The effects of CAP greening on specialised arable farms in Italy*

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Jel classification: Q12, Q18

Abstract

In the CAP 2014-2020 a component of the total amount of direct payments is linked to the remuneration for specific environmental actions required to farmers. This paper analyses the effects of the greening measures on farm income in Italy ,focusing on two specialised farming systems which will be largely affected by the introduction of green payments: the maize production system, mainly concerning Northern regions, and the durum wheat production system, prevailing in Central and Southern regions. The effects of greening requirements were determined, based on the Italian FADN data, by looking at the change of total Gross Margin deriving from the introduction of crop diversification and Ecological Focus Areas requirements. These changes were assessed for 16 "representative farms" where these specialised systems prevail. The paper shows that greening requirement will probably have some significant negative effects, in terms of gross margin, especially for farms specialised in maize production and located in the plains. Data also indicates that for farms specialised in maize production, the green payments do not generally compensate the reduction of farm gross margin, while for farms specialised in durum wheat, the green payments would cover the reduction of farm gross margin caused by the introduction of the new environmental obligations.

Keywords: *CAP reform, direct payments, CAP greening, Italian farming systems, FADN.*

Résumé

Dans la PAC 2014-2020, une composante du montant total des paiements directs est liée à la rémunération des services spécifiques en faveur de l'environnement demandés aux agriculteurs. Dans ce travail, nous allons analyser les effets des mesures de verdissement sur le revenu des exploitations en Italie, en mettant l'accent sur deux systèmes de culture spécialisés qui seront considérablement touchés par l'introduction des paiements verts: le système de production du maïs, qui intéresse tout particulièrement les régions du Nord, et celui du blé dur, répandu surtout dans les régions centrales et du Sud de l'Italie. Les effets des exigences du verdissement ont été évalués sur la base des données de la FADN italienne, en examinant le changement de la marge brute totale, déterminée par l'introduction de la diversification des cultures et des Surfaces d'intérêt Ecologiques. Ces changements ont été estimés pour 16 "exploitations représentatives " où prédominent des systèmes spécialisés. Les exigences du verdissement vont probablement avoir des effets négatifs importants en termes de marge brute, surtout dans le cas des exploitations spécialisées dans la culture du maïs et situées dans des plaines. Les résultats de l'étude indiquent également que pour les exploitations spécialisées dans la production de maïs, les paiements verts ne compensent généralement pas la réduction de la marge brute de l'exploitation alors que pour les exploitations spécialisées dans la production de blé dur, les paiements verts semblent couvrir la réduction de la marge brute de l'exploitation causée par l'introduction des nouvelles obligations environnementales de la PAC.

Mots-clés: Réforme de la PAC, paiements directs, verdissement de la PAC, systèmes de culture italiens, FADN.

1. Introduction

The logic underlying the greening of direct payments in the most recent CAP reform is enhancing the provision of public goods through the agricultural activity. Quite straightforwardly, a component of the total amount of direct payments becomes the remuneration for specific actions required to farmers: if they pursue these specific actions (or other considered equivalent) they receive that remuneration; if not, they do not receive that remuneration and sanctions may be applied. The long path that led to this decision moves from two different origins: on the one hand, the acknowledgement of the rapid post-war transformation of agriculture in Europe that entailed many environmental consequences, especially in terms of biodiversity reduction and pollution increase (Garrod, 2009); on the other hand, the need to justify the large amount of direct payments granted to farmers with no specific commitment on their behalf (Anania, 2013).

The first step towards the reduction of the environmental pressure of agricultural activities has been taken by the second pillar of the CAP, thanks to the agro-environmental measures. An attempt to justify direct payments as remuneration for the provision of public goods in agriculture came with the conditionality (Matthews, 2013). With the greening of direct payments, the EU keeps following the same path: a mandatory set of requirements to meet in order to "gain" the full amount of direct payments.

The fulfilment of environmental constraints implies a change in land management and use of techniques that have consequences on the cost structure for farmers. Despite the optimistic views of the Commission on the impact of greening on production costs, account should be taken of the specific production systems to address this issue.

In this paper we shall carry out a preliminary assessment of greening cost for farms in Italy, focusing on two specific production systems: maize (mainly in Northern Italy) and durum wheat (in Central and Southern Italy). First, our aim is to quantify the farms and the agricultural area in Italy concerned by the mandatory greening requirements in order

** A previous version of this paper was presented at the EAAE 2014 Congress 'Agri-Food and Rural Innovations for Healthier Societies', 26th- 29th August 2014 in Ljubljana, Slovenia.*

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to identify the "representative farms" for each region where the two production systems prevail. Secondly, based on data from the Italian FADN, the change in the total gross margin value, due to the change in the farm specialisation, is calculated. Finally, the change of gross margin (which is usually a loss, resulting from the obligation to diversify specialised systems) is compared with the share of direct payments related to the fulfilment of the green payment requirements. This analysis shows that, as regards the farms specialised in maize production, the loss of income due to the increase in specific costs (incorporated in the gross margin value of each crop) is higher than the share of direct payments representing the "remuneration" of the public good produced (green measures). In contrast, for farms specialised in durum wheat, it seems that the green payments would compensate the reduction of gross margin deriving from the new environmental obligations.

