



AgEcon SEARCH
RESEARCH IN AGRICULTURAL & APPLIED ECONOMICS

The World's Largest Open Access Agricultural & Applied Economics Digital Library

This document is discoverable and free to researchers across the globe due to the work of AgEcon Search.

Help ensure our sustainability.

Give to AgEcon Search

AgEcon Search
<http://ageconsearch.umn.edu>
aesearch@umn.edu

*Papers downloaded from **AgEcon Search** may be used for non-commercial purposes and personal study only. No other use, including posting to another Internet site, is permitted without permission from the copyright owner (not AgEcon Search), or as allowed under the provisions of Fair Use, U.S. Copyright Act, Title 17 U.S.C.*

Public money for environmental public goods that enhance farm incomes: a proposal for an evidence-based approach in Italy

Ciliberti S., Frascarelli A.

Department of Agricultural, Food and Environmental Sciences - University of Perugia



Paper prepared for presentation at the 172nd EAAE Seminar 'Agricultural policy for the environment or environmental policy for agriculture?'

May 28-29, 2019.

Brussels.

Copyright 2019 by Stefano Ciliberti and Angelo Frascarelli. All rights reserved. Readers may make verbatim copies of this document for non-commercial purposes by any means, provided that this copyright notice appears on all such copies.

1. Introduction

The Common Agricultural Policy (CAP) is a complex and multi-objective policy that addresses several sectoral and territorial challenges related to agricultural and rural areas. Due to its specific nature, it is particularly difficult to clearly evaluate whether and in which measure specific goals are achieved, as well as how effectively public resources are used.

The recent proposal for the reform of the CAP after 2020 has introduced the concept of “new delivery model” (NDM), based on national Strategic plans, in order to lead the shift from a compliance-oriented policy to a result-oriented policy (European Commission, 2018). Even though more details are needed in order to better understand the implications of such a new approach, what seems clear is that it represents a completely different way of managing CAP public expenditures in response to the critique that the results of the current policy are not easily measured.

In such a framework, the provision of environmental public goods and climate actions remains one of the main general objectives of the CAP (European Commission, 2017; 2018). Moreover, the proposal foresees that environmental purposes must be combined with another of the main objective of the CAP, that is the enhancement of the farm incomes, since it is estimated that the CAP provides nearly 40% of farm income (Bateman and Balmford, 2018). Accordingly, it is not surprising the decision to introduce a basic income support for sustainability in the Pillar 1 specifically aimed to support farmers’ income due to their contribution in providing environmental public resources.

Since the NDM has the ambition to make the CAP an evidence-based policy, what emerges is that member states should bear greater responsibility and be more accountable concerning how they meet objectives of enhancing farm income and providing environmental public goods. In this regard, the present paper aims to contribute to the ongoing debate over the CAP by proposing a quantitative evaluation of the effectiveness of decoupled direct

payments (DDPs) in Italy, using data from the Italian version of the Farm Accountancy Data Network (FADN).

In this regard, attention is paid to verify whether and how DDPs may foster the achievement of CAP main goals. Research questions to be addressed are twofold:

- Is the application of DDPs in Italy able to effectively enhance farm incomes by fostering the provision of public goods?
- Which are alternative solutions able to improve the ability of the DDPs to both enhance farm incomes and foster the provision of environmental public goods?

This paper is organized as follows. Section 2 briefly summarizes the evolution of public support for farm income and environmental public goods within the CAP and reports on the main literature on DDPs, shedding light on the main limitations and shortfalls that have attracted the attentions of several scholars in the last decade. Section 3 describes the methodology and data adopted in order to verify our research hypotheses. Section 4 shows the main results obtained, that are discussed based on existing literature in Section 5. Finally, conclusions are provided bringing suggestions for both policymakers and stakeholders.

