# Understanding Farmers' Responses to CAP Reform

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## Abstract

*The 2014-2020 Common Agricultural Policy (CAP) reform defines new rules for farmers, including regionalisation, crop diversification and the ecological focus area (EFA). This paper aims to evaluate the farmers' intention to modify their behaviour in response to the CAP reform using the Theory of Planned Behaviour (TPB). A questionnaire was submitted to 211 Italian durum wheat producers. Two behaviours were analysed: 1) the change in the durum wheat acreage, and 2) the maintenance of at least 7% of the arable land as an EFA. A structural equation model (SEM) technique was employed. The TPB model explains, respectively, 52% and 55% of the intention variance. Subjective norms affect the intention to change the durum wheat acreage, while attitude drives the intention to maintain at least 7% of the arable land as an EFA. Implications for policy makers and producers are discussed.*

*Keywords: Common Agricultural Policy (CAP), durum wheat, Theory of Planned Behaviour (TPB), intention, ecological focus area.*

## Résumé

*La Politique Agricole Commune (PAC) 2014-2020 a défini de nouvelles règles pour les agriculteurs concernant la régionalisation des paiements et les mesures de «reverdissement» de l'agriculture européenne come la surface d'intérêt écologique (EFA). L'objectif de cet article est d'évaluer l'intention des agriculteurs à modifier leur comportement en réponse à la réforme de la PAC en utilisant la théorie du comportement planifié (TPB). Un questionnaire a été soumis à 211 producteurs de blé dur italien. Deux comportements ont été analysés: 1) le changement de la surface de blé dur, et 2) le maintien d'au moins 7% des terres arables comme EFA. Un modèle à équations structurelles (SEM) a été utilisé qui explique pour les deux comportements mentionnés, respectivement, 52% et 55% de la variance de l'intention. Les normes subjectives affectent l'intention à modifier la surface de blé dur, alors que l'attitude entraîne l'intention de garder au moins 7% des terres arables comme EFA. Les implications pour les décideurs et les producteurs sont discutées.*

*Mots clés: Politique agricole commune (PAC), blé dur, théorie du comportement planifié (TPB), intention, surface d'intérêt écologique.*

## 1. Introduction

The new 2014-2020 Common Agricultural Policy (CAP) reform defines another important step toward more balanced European agricultural policy interventions and its full involvement within global issues, such as world population food access and climate change (European Commission, 2010). This definition is especially true for countries such as Italy, where the decoupled agricultural payment has been applied according to historical criteria, freezing in this way the level of farm payments to an out-of-date situation linked to the past, with evident disparities among farms belonging to the same sector. After a debated negotiation, the CAP reform has introduced a more equitable direct payment that is as uniform as possible for farms across and within the Member States according to non-discriminatory and homogenous criteria (regionalisation). This process will be implemented gradually by each Member State minimising the prejudice that is sustained by the historical beneficiaries. When the convergence is completed, a more balanced and equitable distribution of direct payments among farmers will be achieved; those who are currently receiving high payments per hectare will be worse off, while those with low (or null) payments will be better off.

The CAP reform design aims to improve the environmental performance of agriculture, by introducing new environmental commitments involving all of the beneficiaries. The CAP green direct payment (greening), accounting for 30% of the national direct payment envelope, rewards farmers for respecting three agricultural actions: crop diversification, maintenance of permanent grassland and the ecological focus area (EFA). Crop diversification is compulsory when the arable land exceeds 15 hectares and corresponds to a cultivation of at least 2 crops (3 if the arable land exceeds 30 hectares); the second greening constraint requires that the incidence of the permanent grassland at the farm or regional level cannot be lower than 5%; the last action forces farms with more than 10 hectares of arable land to maintain at least 5% of the arable crop land (likely 7% after 2017) to an area with particular environmental characteristics, such as strip and buffer areas, environmental set-aside and nitrogenous fixing crops. To fulfil the greening requirements, farmers will receive a payment (the green payment) as compensation for the possible profit losses incurred. The new CAP mechanism will likely affect farmers' decisions (input allocation) and the economic results of farms (Solazzo *et al*., 2014; Wąs *et al*., 2014).

Many authors have evaluated the impact of the past CAP reforms on farmers' behaviour in an attempt to identify a relationship between the level of public support and the farm

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production responses, e.g., evaluating the effects of the coupled payment reduction or removal on farm strategy. Most of these analyses assume that decoupled payments are neutral with respect to farm choices because they do not affect the level of profitability of the agricultural activities (Chakir *et al.*, 2007; Arfini, 2005; Judez *et al.* 2001; Buysse *et al.*, 2007a; Blanco *et al.*, 2008; Lansink and Peerlings, 1996; Viaggi *et al.*, 2010). Only few works have dealt with the effect of the decoupled payment modifications on production decisions. These works are mainly based on econometric techniques aiming to evaluate the effect of (decoupled) farm payments on the farm risk aversion (Sckokai and Moro, 2006; Hennesy, 1998; Koundouri *et al.*, 2009; Goodwin and Mishra, 2006). Sckokai and Moro (2006) have evaluated the impact of the Mid Term Review (MTR) assuming a decreasing absolute risk aversion (DARA) preference, that implies a reduction (increase) of the individual risk aversion if the level of individual wealth increases (decreases). This change in the risk aversion level due to modifications in the level of payments (coupled and decoupled) affects the production decisions. In other quantitative approaches that do not consider the risk in farmer behaviour representation, the effects of decoupling cannot be fully evaluated (Hennesy, 1998; Koundouri *et al.*, 2009).

While the effect of CAP payments on farmers' behaviours has been widely studied in the economic literature, the agri-environmental measures have been less investigated. In particular, the second pillar agri-environmental actions have been evaluated to understand the responsiveness of farmers and their effectiveness at the territorial level (Primdahl *et al.*, 2010; Godard *et al.*, 2008; Buysse *et al.*, 2007b). Attempts to predict the impact of agri-environmental measures on farm decisions have been developed mainly applying mathematical programming techniques (Arfini and Donati, 2013; Louhichi *et al.*, 2010; Janssen *et al.*, 2010; Galko and Jayet, 2011; Buysse *et al.*, 2007b; Rohm and Dabbert, 2003) and econometric approaches (Schulz *et al.*, 2014; Espinoza-Godet *et al.*, 2010; Kleinhanß *et. al.*, 2007; Reinhard *et al.*, 1999; Bonnieux *et al.*, 1998). Despite the extensive use of quantitative methodologies to assess agri-environmental measures, quali-quantitative approaches have also been adopted to predict the farm response to new environmental policy design. In particular, the Theory of Planned Behaviour (TPB) (Ajzen, 1991) has been applied to evaluate the attitude and the likely behaviour of farmers regarding environmental protection actions. The TPB suggests that the likelihood of a particular behaviour can be predicted by the individual's intention to perform that behaviour (Ajzen, 1991), capturing the motivational factors that influence behaviour. According to the TPB, behaviour is guided by the favourable or unfavourable evaluation of the behaviour (attitude towards the behaviour), perceived social pressure (subjective norms, SN) and perceived ability to perform the behaviour (perceived behavioural control, PBC). In general, the more favourable the attitude and subjective norm, and the greater the perceived control, the stronger the inten-