After a short description of the greening of direct payments and of the related debate (section 2), section 3 briefly reviews the current literature on the economic effects of greening across the EU. Section 4 focuses on the objectives and methodology of the paper, while the results are illustrated and discussed in section 5. In Section 6 some conclusions are presented.

2. The greening of direct payments

The objective of greening direct payments is not new to the CAP: since Agenda 2000 much effort has been put in justifying direct support and CAP ,in general, as a sustainable policy capable of improving the environment and the synergistic connection between agricultural activities and environmental concerns (European Commission, 1992; European Commission, 1996; Ahner, 2001)[1]. Nevertheless, for the first time in the CAP 2014-2020 (European Parliament and Council, 2013) an explicit attempt to remunerate public goods produced by farmers through a specific component of the direct payments has been introduced. The so-called green payment is a share of the total potential payment that farmers may receive from the CAP in exchange for the provision of public goods. According to the new regulation on direct payments, 30% of the total amount of resources devoted to direct payments in each Member State is conditioned to the respect of three mandatory requirements: to maintain on-farm permanent grassland and, limited to farms specialised in arable crops, to diversify crops in order to improve biodiversity and to devote 5% of the UAA to "Ecological Focus Areas" (EFAs). Organic producers and farmers in the "small farmers" scheme are exempted from the obligations in order to receive green payments, while certification schemes and some voluntary agri-environment schemes that yield an equivalent or a higher level of benefit for the climate and the environment can be considered "equivalent" to the three greening obligations.

The requirements that may potentially have an effect, to a large extent, on farms' management and, indirectly, on farms' revenue, are the crop diversification requirement and the introduction of the Ecological Focus Areas (EFAs). Crop diversification applies to farms with arable land exceeding 10 hectares and it requires the presence of at least 2 crops on arable land between 10 and 30 hectares (the main crop should not cover more than 75% of the total arable land), and of at least 3 crops on arable land exceeding 30 hectares (the main crop should not cover more than 75% and the two main crops together should not cover more than 95% of that arable land)[2]. The EFAs requirement applies only to farms with at least 15 hectares of arable land. These farms shall ensure an EFA corresponding to at least 5% of the arable land[3]. The following land uses can be considered as EFA: fallow land, terraces, landscape features, buffer strips, areas with short rotation coppice with no use of chemical products, afforested areas, areas with catch crops and areas with nitrogen fixing crops[4]. Member States may decide to implement up to 50% of the EFA at the regional level in order to obtain adjacent ecological focus areas and may also decide to allow farmers whose holdings are in close proximity to fulfil this obligation on the basis of a collective implementation.

These new environmental requirements may be considered an effort to reduce the mono-cropping specialisation that has been the result of years of productivism and agriculture industrialisation and, to some extent, an attempt to pave the way to a new sustainable approach to produce agricultural products and food (Schmid *et al.*, 2012). The "agricultural practices beneficial for the climate and the environment" that have been introduced in the new regulation for direct payments (1307/2013) are a compromise between the original proposal of the Commission and the revisions proposed by the European Parliament, whose position was relevant in reviewing the original draft of the Commission (for a better understanding of the intense debate on this

[1] This new set of measures goes in the same direction of the cross-compliance being, as it is, a non-contractual and mandatory measure. At the same time, large efforts towards a more effective greening of the CAP have been pursued within the second pillar with the agro-environmental measures, based, on the contrary, on a contractual and voluntary approach.

[2] This requirement does not apply where more than 75% of the eligible agricultural area is permanent grassland, used for the production of grasses or other herbaceous forage or crops under water or a combination of these uses, provided that the arable area not covered by these uses does not exceed 30 hectares.

[3] In 2017, the Commission will present an evaluation report on the implementation of this requirement and the threshold could be increased from 5% to 7%.

[4] This requirement is not applied even where more than 75% of the eligible agricultural area is permanent grassland, used for the production of grasses or other herbaceous forage or cultivated with crops under water either for a significant part of the year and where more than 75% of the arable land is used for production of grasses or other herbaceous forage, land lying fallow, cultivated with leguminous crops or a combination of these uses. The requirement is though applied in cases where the arable area not covered by these uses would exceed 30 hectares.

matter, see Matthews 2012; 2013 and Bureau 2013). According to many authors, the result, is a "less green" CAP, but at the same time, it is acknowledged that simplification is aimed at "more manageable" measures (Bureau, 2013).

The main points of criticism on the greening measures in the academic environment are related to the environmental benefits that may result from this type of super-cross compliance, since the common rules are applied to the whole EU territory without considering the diverse characteristics of the different agro-ecosystems across Europe (Garrod 2009; Jambor and Harvey 2009).

In a paper published recently in *Science*, Pe'er *et al*. (2014) argue that, through the greening of direct payments, the European Union has lost an opportunity to design better guidelines to improve agricultural sustainability, since the new environmental prescriptions are so diluted that they are unlikely to benefit biodiversity. However, the authors maintain that the individual Member states can still use flexibility granted by the new CAP to design more effective national strategies aimed at protecting farmland habitats and at ensuring the long term provision of ecosystem services.