2. Concepts and theories

Farm subsidies were promoted based on concerns for the chronically low and highly variable incomes of farmers. Innovations in terms of farm income support tools included the introduction of direct payments (DPs) with the MacSharry Reform in 1992. These payments have represented one of the most important tools of the CAP, aiming to overcome the main shortcomings of the CMOs during the 1960-1990 period, as well as to strengthen the EU's position in WTO agricultural trade negotiations. However, it was only thanks to the Fischler Reform of 2003 that this tool

finally gained acceptability in the eyes of international competitors. Indeed, this reform movement went beyond the distortions of productions and market equilibria caused by coupled direct payments (CDPs), introducing a new system of decoupled aids, called the Single Payment Scheme (SPS). Since 2005, the SPS has represented one of the milestones of the CAP as a whole, absorbing about two-thirds of its budget. The introduction of the SPS has removed the link between production and subsidies and has increased farmers' freedom to produce in response to market demands. Moreover, the DDPs have been associated with the compliance of farmers with basic standards concerning the environment, food safety, animal and plant health and animal welfare.

The 2013 reform of the CAP has introduced a new scheme with seven components of direct payments (DPs), with the aim of improving both the tailoring and targeting of these public aids. Four payments that mainly aim to enhance farm incomes (basic payment scheme, redistributive payment, small farmers scheme and voluntary coupled support), one payment with the provision of environmental public goods as a priority (greening) and, finally, one payment whose purpose is the maintenance of agricultural diversity (payments for areas with natural constraints). However, in financial terms, payments aiming to enhance farm incomes and foster the provision of public goods have absorbed approximately 90% of the financial resources for the EU-28; it follows that they clearly represent two strategic objectives of Pillar I for the 2015-2020 period.

Lastly, in June 2018, the European Commission presented legislative proposals on the common agricultural policy (CAP) beyond 2020. It has introduced a new scheme of support with six types of DPs: a basic income support for sustainability, two complementary income supports (a redistributive income support for sustainability and an income support for young farmers), a scheme for the climate and environment, a coupled income support, a round sum payment for small farmers. What is clearly emerged from this proposal is the attempt to put more emphasis on

reconciling two main objectives, such as environmental sustainability on the one hand and the enhancement of farm income level on the other hand. However, DPs would continue to be associated with land, even if Member States opted for abolishing payment entitlements. It follows that a strong link between payments and land will be still at stake, that is expected to somehow affect the way DPs are able to sustain farm incomes and to foster the provision of public goods. Henceforth, both these aspects are investigated in the lights of the existing literature on these topics.

DDPs and farm income support

Payments aiming to enhance farm incomes absorb approximately 70% of financial resources for the EU-28; therefore, they clearly represent a strategic objective of Pillar I for the 2015-2020 period. However, in the last years, empirical evidences highlighted that since land availability is a precondition for obtaining aids (SPS before and basic payment scheme later), there are collateral effects that negatively impact the effectiveness of public support for farmers' income. They are i) the high (and unequal) concentration of DPs (Buckwell et al., 2017) and ii) the capitalization of these aids on land prices (Ciaian et al., 2017).

Scholars have increasingly paid attention to these issues. With regard to concentration of DDPs, it must be noted that even though they represent a basic income support for farmers, serious concerns have been expressed regarding the inequitable distribution of strongly concentrated DPs (Allanson, 2006). Indeed, distribution of DDPs is clearly driven by the concentration of land, such that the former is as concentrated as the latter: 20% of the largest farms in the EU constitute 80% of agricultural land and production. It is the nature of the support, which is largely area-based, that is the main determinant of such an unequal concentration (Severini and Tantari, 2015). Such an impact is confirmed by official statistics that highlight how 80% of DPs are approximately granted to 20% of the biggest beneficiaries in terms of amount of DPs (European Commission, 2017). As

a consequence, Von Witze and Noleppa (2007) showed that the main beneficiaries of such payments are farms with large cultivated areas, instead of small or medium farms. Moreover, the distribution of direct aid is largely unequal, because high-income farms take a large share of the payments (Allanson and Rocchi 2008; Mishra et al. 2009). Schmid et al. (2006) claimed that in most cases, DPs do not prevent a relevant share of European farmers from remaining in the poorest decile of farm income. In this regard, despite one of the objectives of the 2015-2020 CAP Reform was to improve the distribution of direct income support among farmers by redesigning first pillar payments, however, analysing DPs given in the year 2015 reveals that just 5% of DPs went to farms with incomes below the median, while 95% of payments went to farms with incomes above the median (Hansen and Offermann, 2016; Matthews, 2016).