tion to perform a given behaviour should be (Ajzen, 1991). Although widely applied in the analysis of consumer's behaviour (see, e.g., Menozzi and Mora, 2012; Menozzi *et al.*, 2015), the TPB has been successfully used to predict entrepreneurial behaviour, such as starting a business (Kautonen *et al.*, 2013), and to test the determinants of the farmers' behaviour, such as strategic decisions under a milk quota system (Bergevoet *et al.*, 2004), climate information use (Sharifzadeh *et al.*, 2012), occupational health-related behaviours (Colémont and Van den Broucke, 2008), decisions to improve animal welfare (de Lauwere *et al.*, 2012), as well as behaviours related to agri-environmental measures (Beedel and Rehman, 2000; Wauters *et al.*, 2010; Hansson *et al.*, 2012; Power *et al.*, 2013) and other sustainable agricultural practices (Corbett, 2002; Fielding *et al.*, 2008). All of these TPB applications attempt to identify the driving factors that lead producers to adopt a given decision. The results are important for policy makers and food chain actors who consider the cause-effect linkage between policies and producer behaviour to develop the most appropriate strategy and intervention to stimulate farmers' sustainable behaviour (Beedel and Rehman, 2000).

This paper aims to evaluate the Italian durum wheat producers' intention to modify their behaviour in response to the new 2014-2020 CAP reform. In particular, a TPB model has been applied to study the farmers' intention 1) to change the durum wheat acreage as a response to the regionalisation of direct payments and greening commitments (e.g., crop diversification), and 2) to maintain at least 7% of the arable land as an EFA. The durum wheat production represents the raw material for one of the most important Italian food chains: the pasta food chain. Moreover, this sector is particularly sensitive to CAP changes: after the MTR reform, the durum wheat cultivation dropped by 40% (Cisilino *et al.*, 2011). Currently, we are potentially approaching another perturbing scenario in which the durum wheat production could significantly change, thus affecting the entire food chain. The modifications to the decoupled payment level should no longer be considered neutral in the farmers' decision-making process, and greening actions should be carefully evaluated. The TPB may help to analyse the relationship between the farmers' intentions under the new CAP scenarios and their antecedents and to understand how farmers use the available information to build a strategy. The following section describes the theoretical framework and its application to durum wheat farmers defining the hypotheses to be tested. The data collection and analytical procedures to test the hypothesis are outlined in the third section. The fourth section presents the main results, while the related discussions and implications are presented in the fifth section.

## 2. The Theoretical framework

The econometric models generally applied to study farmers' behaviour employ a range of determinants such as farm and farmer characteristics, institutional setting, individual perceptions related to the economic environment, etc. Hansson *et al.* (2012) noticed that psycho-social models

have recently been used in the field of behavioural economics and have been shown to explain economic behaviour and to increase the relevance of economic models. This paper extends this research by introducing psychosocial constructs to explain farmers' intention to modify their behaviour (i.e. change in the durum wheat acreage and maintenance of at least 7% of the arable land as an EFA) by applying Ajzen's (1991) Theory of Planned Behaviour (TPB). Originating from social psychology, TPB considers the individual's intention to perform a given behaviour a central factor in performing the behaviour. Intentions are assumed to capture the motivational factors that influence a behaviour, and depend on beliefs that link the given behaviour to certain outcomes (attitudes) and on the perceived social pressure to perform the behaviour (subjective norms). Intentions are expected to influence behavioural performance to the extent that the person has actual control over the behaviour (PBC). The TPB thus contributes to our understanding of the emergence of farmers' behaviour and determinants prior to any observable action, which has notable implications for agricultural policy and food industry strategy (Kautonen et al., 2013). Indeed, from a methodological perspective, TPB is an appropriate theoretical framework providing a parsimonious model for understanding farmers' beliefs and motivations, and how information can influence behaviour (Fielding et al., 2008).

Prior applications of the TPB to the agricultural context suggest that attitude, subjective norms and PBC explain from 23% to 79% of the variance in intention (Corbett, 2002; Sharifzadeh et al., 2012; Fielding et al., 2008; Colémont and Van den Broucke, 2008; Wauters et al., 2010; de Lauwere et al., 2012). The farmers' personal attitudes towards the behaviour were found to positively affect intentions to change strategic behaviour (Colémont and Van den Broucke, 2008; Sharifzadeh et al., 2012; de Lauwere et al., 2012) and to adopt environmental sound practices (Fielding et al., 2008; Wauters et al., 2010). Secondly, farmers' behaviour is not fully under volitional control, whilst it is strongly influenced by external stakeholders such as producers' organizations, food industries, public authorities, etc. Thus, PBC and subjective norms become valuable theoretical constructs in several studies predicting strategic (Colémont and Van den Broucke, 2008; de Lauwere et al., 2012; Sharifzadeh et al., 2012) and eco-friendly behaviours (Fielding et al., 2008), although non-significant effects were also found (e.g., Wauters et al., 2010). In this study it is suggested that attitude (H1a), subjective norms (H1b) and PBC (H1c) are positively related to farmers' intention to modify their behaviour (i.e. change in the durum wheat acreage and maintenance of at least 7% of the arable land as an EFA).

Although the success of the TPB in predicting behaviour has been proved (Armitage and Conner, 2001), it has been argued that for some behaviour and contexts the inclusion of other variables may increase the model's predictive power (Menozzi et al., 2015). It is reasonable to assume that farmers with greater environmental awareness and who feel moral responsibilities toward environmental behaviours could have more positive attitudes towards the adoption of sustainable agricultural practices (Beedell and Rehman, 2000; Corbett, 2002; Fielding et al., 2008). It is therefore suggested that moral obligations, defined as an individual's perception of the moral correctness or incorrectness of performing a behaviour (Ajzen, 1991), have a positive effect on farmers' attitudes towards the maintenance of at least 7% of the arable land as an EFA (H2). Several studies have also suggested that past behaviour may be an important predictor of future behaviour (Armitage and Conner, 2001). Fielding et al. (2008) argued that past efforts in ecological management practices, comprising a set of behaviours that require substantial outlay of time and capital, are likely to have an impact on future intentions. Consistent with their argument and findings, a variable measuring past behaviour was also included in the model relative to EFAs and expected to be a positive predictor of intentions. Thus, those farmers that have already an ecological area on their agricultural holdings are expected to maintain the EFAs also in the future (H3).