Similarly, a study by Westhoek *et al*. (2012), concluded that the introduction of the greening measures will not have a significant impact on the quality of the natural environment given that compliance applies only to 2% of the agricultural area in the EU. This study shows how the EFA requirement is potentially the most effective measure in providing highly valued public goods, but that this effectiveness could be increased by tailoring these measures to local conditions and, above all, by stimulating the implementation of green infrastructures at territorial scale through coordination and cooperation. In this perspective, Mahé (2012) maintains that the definition of the EFA should not apply to farming units but rather to a spatial grid. He also points out how the EFA can end up removing fertile soil from production while the exchange of entitlements and obligations would concentrate the EFA in areas of higher ecological value and lower fertility.

Matthews (2012 and 2013) underlines how greening would add costs to the farmers while their capacity to ensure measurable environmental benefits are rather questionable. Matthews also considers the attempt to green the direct payments as a way to avoid larger cuts to agriculture in the budget discussion, but the lack of serious cuts to payments, when the greening requirements are not met, undermines this assumption. In other words, no considerable savings would have been generated. At the same time, it would have been possible to green the CAP more effectively by enhancing the agro-environmental measures in Pillar 2 rather than greening Pillar 1.

One more sharp position has been expressed by Bureau (2013) that maintains that the CAP, particularly after the amendments by the European Parliament, will be less green in the future, above all due to the equivalence of national schemes with the greening measures. Indeed, national schemes are often voluntary and they cannot be considered equal to mandatory measures. Furthermore, the extension of the "green by definition" to all non-arable land and to the "small farmers" will also reduce the positive impact of the green measures.

According to several authors, in some Member States the greening measures partially overlap with a number of "Good Agricultural and Environmental Conditions" (GAEC). Thus, specific payments will be introduced for some practices which are already required without payment under cross-compliance, where the Member States have the potential to be tailored more specifically to local conditions (Hart and Baldock, 2011). In order to increase the effectiveness of the greening measures, a high implementation flexibility is also requested, to take account of locally specific issues and to allow flexible interpretation at farm level so as to achieve the expected outcomes. The need for an increasing flexibility of the measures was also recognised by the Groupe de Bruges (2012), according to which the greening rules "seem random, rigid, ill targeted and lack incentives for farmers to keep on improving their 'green' performance".

As regards the policy effectiveness, some authors argue that the greening as such is not cost-effective, since it would increase the administrative burden for farmers and the implementation costs for national authorities (Roza and Selnes, 2012). According to these authors, this would be legitimized only by substantial environmental effects which currently do not seem fully documented.

Finally, the shortcomings of the greening of direct payments identified by Mahé (2012) are related to the low requirements with respect to the existing practices (crop rotation and portion of utilized agricultural areas in ecological focus areas) and to the high cost of environmental bonuses due to their application methods (supplements to basic payment on all the utilized agricultural areas, without adjustment to shortfall).

3. The economic effects of greening

In the recent literature only a few works have explored the impacts of the greening measures on farm revenues. The first economic assessment was carried out by the European Commission (2011), where the effects of the new environmental obligations on the income of European farms were assessed through FADN data. In this assessment the effects of greening were estimated to be, on average, 43 Euros per hectare of potential eligible area. However, it was recognised that such a cost may vary widely according to the regions and farming systems, given the differences in land use and profitability as well as the specific situation of each farm. Based on this evaluation, in the EU-27, the greening measures would lead to 29% of farms having a cost between 15 Euros and 30 Euros per hectare, 4% having a cost higher that 200 Euros per hectare and about 21% of farms having no cost at all.

Several agricultural economists investigated the econom-

ic effects of greening in various Member States. Czekay *et al.* (2013) and W?s *et al*. (2014) analysed the effects of greening on Polish farms. Following an optimization model, the main outcome of these studies is that the majority of Polish farms are already complying with the new environmental requirements. For the remaining farms the fulfilment of the new requirements is mainly dependent on the reduction of UAA for the EFAs and on small changes in the cropping structure. This will have a negligible impact on farm income generated by the Polish agricultural sector. Similar results, with a different methodology, were obtained by Heinrich (2012) for the German farms. She worked on 18 farms covering most farm types in Germany, evaluating the greening effects on gross margins. All in all, the share of direct payments devoted to the greening measure is a strong incentive which encourages farmers to join the scheme and only farms with a high gross margin might turn down the support. Another study addressed the effects of greening on Cornish farms (Brown and Jones, 2013), focussing on dairy, mixed and upland farms. Semi-structured interviews were used in this study to investigate farmers' reaction to the greening measures. Conclusions indicated that these measures had a heavy impact on dairy farms, in particular on those which grew only one arable crop. Mixed farms were also considerably affected by the permanent pasture and crop diversification elements of greening, while upland farms were likely to remain largely unaffected.

