES contracts end.

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 social 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 can help to signal the social norm to farmers. For example, Kuhfuss *et al.* (2015) show with a choice experiment survey that a monetary bonus paid to all contractors if the adoption rate is above a given target can improve farmers' participation and increase land enrolment for lower overall budgetary costs. Indeed, this study shows that wine growers in the South of France does value this conditional bonus much more than its expected monetary value. In addition, they suggest that the introduction of this conditional bonus contributes to increased expectations of farmers on others' participation, therefore shifting a pro-environmental social norm and favouring the adoption of less pesticide-intensive farming practices. In such case, combining a financial incentive with a behavioural nudge can increase the efficiency of public policy with no added costs.

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Tables

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

Table 2: Descriptive statistics of the sample

Variables	Obs.	% of Obs. / Mean (Std. Dev.)
<i>Pecuniary motivations</i>		
Increased gross margin	360	41.7%
Higher value	343	20.1%
Technical difficulties	384	48.2%
<i>Non-pecuniary selfish motivations</i>		
Social acknowledgment	376	88.8%
Better life quality	348	49.4%
<i>Non-pecuniary altruistic motivations</i>		
Contribute to environment	384	96.1%
<i>Additionality</i>		
Already conform	357	67.8%
Low changes	395	46.1%
Medium changes	395	38.5%
Major changes	395	15.4%
<i>Farm characteristics</i>		
UAA ¹ (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	385	31.7%
Other agricultural production	385	2.6%

1: Utilisable Agricultural Area (UAA) – standard deviation into brackets

Table 3: Balancing tests and mean value of the dependent variable in each treatment group

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
Y	0.430	0.614***	0.001	0.659***	0.004	0.574	0.551
<i>Pecuniary motivations</i>							
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
Better life quality	0.508	0.469	0.476	0.468	0.704	0.471	0.745
<i>Non-pecuniary selfish motivations</i>							
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
<i>Non-pecuniary altruistic motivations</i>							
Contribute to environment	0.976	0.954	0.308	0.984	0.109	0.927**	0.011
<i>Additionality</i>							
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
<i>Farm characteristics</i>							
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	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 T₁=1 and T₁=0 are equal

3: reports the p-value of the test that the mean values for both groups T₂=1 and T₂=0 are equal

*p<0.1; **p<0.05; ***p<0.01

Table 4: Models results (odds ratios)

Y	Odds ratios			
	Logit 1	Logit 2	Logit 3	Logit 4
T	2.113***		2.686***	2.634***
T ₁ (ref: T ₀)		2.562***		
T ₂ (ref: T ₀)		1.792**		
<i>Pecuniary motivations</i>				
Increased gross margin			1.505	1.548
Higher value			2.220*	2.222*
Technical difficulties			0.457**	0.452**
<i>Non-pecuniary selfish motivations</i>				
Acknowledgment (centered in Logit 4)			2.541*	2.313
Better life quality			1.915*	1.908*
<i>Non-pecuniary altruistic motivations</i>				
Contribute to environment (centered in Logit 4)			1.760	0.365
<i>Additionality</i>				
Already conform			2.059**	2.089**
Medium changes (ref: low changes)			0.636	0.652
Major changes (ref: low changes)			0.368**	0.361**
<i>Farm characteristics</i>				
UAA (ha)			0.998	0.998
AES fertilizers			0.528**	0.539**
AES phytosanitary			2.998***	3.021***
AES land cover			1.760	1.758
AES grassland			0.402**	0.409**
AES linear			2.307*	2.134*
AES organic			1.689	1.695
AES other			2.167	1.956
Vine or arboriculture (ref: other agric. prod.)			1.126	1.152
Livestock farming (ref: other agric. prod.)			0.718	0.715
Field crops (ref: other agric. prod.)			0.686	0.690
Mixed farming (ref: other agric. prod.)			0.618	0.635
Acknowledgment (centered) * T				1.094
Contribute to environment (centered) * T				8.842
_cons	0.753	0.753	0.624	0.609
N	395	395	287	287
Log likelihood	-265.49	-264.49	-143.97	-143.36
Pseudo R2	0.0219	0.0256	0.2729	0.2760