CAP assessment studies generally assume that decoupled payments have no influence on the farmers' production plan (Arfini, 2005). However, it has also been demonstrated that the single farm payment level is not an external component of the farm's investment decision-making process, whilst affecting the final input allocation (Koundouri et al., 2009; Serra et al., 2006). Therefore, this study proposes that the single farm payment level is positively related to farmers' intention to change the durum wheat acreage as a response to the CAP reform (H4).

Finally, consistent with similar studies (see, e.g., Kautonen et al., 2013), the model specification includes also other variables related to the structure of agricultural holdings (e.g., farmer age, % of rented agricultural land, % of durum wheat acreage, etc.), in order to monitor their effect on behavioural intentions.
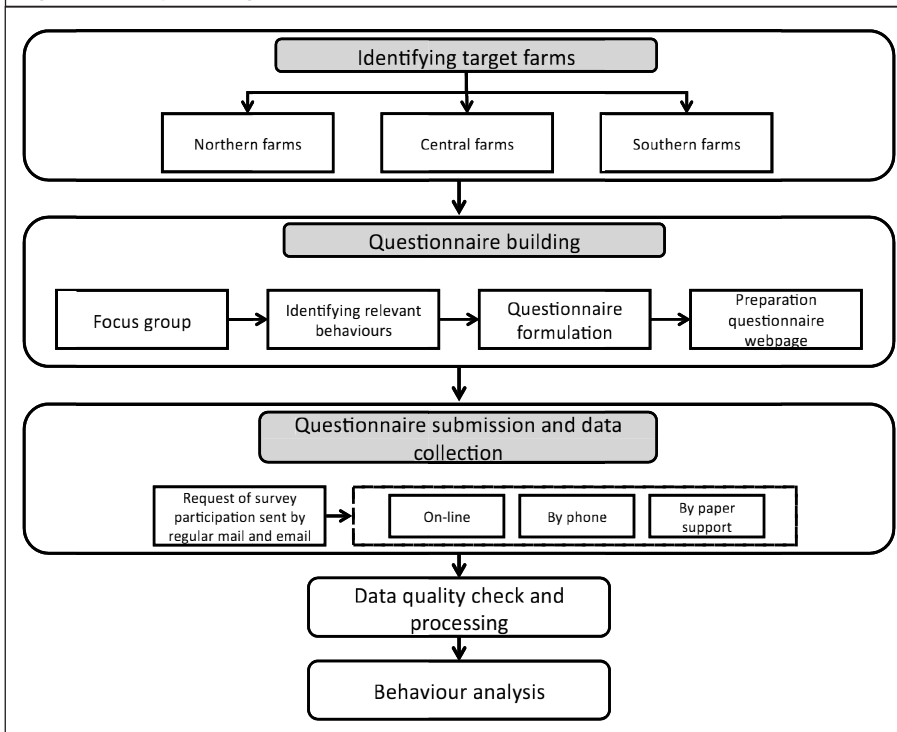
The contributions of this paper are twofold. First, it provides an understanding of the determinants of durum wheat farmers' intentions to modify their behaviour in the context of the forthcoming 2014-2020 CAP reform. Secondly, the relationships between TPB predictors and intention to modify their behaviour (i.e. change in the durum wheat acreage and maintenance of at least 7% of the arable land as an EFA) will be addressed, justified, and empirically tested using structural equation modelling (SEM) technique.

# 3. Material and Methods

## 3.1. Design and sample

A survey was conducted from June to July 2013 on a sample set of farmers involved in the pasta supply chain producing durum wheat in Italy. In particular, all of the contacted farmers signed contracts with the world's largest pasta producer. Contract farming establishes the technical and agronomic criteria for growing and delivering durum wheat

Figure 1 - *Analysis design.*



ferent steps, starting with the organisation of a preliminary focus group of 6 participants (4 farmers, 1 food industry representative and 1 agronomist) to identify the main issues perceived by durum wheat producers regarding the new CAP reform (Fioravanzi, 2013). The focus group identified the relevant behaviours related to CAP reform to be tested with statistical analysis. Then, the questionnaire, based on the TPB constructs, was defined and sent to the farmers by regular and electronic mail. In the beginning of the questionnaire, we emphasised a request of participation with the explanation of the study's aim and the instructions to fulfil the questionnaire to prepare and commit the farmers for the survey. We offered farmers three ways to fill in the questionnaire: by a specific webpage developed by Google Doc®, by phone through direct interview, and by paper questionnaire to return via regular mail.

A total of 73 questionnaires were completed, 16 by paper and 57 on-line questionnaire; no farmers decided to reply by

with a specified quality as well as price. Most of these farms belongs to producers' organisations (POs) which represent the main interface between farmers and industry. Through the pasta industry and POs contacts, we have identified 211 durum wheat producers that were formally involved in the supply chain of the world's largest pasta industry, distributed uniformly in the three geographical areas of Italy, i.e., North, Centre and South.

As described in Figure 1, this survey was conducted in dif-

phone interview. After two incomplete questionnaires were removed, the final sample consisted of 71 respondents. The sample set was almost equally distributed between the three geographical areas (Table 1).

Most of the farms were specialised in arable crops, particularly cereal production, while 63% of the farms belonged to POs. The farms that were surveyed in Central Italy were larger than those in the Northern and Southern regions. As shown in Table 1, their size in terms of Utilised Agricultural Area (UAA) is much larger than the average size of farms specialised in field crops in Italy (i.e. 13 ha). The percentage of durum wheat surface on total UAA is on average 43% for the sample, which is higher than the Italian average (29%). On average, 40% of the cultivated land was rented, with a greater incidence in Northern and Central Italy. This figure is slightly higher than the Italian average data for farms with durum wheat production (31%). Approximately 35% of the total revenue is represented by