As regards Italy, the effects of the post-2013 CAP Reform on farms' margin were evaluated by Arfini *et al*. (2013) through Positive Mathematical Programming. Following the simulation of these authors, based on FADN data of 460 farms located in the plain area of Emilia Romagna Region, the economic impact of greening (calculated as income foregone) in this area is on average 21 Euros/ha, corresponding to a reduction of only 1.5% compared to the baseline scenario. A Positive Mathematical Programming model was also used by Solazzo *et al*. (2014) to analyse the effect of the CAP reform 2014-2020 on processing tomato. This study shows that, whilst the convergence process will reduce considerably the profitability of this sector, the impact of greening requirements would not differ greatly compared to arable farms. Vanni *et al.* (2013) analysed in a previous study the impact of greening on farm gross margin for five Italian regions (Piemonte, Lombardia, Marche, Puglia and Basilicata), with a view to observing the possible effects of greening measures as proposed by the European Commission in 2011 in different arable farming systems across Italy. The study shows that the economic impact of greening vary to a large extent according to the characteristics of the farms, their location and their economic and physical size.

The present article adds to this literature featuring two steps of analysis. The first step relies on data from the sixth Italian agriculture census (farm universe) to estimate the potential number of farms affected by the greening measures (Vanni and Cardillo, 2013). Such elaborations aimed at identifying the structural features of the "representative farms" for the two main arable systems under study: maize and durum wheat. From there, we take a step forward using FADN data to calculate the change in the gross margin values following the implementation of greening and to compare these values to the green payments in order to assess the actual cost of greening on Italian arable farms.

4. Objectives and methodology

The paper focuses on two specialised farming systems that are likely to be affected to the greatest extent by the introduction of green payments in Italy: the maize system, localized mainly in Northern regions, and the durum wheat system, especially localized in Central and Southern regions. Tables 1 shows the regions selected for maize and wheat specialization respectively, as well as some features of the regional arable crops sector.

Table 1 - *The arable sector in selected Italian region.*

Farming system specialised in maize production				Farming system specialised in wheat[1] production			
Region	% of farms specialised in arable crops	% arable land/UAA	% maize /arable land		% of farms specialised in arable crops	% arable land/UAA	% wheat/ arable land
Piemonte	30.5	53.7	34.0	Marche	48.7	79.4	39.8
Lombardia	41.1	72.5	47.5	Molise	35.8	72.3	40.3
Veneto	53.7	70.2	50.3	Puglia	12.8	50.7	54.9
Friuli V.G.	60.1	74.3	49.1	Basilicata	36.4	60.2	46.0
Italy	23.7	54.5	16.0	Italy	23.7	54.5	28.0

[1] Common wheat and durum wheat.
Source: Istat, 6th Agricultural Census.

These eight regions were selected on the basis of the following criteria:

- The selected regions are particularly relevant in the arable crop sector in Italy, since they concentrate 53% of the Italian farms specialised in arable crops, totalling 60% of the arable crops area at the national level;
- The area share covered either by maize or wheat in these regions is generally well above the national average, determining a strong specialization of the arable farms in these two crops.

In addition, according to some recent simulations regarding the number of farms involved in the greening measures (Vanni and Cardillo, 2013), these regions proved to be potentially affected by the greening measures to a larger extent compared to other regions, due to both their higher average size and their strong specialization (see table 2).

The first step of our analysis was to identify the structural characteristics of these specialised farming systems in the different areas (mountains, hills and plains) for each region under study.

Since it was not possible to detect information about the

Table 2 - *Arable farms (%) affected by greening requirements in selected Italian regions.*

Farming system specialised in maize production					Farming system specialised in wheat[1] production				
Region	Crop div. only	EFA only	Crop div. and EFA	Total	Region	Crop div. only	EFA only	Crop div. and EFA	Total
Piemonte	3.2	11.6	6.9	21.8	Marche	3.3	9.1	4.1	16.4
Lombardia	4.4	17.5	12.9	34.8	Molise	6.2	11.3	4.7	22.2
Veneto	2.0	4.7	2.9	9.5	Puglia	8.4	5.0	11.0	24.3
Friuli V.G.	2.6	7.3	3.7	13.6	Basilicata	10.6	6.3	8.0	24.9
Italy	3.1	5.6	4.2	13.0	Italy	3.1	5.6	4.2	13.0

[1] Common wheat and durum wheat.
Source: Elaboration on Vanni and Cardillo (2013).

Table 3 - *Degree of specialization for farms affected by the crop diversification requirement in selected Italian regions.*

% of farms with maize cultivated on > 75% of arable land					% of farms with wheat cultivated on > 75% of arable land				
Region	Mountains	Hills	Plains	Total	Region	Mountains	Hills	Plains	Total
Piemonte	45.5	40.6	57.3	53.7	Marche	34.1	48.5	-	46.6
Lombardia	46.7	53.8	62.3	61.4	Molise	27.2	50.8	-	46.4
Veneto	92.6	74.1	64.2	65.5	Puglia	78.3	56.3	62.4	59.7
Friuli V.G.	100.0	66.5	60.1	61.5	Basilicata	24.3	52.2	50.7	48.1
Italy	4.9	4.1	35.7	18.0	Italy	22.7	35.7	20.8	28.1

Source: Elaboration on Istat, 6th Agricultural Census.