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

Note: N is <395 in Logit 3 and 4 due to missing observations for X

Figures

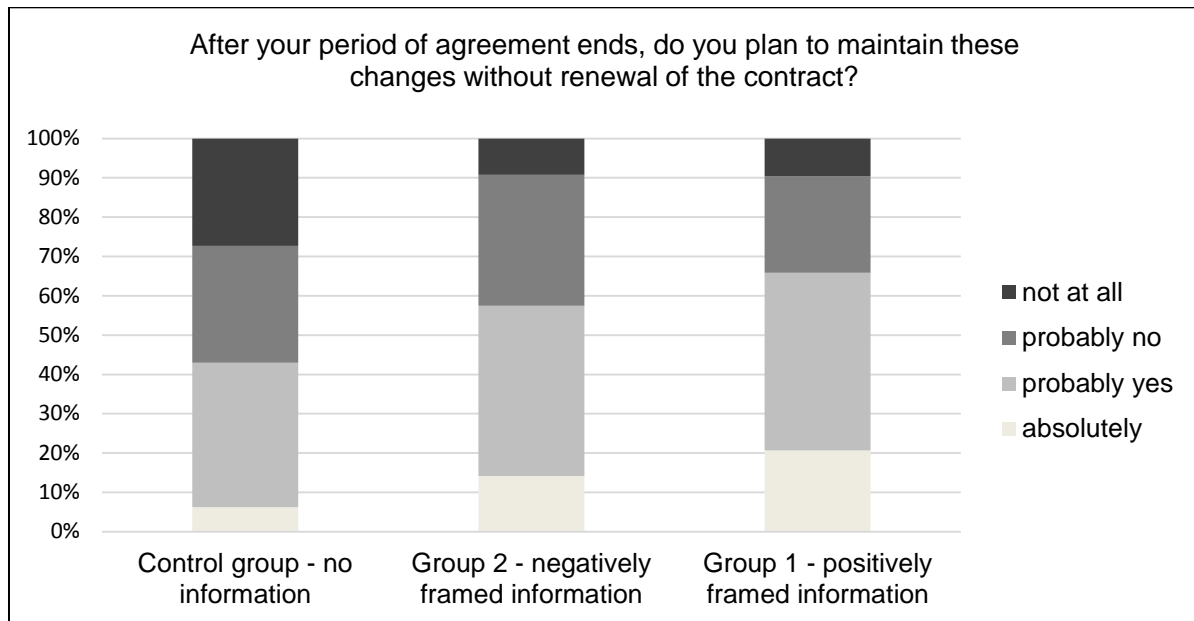


Figure 1: Percentage of farmers intending to maintain the pro-environment practices after the contract end according to the three treatments.

Footnotes

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

² The strategy method, in which a responder makes conditional decisions for each possible information set, is usually opposed to the more standard direct-response method.

³ Using the software Limesurvey®.

⁴ Based on the responses of 91 farmers participating to the MAEt scheme.

⁵ There are no significant differences in the answer rates of the 3 groups.

⁶ Some examples reported by farmers in an open-ended question of the survey include: difficulties to manage weeds without herbicides during rainy years difficulties in respecting the objective of input reduction each year of the 5-year commitment, timing issues for AES options which include constraints on the period of interventions (mowing date for example), that can be incompatible with weather conditions or workforce availability. Previous surveys with farmers participating in the MAEt scheme in France have shown that field slopes or narrow rows in vineyards and orchards can hinder mechanical interventions, which are usually substitutes to the use of phytosanitary products. All these “technical difficulties” which vary from one farmer to another according to his farming skills, equipment and local constraints, do have an impact on his decision to maintain pro-environment practices without contract payments.

⁷ In open ended questions of our survey, many farmers highlight their concern for the environment (altruistic motivations). They are often upset that their efforts for preserving landscape, biodiversity and the environment in general is not sufficiently acknowledged by policy- makers and society in general. Therefore, many respondents claim that they enrolled in AES to demonstrate and make more visible their environmental contributions (and to gain greater social acknowledgment of their efforts).