Table 1 - *Description of the main characteristics of the sample set and Italian farms producing durum wheat.*

| Description | Sample | | | | Italy | | | |
|---|---|---|---|---|---|---|---|---|
| | North | Centre | South | Total | North | Centre | South | Total |
| No. of durum wheat farms | 21 | 29 | 21 | 71 | 14,718 | 31,818 | 156,254 | 202,790 |
| - Specialised in cereals | 17 | 22 | 20 | 59 | n.a. | n.a. | n.a. | n.a. |
| - Belonging to the Producers' Organisation | 16 | 16 | 13 | 45 | n.a. | n.a. | n.a. | n.a. |
| Utilised Agricultural Area (UAA, average ha) | 114.6 | 212.6 | 71.3 | 141.8 | 13.4 [a] | 14.5 [a] | 11.5 [a] | 12.8 [a] |
| Durum wheat surface per farm (average ha) | 23.1 | 94.8 | 45.3 | 80.4 | 8.0 | 9.9 | 6.3 | 7.0 |
| % Rented agricultural land on total UAA | 36.1 | 58.3 | 19.7 | 40.4 | 44.3 | 24.7 | 21.7 | 31.4 |
| % Durum wheat surface on total UAA | 20.2 | 44.6 | 63.6 | 43.0 | 5.5 [a] | 34.9 [a] | 52.5 [a] | 28.9 [a] |
| % Single farm payment of total revenue | 29.1 | 31.1 | 46.8 | 35.1 | n.a. | n.a. | n.a. | n.a. |
| % Durum wheat revenue of the total revenue | 18.8 | 45.0 | 59.2 | 41.5 | n.a. | n.a. | n.a. | n.a. |
| Farmer age (average) | 50.6 | 47.1 | 53.3 | 50.1 | 62.9 [a] | 62.4 [a] | 58.5 [a] | 61.5 [a] |
| Distance from milling plant (Km) | 129.1 | 87.6 | 172.2 | 124.9 | n.a. | n.a. | n.a. | n.a. |

the single farm (decoupled) payment, demonstrating the high level of dependence of these farms on public subsidies. The introduction of more balanced CAP payments could strongly affect farms' revenues and, consequently, investments. The high percentage of durum wheat revenue and cultivated surfaces of the total, reflects the high degree of specialisation, particularly in the farms of Central and Southern Italy. In this sample, the farmer's average age is approximately 50 years, which is lower than the average age of Italian farmers producing durum wheat (62 years). It can be concluded that the surveyed farms are larger, more specialized in the production of durum wheat, managed by farmers younger than the national population. These differences are likely to be influenced by the sampling criteria, i.e. farms with contractual agreements with the food industry; indeed, vertically integrated farms are more likely to be larger and managed by younger and trained managers than the non-integrated ones.

## 3.2. TPB model measures

The questionnaire items were defined considering a) Ajzen's conceptual and methodological considerations for constructing a TPB questionnaire (Ajzen, 1991; 2006), b) previous findings on similar topics (Beedel and Rehman, 2000; Corbett, 2002; Fielding *et al.*, 2008; Wauters *et al.*, 2010; Hansson *et al.*, 2011), and c) the preliminary focus group (Fioravanzi, 2013). After having explained in detail the 2014-2020 CAP reform in terms of regionalisation and greening commitments, two behaviours were analysed: 1) the change in the durum wheat acreage as a response to the regionalisation of direct payments and greening commitments (e.g., crop diversification), and 2) the maintenance of at least 7% of the arable land as an EFA. The participants received a questionnaire containing items measuring the model variables across these two behaviours: attitudes, subjective norms, perceived behavioural control (PBC), behavioural intentions, as well as moral obligation and past behaviour for EFA requirement. All of the items were scored on a 7-point Likert scale (1="totally disagree", 7="totally agree").

Four semantic items were formulated to measure the attitude towards the change in durum wheat acreage (e.g., "A possible change in the durum wheat acreage to diversify the farm's activity in response to the new CAP reform is: bad – good"), the subjective norms were assessed by six items (e.g., "The producers' organisation that I belong to expects me to change the durum wheat acreage"), three items measured the PBC (e.g., "I believe that changing the durum wheat acreage of my farm is possible"), and two items assessed intentions (e.g., "I intend to change the durum wheat acreage").

Regarding the EFAs, attitudes were assessed using four semantic differential items (e.g., "Maintaining at least 7% of the arable land as an EFA is negative – positive for the environment"), eight items assessed the subjective norms (e.g., "The mills and the food industry expect me to main-

tain at least 7% of the arable land as an EFA"), three items measured the PBC (e.g., "Whether I maintain at least 7% of the arable land as an EFA is a decision that depends entirely on me") and two items measured intentions (e.g., "I intend to maintain at least 7% of the arable land as an EFA"). A measure of perceived moral obligation (Beedel and Rehman, 2000; Corbett, 2002; Fielding *et al.*, 2008) was added to the TPB with two items (e.g., "I believe that maintaining at least 7% of the arable land as an EFA is fair for future generations"). A variable measuring past behaviour was also modelled to consider farmers that have already EFA features on their arable land. The respective single-item measure in the survey questionnaire was: "My farm is already maintaining part of its arable land as an EFA".

The questionnaire also included items covering aspects related to farm characteristics (e.g., farm size, farm location, crop cultivation, etc.), and other socio-economic aspects (e.g., % durum wheat revenues of the total farm revenues, % of single farm payment of total revenue, etc.), in order to monitor their effect on behavioural intentions.

## 3.3. Data analysis

We tested the hypothesis specified in Section 2 by applying an extended version of the TPB model, as defined by Ajzen (1991), where intention is determined by attitudes, subjective norms, PBC, and other socio-economic aspects, and where attitudes towards the maintenance of the EFAs are influenced by farmers' moral obligations. A SEM technique was employed on the data that were collected to test for the relative importance of intention determinants in the two considered behaviours. SEM determines the specifications of the model structure with both latent and observed variables; the latent variables, i.e., abstract phenomena that cannot be directly measured by the researcher, have been analysed using confirmatory factor analysis (CFA) (Byrne, 2010). CFA, often referred to as the measurement model, is used when the researcher has some knowledge of the underlying latent variable structure or wishes to evaluate a priori hypotheses driven by theory. The internal consistency of the latent variables has been assessed by Cronbach's alpha coefficient. The relationship between the latent variables identifies the structural model. Using SEM it is possible to examine the influence of several variables on several other variables, according to a specified model. In SEM exogenous latent variables (i.e. independent variables) "cause" fluctuations in the values of other latent variables in the model (Byrne, 2010). In the case studied, subjective norms, PBC, moral obligation and other background variables, such as farmers' age, are examples of such external factors. Endogenous latent variables (i.e. dependent variables) are influenced by the exogenous variables in the model either directly or indirectly, i.e. mediated by other (endogenous) variables. The endogenous latent variables in the tested models were intention and attitude (this latter only for the EFA model). Fluctuation in the values of endogenous variables is explained by the model (Byrne, 2010). Thus, the w-