Table 4 - *The FADN sample: number of farms in selected Italian regions per altimetry.*

Farming system specialised in maize production					Farming system specialised in wheat production				
Region	Mountains	Hills	Plains	Total	Region	Mountains	Hills	Plains	Total
Piemonte	-	39	250	289	Marche	151	87	-	238
Lombardia	-	35	246	281	Molise		9	-	164
Veneto	-	24	369	393	Puglia	65	7	60	132
Friuli V.G.	-	23	101	124	Basilicata	141	4	-	145
Total	-	121	966	1,087	Total	357	107	60	524

entire population of farms, the second step consisted in the identification, for each area, of a "representative farm", which might be defined as a farm exhibiting similar characteristics compared to those of a higher number of farms in terms of size, crop specialization and gross margin[5].

The concept of a representative farm is essentially empirical. In fact, it applies to a farm whose features are typical of a population of farms. In other words, the representative farm has the average characteristics of a substantially homogeneous group of farms. Therefore, a representative farm is not necessarily a real farm, but its structural characteristics can be theoretically "built" (De Benedictis and Cosentino, 1979). In order to define a representative farm, it is necessary to allocate the entire population of farms of a given territory in homogeneous groups (in our work these groups coincide with the specialist cereal farms grouped by region and altitude). After defining the various groups, the next step will define, for each area, a farm with the necessary features to represent the entire group.

In this analysis a representative arable farm for each area was built on the basis of the data from the 6th Italian Agricultural Census. More specifically, the crop specialization of each representative farm and the farm size were determined considering the features of the farms that are potentially affected by the greening requirements (most common crop and average UAA). These farms were identified using micro-data regarding all the Italian farms registered in the 2010 agricultural census (1.6 million units) and by excluding all the farms that already comply with the three greening requirements (Vanni and Cardillo, 2013). Table 3 shows that in the selected regions the degree of specialization of farms, that potentially will be subjected to the crop diversification requirement, is particularly high, especially for those specialised in maize production. Indeed, the percentage of farms specialised in a single crop (namely, following the greening requirement, a crop grown in more than 75% of the farm arable area) exceeds by far the national average for both farming systems.

As shown in table 4, some areas were excluded because they are not represented in the FADN database and as a result, a total of 16 representative farms were identified. The analysis of the economic impacts of the greening measures on these representative farms was based on the Italian FADN data base (average 2010-2011), using a constant sample of 1,611 farms[6].

[5] The choice of concentrating our analysis on representative farms is mainly due to two reasons. The first is to keep the analysis at a rather simple level, since the use of representative farms allows straightforward comparisons amongst territories without further methodological adjustments. Secondly, representative farms can work quite well when it is necessary to define a sort of "theoretical benchmark" for real farms. In our case they represent a sort of reference point being 100% monocropping average size arable farms.

[6] As it may be noticed in table 4, the distribution of the constant sample is very heterogeneous amongst the regions and some representative farms were built through a very small number of units (especially the farms located on the hills of Molise, Puglia and Basilicata). Nevertheless, these areas were included in the analysis since in all areas data on crops gross margin showed a little variability (unlike the structural features) and the results were consistent with the other areas under study.

Table 5 - *Methodology overview.*

	Pre-Reform scenario	Post-Reform scenario
Crop diversification	One crop (1): maize or wheat	Three crops: (1) (Maize or wheat) 75% (2) 20% and (3) 5% of the UAA. The choice (and the order) of crops (2) and (3) is based on the area covered by these crops in each region/altimetry
Ecological Focus Area	0%	EFA Mountains: 0% UAA; EFA Hills: 2,5% UAA; EFA Plains: 5% UAA
Farm area	Average UAA of farms potentially affected by greening	Mountains: UAA; Hills: UAA net of EFA Hills; Plains: UAA net of EFA Plains

The impact of the greening measures was evaluated by comparing a pre-reform scenario with a post-reform scenario. Table 5 indicates that in the pre-reform scenario representative farms were assumed to be entirely specialised in maize or wheat production (100% of farm area). The farm gross margin was calculated by using the gross production values and the specific costs for these crops. Direct payments were calculated by selecting, among the total amounts of the payments received by farmers, those payments related to arable crops[7]. For them the average values between 2010 and 2011 were calculated and then divided for the UAA of each arable crop cultivated on the farm analysed.

The simulation regarding the post-reform scenario was drawn to show the combined impact of two greening measures: the introduction of the EFA on 5% of the arable area and the crop diversification requirement.

The impact of the EFA was introduced by reducing the area of each representative farm by 2,5% for the farms located on the hills and by 5% for the farms located in the plains, while no reduction was applied to the farms located in the mountains. Indeed, it was assumed that each farm in the post-reform scenario would use the unproductive land as part of the EFA, and it was supposed that the different locations would influence the amount of land qualifying for EFA at a different extent.