hole TPB can be tested in relation to the dataset in one analysis. The use of different goodness-of-fit indices is generally recommended to test how well the observed data fit the model. The model fit was assessed with chi-square normalised by the degrees of freedom ($\chi^2$/df), comparative fix index (CFI), the Tucker-Lewis Index (TLI), and root mean square error of approximation (RMSEA). An adequate model fit is obtained when the $\chi^2$/df is < 2, the CFI and TLI are > .90 and the RMSEA < .08, while a superior fit is obtained when the $\chi^2$/df is close to 1, the CFI and TLI are > .95 and the RMSEA is < .05 (Byrne, 2010). The coefficient of determination R-square was used to measure the explained variance of the endogenous variable (i.e., intention). The models were estimated using maximum likelihood procedures. To make sure that the overall fit was not inflated because of the small sample size relative to the degrees of freedom of the model, we performed a model-based bootstrapping simulation (Yuan and Hayashi, 2003; Byrne, 2010). Bootstrapping methods are re-sampling simulations with repetition from the initial collected sample. The main advantage of bootstrapping, in general, is that it allows the researcher to assess the stability of parameter estimates, providing a mechanism for addressing situations where the statistical assumptions of large sample size and multivariate normality may not hold (Byrne, 2010). Bootstrapping is widely used with path modelling and SEMs, as these models usually are associated with many degrees of freedom and therefore require a larger sample size than the collected sample (Dentoni *et al.*, 2012). Indeed, the strongest advantage of bootstrapping in SEM is "its 'automatic' refinement on standard asymptotic theories (e.g., higher-order accuracy) so that the bootstrap can be applied even for samples with moderate sizes" (Byrne, 2010, p. 332). In this study, a model-based bootstrapping simulation increasing the sample up to one thousand repetitions leaves the overall fit of the model still acceptable on the basis of the chi-square, RMSEA, CFI and TLI.

## 4. Results

## 4.1. Descriptive analysis

The questionnaire was divided into three parts. The first part aimed to identify the level of the farmers' knowledge regarding the new CAP and the perception of its effect on farm management; the second part referred to the individual prediction of the durum wheat acreage change, while the last part aimed to collect information of the impact of the greening measures, particularly the EFA.

The respondents reported a moderately low level of knowledge regarding the new CAP reform. Table 2 shows that farmers believe that the new reform will mostly affect the land value, farm labour and input use. The beliefs of the modifications of the input use (labour included), significantly below the value 4 ("no variation"), as well as the durum wheat acreage change (although not significantly below the value 4), indicate that the farmers expect to reduce rather than increase the investments in durum wheat production and in the level of input in response to the CAP reform. Farmers foresee a positive change (although not sig-

**Table 2 -** *The perceived effects of the new CAP.*

| Item | Mean (SD) | p value [c] |
|---|---|---|
| Self-reported level of knowledge regarding the new CAP [a] | 3.62 (1.60) | 0.049 |
| How do you believe that the CAP reform will affect the durum wheat acreage? [b] | 3.85 (1.13) | 0.252 |
| How do you believe that the CAP reform will affect the input use? [b] | 3.70 (1.26) | 0.052 |
| How do you believe that the CAP reform will affect farm labour? [b] | 3.52 (1.21) | 0.001 |
| How do you believe that the CAP reform will affect the fallow areas? [b] | 4.23 (1.46) | 0.196 |
| How do you believe that the CAP reform will affect the land value? [b] | 3.49 (1.31) | 0.002 |

[a] Scale: 1 ("worst") – 4 ("moderate") – 7 ("excellent").
[b] Scale: 1 ("strong reduction") – 4 ("no variation") – 7 ("strong increase").
[c] One-sample t-test on value 4 ("moderate" or "no variation").

**Table 3 -** *Questionnaire items of Behaviour 1 "Change in the durum wheat acreage", mean and standard deviation (in parentheses).*

| Items | Intention | Attitude | Subjective norms | PBC |
|---|---|---|---|---|
| Cronbach's alpha | 0.78 | 0.71 | 0.91 | 0.70 |
| I intend to change the durum wheat acreage [a] | 2.96 (1.71) | | | |
| I am sure I will change the durum wheat acreage [a] | 1.83 (1.96) | | | |
| The change in the durum wheat acreage is bad (1) – good (7) | | 3.92 (1.90) | | |
| The change in the durum wheat acreage is unrealistic (1) – realistic (7) | | 3.62 (1.72) | | |
| The change in the durum wheat acreage is not profitable (1) – profitable (7) | | 3.42 (1.49) | | |
| The change in the durum wheat acreage is negative (1) – positive (7) for the environment | | 4.45 (1.62) | | |
| Other farmers expect me to change the durum wheat acreage [a] | | | 2.70 (1.62) | |
| The mills and the food industry expect me to change the durum wheat acreage [a] | | | 2.99 (1.71) | |
| The public authorities expect me to change the durum wheat acreage [a] | | | 3.49 (1.84) | |
| The cooperatives and Producers Organisations expect me to change the durum wheat acreage [a] | | | 2.80 (1.62) | |
| The agronomists expect me to change the durum wheat acreage [a] | | | 2.90 (1.68) | |
| Other durum wheat producers will change their durum wheat acreage [a] | | | 3.55 (2.00) | |
| I think that changing the durum wheat acreage is possible [a] | | | | 4.04 (1.86) |
| My skills and knowledge do not allow me to change the durum wheat acreage [a] | | | | 3.52 (2.01) |
| Machinery and structural endowments do not allow me to change the durum wheat acreage [a] | | | | 3.77 (1.95) |

[a] Scale: 1 ("totally disagree") – 7 ("totally agree").

nificantly above the value 4) in fallow areas, i.e., areas that are set aside from agricultural production. Thus, farmers perceive that the greening will negatively affect the productive land availability. Given a supposed reduction in the level of subsidies and farm margins, the respondents have indicated a significant land value reduction in response to the new CAP (Table 2).

We first investigated the influence of the new CAP on durum wheat cultivation (Behaviour 1). Farmers are generally not willing to significantly modify the current situation, as shown by the intention items in Table 3. This result may mask the intention to maintain the status quo in the short term, at least until the CAP reform enters into force. A likely change in the durum wheat acreage is perceived to reduce farm wealth. A modification in durum wheat cultivation is evaluated as a moderately unprofitable and unrealistic solution with a negative effect on farm equilibrium. However, farmers are aware that a change (in particular a reduction) in durum wheat cultivation can engender positive effects for the natural environment due to the likely reduction in the use of fertilisers and pesticides. The role of other subjects in the durum wheat cultivation decisions is perceived by farmers as weak. Only the expectations of public authorities and the behaviour of other specialised farmers are moderately perceived by the respondents. Finally, the PBC items also indicate the presence of barriers (e.g., lack of knowledge and experiences, fixed capital endowments, etc.) that may reduce the willingness to change durum wheat production. The reliabilities of the scales in the measurement model are confirmed by Cronbach's alpha coefficient values, which were higher than the recommended level of 0.70; in other words, the type and the number of items included in the analysis provided an accurate measure of the constructs.

Then, we assessed the intention to maintain at least 7% of the arable land as an EFA (Behaviour 2), which is considered the most costly greening measure included in the CAP reform (Schultz *et al.*, 2014; Matthews, 2013). Farmers have expressed a low intention to adopt the new agro-environmental measure (items scores lower than 2.6), even though they believe that the EFA is "positive" for the environment (Table 4). The attitude towards the behaviour is generally negative; although durum wheat producers believe that they would provide public goods by maintaining at least 7% of the arable land as an EFA (i.e., is "positive" for the environment), they also note that this measure could have negative consequences on farm profitability and be unrealistic. This result is not contradictory, while suggesting that the

farmers' greatest concern is the supposed economic losses from the reduction of productive arable land and not the uncertainty of the positive externality generated. According to the subjective norm items, farmers perceive that public authorities and consumers/society expect them to adopt the greening EFA measure. From the farmers' point of view, the public authorities (e.g., the European Union and regions) keep the role of agricultural policy makers and controllers, while society is the end-user of their environmental services provision. The items measuring the moral obligation support this consideration: most of the respondents believe in the relevance of the EFA for future generations and society.

The scores of the other subjective norm items are on the negative side of the scale, indicating that farmers perceive that family, industry, agronomists, POs and other farmers would not expect them to perform the behaviour. However, the mean

Table 4 - *Questionnaire items of Behaviour 2 "Ecological focus area", mean and standard deviation (in parentheses).*

| Items | Intention | Attitude | Subjective norms | PBC | Moral obligation | Past behaviour |
|---|---|---|---|---|---|---|
| Cronbach's alpha | 0.95 | 0.81 | 0.89 | 0.75 | 0.94 | - |
| I intend to maintain at least 7% of the arable land as an EFA [a] | 2.59 (2.00) | | | | | |
| I'm sure that I will maintain at least 7% of the arable land as an EFA [a] | 2.39 (1.96) | | | | | |
| Maintaining at least 7% of the arable land as an EFA is bad (1) – good (7) | | 3.79 (2.06) | | | | |
| Maintaining at least 7% of the arable land as an EFA is unrealistic (1) – realistic (7) | | 3.45 (1.67) | | | | |
| Maintaining at least 7% of the arable land as an EFA is unprofitable (1) – profitable (7) | | 2.41 (1.29) | | | | |
| Maintaining at least 7% of the arable land as an EFA is negative (1) – positive (7) for the environment | | 4.97 (2.04) | | | | |
| Other farmers expect me to maintain at least 7% of the arable land as an EFA [a] | | | 2.89 (1.74) | | | |
| My family expects me to maintain at least 7% of the arable land as an EFA [a] | | | 3.63 (2.02) | | | |
| The mills and the food industries expect me to maintain at least 7% of the arable land as an EFA [a] | | | 3.68 (1.86) | | | |
| The public authorities expect me to maintain at least 7% of the arable land as an EFA [a] | | | 4.87 (1.83) | | | |
| The cooperatives and POs expect me to maintain at least 7% of the arable land as an EFA [a] | | | 3.69 (1.78) | | | |
| The agronomists expect me to maintain at least 7% of the arable land as an EFA [a] | | | 3.54 (1.76) | | | |
| Other durum wheat producers will maintain at least 7% of the arable land as an EFA [a] | | | 3.25 (1.65) | | | |
| Consumers (society) expect me to maintain at least 7% of the arable land as an EFA [a] | | | 4.39 (1.98) | | | |
| I think that maintaining at least 7% of the arable land as an EFA is possible [a] | | | | 3.77 (2.11) | | |
| My skills and knowledge allow me to maintain at least 7% of the arable land as an EFA [a] | | | | 3.37 (2.09) | | |
| Whether I maintain at least 7% of the arable land as an EFA is a decision that depends entirely on me [a] | | | | 4.45 (2.20) | | |
| I believe that maintaining at least 7% of the arable land as an EFA is fair for future generations [a] | | | | | 4.24 (2.01) | |
| I believe that maintaining at least 7% of the arable land as an EFA is a commitment to society [a] | | | | | 4.10 (1.99) | |
| My farm is already maintaining part of its arable land as an EFA [a] | | | | | | 3.68 (2.69) |

[a] Scale: 1 ("totally disagree") – 7 ("totally agree").

scores of the subjective norms are higher than those of Behaviour 1, suggesting that farmers might require more participation by external subjects in making their EFA decision, such as family members, who may give suggestions on how implement (interpret) the EFA measure, and industry members or agronomists, who can provide technical advice. The P-BC items confirm that farmers believe to a lesser extent that their skills and knowledge allow them to maintain at least 7% of the arable land as an EFA. Nevertheless, farmers claim that this decision would be made autonomously. Finally, the single item on past behaviour shows that not all of the farmers are already maintaining part of the arable land as an EFA. The Cronbach's alpha coefficient values showed a good internal reliability of the constructs.

## 4.2. Factors affecting the behaviours

Figure 2 and Figure 3 show the results of the structural equation model predicting, respectively, the intention to 1) change the durum wheat acreage in response to the regionalisation of direct payments and greening commitments (e.g., crop diversification), and 2) to maintain at least 7% of the arable land as an EFA. The TPB model was tested for each behaviour.

The overall goodness-of-fit of the TPB model predicting the intention to change the durum wheat acreage (Behaviour 1), as measured by the fit indices, indicated a good fit to the data ($\chi^2$/df = 1.154; CFI = 0.957; TLI = 0.949; RMSEA = 0.047). The results show that the attitude, subjective norms and PBC, as well as other farms characteristics (i.e., the relative importance of the single farm payment, the age of the farmer, the % of rented agricultural area and the distance from the mill), explain 52% of the variance in the intention to change the durum wheat acreage in response to the CAP reform (Figure 2). The subjective norms are the main determinants of the intention ($\gamma$ = 0.62, p < 0.05), supporting H1b. This indicates that both the farmers' perception of social pressure (e.g., what the food industry, producer organisations, agronomists, etc., expect them to do about changing the durum wheat acreage) and descriptive norm (i.e., how other farmers would behave) significantly affect farmers' intention to change the durum wheat acreage. The other TPB variables are not significant predictors of behavioural intentions in the model; these findings are in contrast to H1a and H1c. In accordance with H4, the percentage of the single farm (decoupled) payment on the total revenue ($\gamma$ = 0.30, p < 0.05) plays positive and significant roles in influencing the intention to change the durum wheat acreage in response to the CAP reform. The percentage of rented agricultural land ($\gamma$ = 0.28, p < 0.01) and, marginally, the farm distance from the mill ($\gamma$ = 0.19, p < 0.10) are also positively influencing the farmers' behavioural inten-

tions. The farm's distance from the mill is positively correlated with the relative importance of the single farm payment ($\varphi$ = 0.26, p < 0.01) and negatively correlated with the percentage of rented agricultural land ($\varphi$ = -0.35, p < 0.01). The variables of attitude, PBC and subjective norms are all positively correlated, supporting the theoretical hypothesis of the TPB.