With regard to the crop diversification measure, simulations were carried out by reducing the area cultivated with the specialised crop (maize or wheat) from 100% to 75% of the farm area and by adding two additional crops, which represent 20% and 5% of the UAA. The choice of the second and the third crop was based on the area covered by each crop in each selected area (region/altimetry), as recorded by the 2010 agricultural census data. In this simulation the crop diversification measure was slightly simplified, since the final regulation on direct payments sets out the presence of at least 2 crops on arable land between 10 and 30 hectares and of at least 3 crops on arable land exceeding 30 hectares (see section 2).

Data on direct payments for each representative farm was based on FADN data base for the pre-reform scenario and on the simulations carried out by De Vivo *et al*. (2012) on the regionalisation of direct payments in Italy resulting from the 2013 CAP reform[8].

Finally, the impact of greening (in terms of gross margin per hectare) was compared to the share of direct payments that in the post-reform scenario would be conditioned to the respect of greening obligations (30%). This difference allows us to clarify whether this share does actually remunerate farmers for the additional costs deriving from the compliance with the two greening requirements analysed. It is worth noting that, in the simulations below, green payments were calculated as 30% of the total direct payments. However, failure in meeting the requirements of the green payments starting from 2017 will imply even more than 30% of direct payments a farmer is entitled to.

Results are presented by comparing the representative farms of each area (mountain, hill and plain) for the different regions under evaluation, by separating the northern regions specialised in maize production and the Central and Southern regions specialised in wheat production, in order to highlight the different impacts of greening measures on the two main specialist systems in the Italian arable crop sector.

5. Results

5.1. The effects of greening on farms specialised in maize

The first objective of this analysis was to calculate the variation in gross margin values due to the greening measures in each highly specialised farming system. Table 6 shows the effects of greening on the eight representative farms specialised in maize production and located in Northern Italian regions. Results demonstrate the negative effect of greening on gross margin for all the farms under study, with some variability, however, according to the different regions and areas considered.

According to these simulations, the decrease of gross margin per hectare ranks from about 131 Euros/ha on the hills of Lombardia to more than 230 Euros/ha on the hills of Friuli Venezia Giulia and in the plains of Piemonte.

The relatively heavy impact of greening on farms profitability for this type of farming system, which averages about 200 Euros/ha, is due to fact that the gross margin of the two additional crops introduced to replace maize is significantly lower compared to the main crop.

Considering values at farm level, a significant gross margin variation may be noticed, due to the different average farm size that will be subject to the greening requirements in the different areas.

[7] In Italy direct payments are granted according to the historical criterion, so that it is possible to identify those generated by arable crops.

[8] Italy opted for a "single region" payment but, at the same time, it chose also the "Irish" internal convergence, so that payments will not converge towards a single flat rate, not even at the end of the process in 2019. As a consequence, our simulations based on a regionalized payment are not very distant from the "real" situation, especially if one considers the first years of the adjustment process.

Table 6. *Effects of greening on farms specialised in maize production in selected Italian regions.*

Region	Altimetry	UAA (ha)	Farm level (€)			Unitary values (€/ha)		
			GM pre-reform	GM post-reform	Δ GM	GM pre-reform	GM post-reform	Δ GM
Piemonte	Hills	27.0	40,139	34,718	-5,421	1,487	1,286	-201
	Plains	38.8	55,474	46,195	-9,279	1,430	1,191	-239
Lombardia	Hills	29.0	34,416	30,606	-3,810	1,187	1,055	-131
	Plains	43.2	65,252	55,376	-9,876	1,510	1,282	-229
Veneto	Hills	31.1	46,998	41,979	-5,018	1,511	1,35	-161
	Plains	31.7	45,572	40,439	-5,132	1,438	1,276	-162
Friuli V.G.	Hills	27.9	38,121	31,477	-6,645	1,366	1,128	-238
	Plains	31.6	38,676	32,605	-6,071	1,224	1,032	-192

Source: own elaboration on FADN data.

Table 7 - *Green payments for farms specialised in maize production in selected Italian regions.*

Region	Altimetry	UAA (ha)	Farm level (€)			Unitary values (€/ha)		
			Direct payments	Green payments	Δ GM + Green payments	Direct payments	Green payments	Δ GM + Green payments
Piemonte	Hills	27.0	8,416	2,525	-2,897	312	94	-107
	Plains	38.8	12,094	3,628	-5,651	312	94	-146
Lombardia	Hills	29.0	12,957	3,887	77	447	134	3
	Plains	43.2	19,302	5,791	-4,086	447	134	-95
Veneto	Hills	31.1	13,127	3,938	-1,080	422	127	-35
	Plains	31.7	13,381	4,014	-1,118	422	127	-35
Friuli V.G.	Hills	27.9	8,604	2,581	-4,063	308	93	-146
	Plains	31.6	9,745	2,924	-3,147	308	93	-100

Source: own elaboration on FADN data.