The estimated TPB model predicting the intention to maintain at least 7% of the arable land as an EFA (Behaviour 2) shows acceptable fit with the data ($\chi^2$/df = 1.387; CFI = 0.922; TLI = 0.908; RMSEA = 0.074). Attitude, subjective norms, PBC, moral obligation, past behaviour and other farms characteristics (i.e., the relative importance of the single farm payment, the relative importance of the durum wheat surface and revenue) accounted for 55% of the variance in the intention to maintain at least 7% of the arable land as an EFA (Figure 3). In this case, the farmers' attitude towards the behaviour, i.e., the positive or negative personal evaluation of maintaining the arable land as an EFA, is the main determinant of the intention ($\beta$ = 0.87, p < 0.05), supporting H1a. The other TPB variables are not significant predictor of behavioural intentions, contrasting with H1b and H1c. Consistent with H3, the past behaviour is a significant positive predictor of intentions ($\gamma$=0.21, p<0.05). The percentage of the durum wheat acreage positively affects the intention to maintain the EFA ($\gamma$ = 0.27, p < 0.10). The perceived moral obligation, i.e., the personal normative considerations felt by farmers with respect to future generations and society, strongly affects attitude ($\gamma$ = 0.88, p < 0.01). This result supports H2 suggesting that, rather than directly influencing intentions, the farmers who felt a self-generated personal moral obligation had more positive personal attitudes towards the behaviour, which significantly affects the intention to maintain at least 7% of the arable land as an EFA. The percentage of the durum wheat surface and the percentage of the durum wheat revenue are positively correlated ($\varphi$ = 0.62, p < 0.01). Hence, the moral obligation construct and the other TPB variables are all positively correlated.



Figure 2 - *Structural equation model results, behaviour 1 "Change in durum wheat acreage": R-squared, standardised coefficients, correlations and standard errors (in parenthesis).*
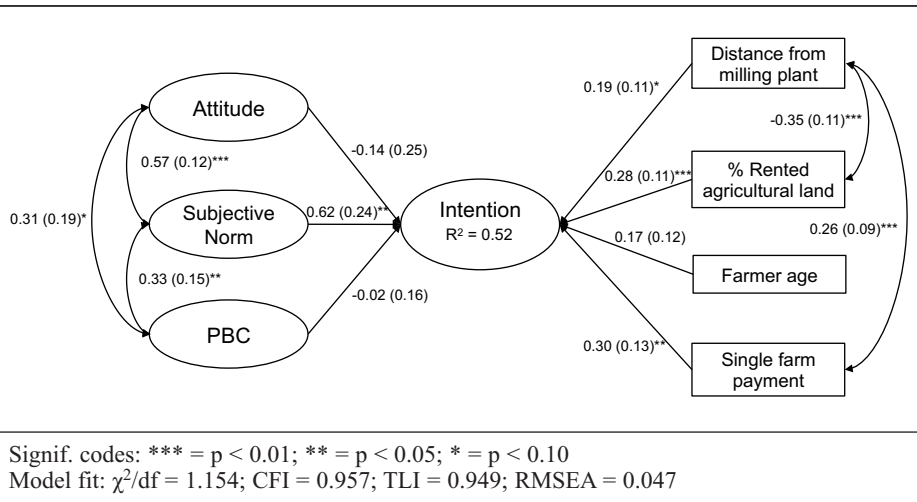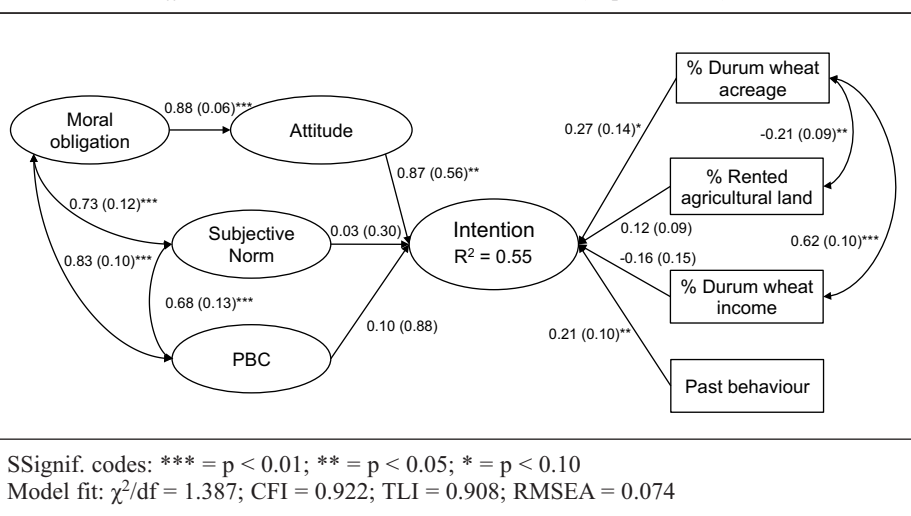
Signif. codes: *** = p < 0.01; ** = p < 0.05; * = p < 0.10
Model fit: $\chi^2$/df = 1.154; CFI = 0.957; TLI = 0.949; RMSEA = 0.047

Figure 3 - *Structural equation model results, behaviour 2 "Ecological focus area": R-squared, standardised coefficients, correlations and standard errors (in parenthesis).*



SSignif. codes: *** = p < 0.01; ** = p < 0.05; * = p < 0.10
Model fit: $\chi^2/df$ = 1.387; CFI = 0.922; TLI = 0.908; RMSEA = 0.074

## 5. Discussion and Conclusions

The results show that attitude, subjective norms, PBC and other farms characteristics accounted for 52% and 55% of the variance in the intention, respectively, to change the durum wheat acreage and to maintain at least 7% of the arable land as an EFA. These results are satisfactory because a meta-analysis of 185 independent studies found that the TPB variables, on average, accounted for 39% of the variance in intention (Armitage and Conner, 2001). Hence, past applications to the farming and agri-environmental contexts suggest that the TPB variables explain from 23% to 79% of the variance in intention (Corbett, 2002; Sharifzadeh *et al*., 2012; Fielding *et al*., 2008; Colémont and Van den Broucke, 2008; Wauters *et al*., 2010; de Lauwere *et al*., 2012).

The analysis of the intention determinants to the change the durum wheat acreage has shown that farmers are more affected by stakeholders such as the food processing industry, producers' organisations and public authorities, than believed. This result is in accordance with that of de Lauwere *et al*. (2012), who suggested that pig breeders were generally unaware of the influence that social norms have on them. Moreover, the fact that all of the surveyed farms were strongly dependent on public subsidies, and thus on public authorities opinions, and were vertically integrated, and thus affected by POs and food industry strategies, justifies this result. This study also confirms the "neighbour behaviour" effect, suggesting that farmers' behaviour may be affected by the behaviour of people in their social environment (i.e., other durum wheat producers). Studies in other social contexts have proven that descriptive norms may influence behaviour and that people are generally inclined to conform to behaviours that are similar to those of others (de Lauwere *et al*., 2012). The results confirm the significant effect of the single farm payment level on the intention to modify the durum wheat acreage. As the direct observation of farm management also reveals, farmers do not consider decoupled payments as an external component of the farm's investment decision-making process. In-

stead, these payments are considered part of the farm activity financial sources, and their modification can thus affect the final input (e.g., land) allocation. Nevertheless, many CAP assessment studies assume that decoupled payments have no influence on the production plan (Arfini, 2005). This study shows that the single farm payment is a key variable in farmers' behaviour that should not be excluded from future studies. We have also demonstrated that the intention to change the durum wheat acreage is positively affected by the farm's percentage of rented land. The percentage of rented agricultural land contributes to making farm planning and land allocation more flexible. Thus, farmers with a higher incidence of rented land may react more dynamically and adapt their choices more quickly to the new CAP.

In line with other studies (Schultz *et al*., 2014; Matthews, 2013), we found that converting arable land into EFA, although evaluated as a positive initiative for enhancing the public good provision, is perceived by farmers as a high-cost measure that can depress the farm economic performance. Similarly to Schultz *et al*. (2014), the results show that farmers who have E-FA features on their land are more willing to maintain the EFA in the future. The farmers' attitude is the main determinant that positively affects the intention to maintain the EFA land. Thus, the awareness that farm investment in EFA can protect and improve rural environmental quality is the key element that may support the farmers' decision to dedicate at least 7% of the arable land to areas with particular environmental features. As suggested by other authors, a measure of moral obligation may contribute to an independent effect in the prediction of behavioural intentions for certain forms of social behaviour (Sparks *et al*., 1995; Beedell and Rehman, 2000). In this study, however, the measure of moral obligation did not prove to be a significant direct predictor of intention. Perceived moral obligation may be less important in situations in which behaviour is compulsory (de Lauwere *et al*., 2012), as for the commitment to an EFA. Nevertheless, in this study the farmers who felt a self-generated personal moral obligation had more positive personal attitudes, which significantly affected the intention to dedicate at least 7% of the arable land to an EFA. The farm's level of specialisation can explain the relationship between the percentage of durum wheat acreage and the intention to maintain arable land as an EFA, with the supposed better knowledge of the CAP reform and the related criteria of exclusion (Matthews, 2013). Larger and more specialised farms, for example, may already have part of their arable land with the natural elements that are required by the EFA measure (e.g., strip and buffer areas, environmental set-aside, etc.).

As suggested by Ajzen (1991), the TPB may provide suggestions for possible interventions aiming to stimulate the behaviour. In particular, the analysis clearly indicates the need

for a better understanding of farmers regarding the new CAP tools. Although the questionnaire provided farmers with some basic information regarding the CAP reform, it is possible that most of the farmers' concerns towards the greening measures are due to an incomplete understanding of the new policy instrument. Thus, efforts to improve not only the farmers' knowledge of the greening agricultural payments *per se* but also their awareness of the rationale for greening payments, including the new role that the society requires of agriculture, is a central issue that must be addressed by both the policy makers and the food chain leaders. Although this would require many efforts in terms of time and money, public training programs enabling farmers to acquire the necessary complete understanding of the new policy design are highly recommended. Given the low intention of durum wheat farmers to implement the EFA measure, a peripheral route of communication using implicit persuasion techniques, which is recommended when farmers are less motivated to perform the desired behaviour, may be more appropriate (de Lauwere *et al.*, 2012). Farms are not isolated entities but rather participate with other subjects, including cooperatives, POs and industry, in enhancing the competitiveness path of each food chain. The role of cooperatives, POs and food industry and their relationships with farmers is important (e.g., in shaping their intention to modify the durum wheat production) but should be improved. This research also shows that the success of many agri-environmental policy tools will be limited unless we succeed in shaping more positive farmer attitudes towards ecological measures. Indeed, efforts to solve technical difficulties when adopting eco-friendly farming practices are likely to have little effect when farmers' attitudes remain negative. This research may suggest also that the policy makers and Member States should calibrate the CAP intervention (regionalisation, convergence, coupled payments and green payment) considering the territorial and farm type characteristics. For instance, adopting more flexible management prescription, such as allowing farmer to rotate and choose annually the EFA land, will significantly raise the acceptance of the greening (Schultz *et al.*, 2014).

Recent studies have suggested that the new CAP reform will mainly affect the arable crop sector with non-negligible consequences on durum wheat production (Solazzo *et al.*, 2014; Schultz *et al.*, 2014; Was *et al.*, 2014). Even though this study doesn't provide predictions on durum wheat producer response to the new CAP reform in terms of land allocation or gross margin modifications, it provides ideas and suggestions to develop new opportunities for farmers and pasta supply chain. More specifically, it points out that the cooperation along the chain is a strategic objective for improving and enhancing the agricultural policy understanding, the implementation of the greening measures at farm level and the ecological performances of the supply chain. A collective strategy may mitigate or eliminate the costs of a likely reduction in durum wheat production. This could be done, for instance, through a better productive and economic coordination, by

disseminating the knowledge about green "marketing" instruments and more advanced agronomic techniques, and through a synergic application of the greening considering the interests of all participants in the supply chain.

A number of limitations in the current study must be acknowledged. First, the limited number of respondents, given a relatively low response rate (35%), is a major limitation of the current study. Although the collected responses were equally distributed across the three geographical areas (North, Centre and South Italy), only a consistently larger sample would enable us to draw solid conclusions regarding the causal linkages in the TPB model. Moreover, our analysis has only modelled self-reported behavioural intentions. The triangulation of these results with on-field observations may provide further consistent results. Finally, although these results cannot be generalised to the broader population, they provide a comprehensive picture of the main determinants that policy makers and food chain operators must address to improve the durum wheat producers' adoption of the new CAP reform.

## Acknowledgments

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