Table 8 - *Effects of greening on farms specialised in durum wheat production in selected Italian regions.*

Region	Altimetry	UAA (ha)	Farm level (€)			Unitary values (€/ha)		
			GM pre-reform	GM post-reform	Δ GM	GM pre-reform	GM post-reform	Δ GM
Marche	Mountains	35.6	30,267	28,066	-2,201	850	788	-62
	Hills	34.1	24,13	22,259	-1,871	708	653	-55
Molise	Hills	25.4	15,978	14,783	-1,195	629	582	-47
Puglia	Mountains	24.2	8,783	7,951	-832	363	329	-34
	Hills	29.3	17,094	13,884	-3,21	583	474	-109
	Plains	30.2	10,138	8,531	-1,606	336	282	-54
Basilicata	Mountains	23.9	7,405	6,347	-1,058	310	266	-44
	Hills	29.3	17,245	16,773	-472	589	572	-17

Source: own elaboration on FADN data.

Table 9 - *Green payments for farms specialised in durum wheat production in selected Italian regions.*

Region	Altimetry	UAA (ha)	Farm level (€)			Unitary values (€/ha)		
			Direct payments	Green payments	Δ GM + Green payments	Direct payments	Green payments	Δ GM + Green payments
Marche	Mountains	35.6	10,524	3,157	956	296	89	27
	Hills	34.1	10,081	3,024	1,153	296	89	34
Molise	Hills	25.4	6,744	2,023	828	266	80	33
Puglia	Mountains	24.2	8,969	2,691	1,859	371	111	77
	Hills	29.3	10,859	3,258	48	371	111	2
	Plains	30.2	11,192	3,358	1,752	371	111	58
Basilicata	Mountains	23.9	5,648	1,694	637	236	71	27
	Hills	29.3	6,924	2,077	1,605	236	71	55

Source: own elaboration on FADN data.

As described in the previous section, it is interesting to analyse, in a policy perspective, whether the share of the regionalised direct payments which are conditioned to the greening obligations – and account for 30% of the direct payment ceilings, according to the new regulation on payments – can compensate farmers for the economic impact of such an obligation. This simulation was carried out by observing, for each representative farm, the difference between the green payments and the gross margin variation.

Table 7 indicates that, when looking at the eight representative farms specialised in maize production, the green payments generally do not compensate the farm gross margin reduction, with the only exception for the representative farms located on the hills of Lombardia.

5.2. The effects of greening on farms specialised in durum wheat

As regard the effects of greening in regions specialised in durum wheat production, the simulations show a lower reduction of farm profitability compared to maize production. This is due to the combined effects of the smaller farm size typical of this farming system and the lower wheat profitability. More specifically, in the pre-reform scenario the gross margin of the eight representative farms was, on average, about 15,400 Euros, with a decrease of 1,500 Euros resulting from greening. Despite these average values, mention should be made of the differences amongst the different areas which are quite significant, with a higher decrease in farm gross margins for the mountain areas of Marche and the hills areas of Puglia. In these areas the impacts of greening measures account for 62 Euros per hectare and 109 Euros per hectare, respectively.

Finally, one more significant difference compared to the farming system specialised in maize production is related to the share of direct payments which are conditioned to the greening obligations. For the eight representative farms specialised in durum wheat, it would cover the reduction of farm gross margin determined by the introduction of the greening obligations (table 9).

5.3. Discussion of results

As indicated earlier, many experts have stressed how the final version of greening has considerably reduced its potential in promoting large-scale sustainable farming practices. In its final form, the greening of direct payments has been turned into a much more selective tool, which will probably affect a rather small percentage of large specialised farms concentrated in specific areas (Vanni and Cardillo, 2013).

For these reasons, the present work aimed at evaluating the effects of greening obligations on Italian farms which are most likely affected by the new environmental requirements: farms specialised in maize production in Northern regions and in durum wheat production in Central and Southern regions. The results of our analysis show the impacts of the new greening requirements on farm gross margins as well as the capacity of the green component of the new direct payments to compensate the variation in gross margin due to the implementation of the new environmental rules. Despite the limits of this approach, which does not take into account other variables affecting the farmers' choices, we consider that it still gives a fairly good and realistic idea of what will happen in the two specialised farming systems under study.

Concerning the effects of greening on gross margin, our results show that, like in the English context (Brown and Jones, 2013), the types of farms most affected by the requirements will be the mono-cropping specialised arable farms. Indeed, as demonstrated by Heinrich (2012) in Germany, a higher diversity in farm structures may reduce the impact of greening, since the related obligations can be borne by those activities with lower gross margins.

Therefore, it must be noticed that the main drawback of our methodology is related to the hypothesis that representative farms are fully specialised in one crop while, in order to maximise the farm gross margin, "real" farms are probably already adopting diversification strategies. For this reason, the simulations presented here may over-estimate the impact of greening and they prove to be useful especially for a comparative analysis of the different areas and of the two crops under study. This is also the main reason explaining the differences of this study, in terms of reduction of farm income, compared to other studies that have analysed the effects of greening on Italian agriculture, such as the evaluation study carried out by the European Commission (2011) and the papers recently published by Arfini *et al*. (2013) and Solazzo *et al.* (2014). At the same time, it should be noticed that the representative farms analysed here were 'built' on the basis of specialised farms potentially affected by the greening requirements, namely on farms that, according to the 2010 agricultural census data, have more than 10 hectares of arable land and do not comply with the diversification rule, cultivating only one crop over more than 75% of arable land. As it can be observed in table 3, since in the selected regions these farms have a high specialization degree, in most cases the effects estimated by this analysis could be quite realistic.

Focussing on the difference between the two target farming systems, it can be noticed that, although the average size of the representative farms involved is quite similar (32.5 ha for the maize system and 29.0 ha for the wheat system), the different profitability of the two main crops brings about significantly higher economic effects of greening for farmers specialised in maize production compared to those specialised in wheat production. The reduction of gross margin between the pre-reform and the post-reform scenario was estimated to average -14.0% for the representative farms specialised in maize and -9.5% for the representative farms specialised in durum wheat. These effects are mainly due to the changes in the crop structure necessary to meet the condition of crop diversification and, as it occurs in Germany (Heinrich, 2012) and Poland (Czekay *et al*., 2013; W?s *et al*., 2014), higher effects were observed for farms located in more intensively farmed regions, with high gross margin per hectare.

As for the green payments capacity to compensate the gross margin variation following the implementation of the new environmental rules, an important point to make is related to the criteria for distribution of direct payments in the programming period 2014-2014. As mentioned in footnote 9, the simulations on direct payments for the Italian farms specialised in maize and wheat production proposed here were based on a hypothesis of regionalisation of direct payments carried out before the national choices of the convergence model for direct payments (De Vivo *et al*., 2012). However, the model of internal convergence of direct payment that will be adopted in Italy would ensure that, especially during the first years of implementation, the values of direct payments remain quite similar to those estimated in this work. With regard to the green payments received by the farms, Italy decided to apply the green component of direct payments at farm level, by calculating it as a percentage of the total value of payment entitlements that the farmer will receive yearly. Of course this choice will influence to a large extent the amount of green payments received by farmers and, indirectly, the distribution of such payments across sector and territories. However, even in this case, the simulations carried out in this work do not differ substantially from this assumption, since the green payments were actually calculated as a percentage of the direct payments received by each representative farm.

In terms of compensation for the greening requirements, Solazzo *et al*. (2014) showed that, in the case of Emilia Romagna , by assuming a green payment per hectare of around 90 Euros, this would compensate for the lower profits due to the application of greening. Our simulations demonstrate that, for the representative farms under study, the green payments do not compensate the decrease of gross margin for farms specialised in maize production, while they fully compensate those specialised in wheat production. In contrast to the comparable values of green payments for the t-

wo farming systems - which were estimated, on average, equal to 112 Euros/ha and 92 Euros/ha for farms specialised in maize and durum wheat, respectively - the effects on gross margin observed for the maize system were significantly higher. Although this may appear a further element which adds to the unfairness of this tool, it can be quite reasonable to maintain, in a policy perspective, that the most profitable and least environment friendly system , i.e. the specialist maize production, will be more heavily affected by the new greening measures.

6. Concluding remarks

This study illustrated the diverse effects of the new greening environmental obligations according to the characteristics of farms, their location and their specialisation, with more considerable impacts, in terms of farm gross margin change, especially for highly specialised maize farms in Northern regions and, more generally, for farms located in the plain areas.

With regard to the remuneration of public goods provision through the green payments, results confirm that green payments, as designed in the new CAP, do not take into account the specific and local features, and the resulting differences in production costs of public goods in agriculture in different farming systems and in different areas. More interestingly, the differences in the remuneration capacity of the additional costs in the two different systems seem to be ascribable to an economic effect, due to the differences in the real alternatives to the main crops, rather than the result of an explicit environmental policy. A different calculation modality for the green payments (i.e. at farm level) would not solve this problem, which is mainly related to the fact that the amount of payments for the provision of public goods is not calculated on the basis of additional costs and loss of income as applied for voluntary agri-environmental schemes, but as a share of first pillar support. These results strengthen the criticism about greening as being not enough selective and, actually, prescriptive and rule-based, and in the end, not effectively rewarding pro-active behaviours among farmers. This type of approach turns out to be too similar to cross-compliance and as a result, it can hardly be viewed as a new and different tool.

The idea of addressing the CAP greening through a horizontal, standard approach does, in many ways, contravene a number of principles on which the new CAP and Europe 2020 rest: the importance of local factors, the interaction between these factors and the local actors, the importance of the natural endowments and the way they interact with human activities. The introduction of some flexibility through the equivalent measures in the second pillar or the use of EFA for "green equivalent" crops do not make the tool more suitable to local needs. The whole CAP might turn into a more complicated, hard to measure and to control, green policy. The general idea of greening the CAP is not questioned, but we cannot overemphasize the contradiction relating to the introduction of environmental rules, based on the amount and distribution of direct payments rather than on farmers' willingness and capacity to provide public goods, and to the additional costs for farmers to adopt more sustainable practices.

Acknowledgments

The authors would like to thank Concetta Cardillo for her support to data elaboration.

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