Moreover, because eligibility for DDPs depends on control over land, these types of aid are capitalised into land value (Matthews, 2017). Indeed, depending on both farm size and the duration of the tenant-landlord agreement, DDPs linked to land positively influence land rents because only those who own or have rented eligible land can claim public support (Killian and Salhofer, 2008; Kirwan and Roberts, 2015). It entails that payments are transferred in land rents, so that support to actual farmers depends on the share of land they own. Therefore, it is a quite straightforward relationship that the greater the share that goes to land and landowners, the less effective DPs are as a means of supporting farmers' income. What emerges is a highly distributive leakage of the benefits of DPs to non-farm groups that may reduce transfer efficiencies of DPs. Attempts to quantitatively estimate the so-called "capitalization effect" revealed that it varies from 0.20 to 0.90 for each unit of subsidy given to farmers (Ciaian and Kancs, 2012; Breustedt and Habermann, 2011; Hendrics et al., 2012; Killian et al., 2012; Klaiber et al., 2017; Kirwan, 2009; Patton et al., 2008). Recent evidence confirms that the 2013 CAP Reform caused land rental prices to increase relative to the pre-reform situation. On average, 27% of

decoupled payments are channelled to non-farming landowners in the EU after the 2013 CAP reform. It follows that around €10.2 billion per year is expected to be channelled outside the farming sector in the EU in the 2014-2020 period. Such a leakage effect that benefits non-farming landowners implies further income inequalities among farmers in the EU (Ciaian et al., 2017). Moreover, as EU member states move towards harmonised payments, the capitalization of DPs is expected to increase if it is not accompanied with measures that have an opposite effect. Such a capitalization effect clearly reduces the effectiveness of DPs. It results in increasing the price of land and, as a consequence, in inhibiting the conversion of agricultural land to other uses, as well as inhibiting the entrance of young farmers into the agricultural sector, due to the increased capital outlays required to purchase a farm (Patton et al., 2008). All in all, such an effect inhibits, or at least hinders, income support to farmers, one of the main goals of DPs (Latruffe and Le Mouel, 2009).

Direct payments and the provision of public goods

The 2003 CAP reform introduced cross compliance related to DDPs. It entails that in order to receive payments, farmers shall respect a set of basic rules. Farmers not respecting EU law on environmental, public and animal health, animal welfare or land management will see the CAP aid they receive reduced. Empirical evidences showed that cross compliance rules seem to contribute to slowing down soil erosion and mitigate water pollution (the latter also through other policies), while the control of water uptake for irrigation remains weak. However, these specific instruments are too limited in extent to reverse the larger-scale impacts of other CAP instruments, supporting the ongoing agricultural intensification, abandonment, and environmental degradation (Pe'er et al., 2017).

The 2013 CAP reform carries forward the principle that there is a link through the cross-compliance system between receipt of CAP support by farmer. It maintained the DDPs as a major policy instrument in the current

2014-2020 financial period, but linked them more closely with the provision of public goods and externalities. The main innovation was the introduction of the so-called greening payment as a conditional requirement to farmers receiving DPs. It accounted for 30% of the total DPs funds and entails the compliance with explicit commitments to foster the provision of public goods by farmers. In more details, the aim of this payment has been to impose a stronger link between the DPs and 'agricultural practises beneficial to the climate and environment' through three specific measures: crop diversification, maintenance of permanent grassland and ecological focus area (EFA).

However, given that the primary objective of CAP greening is to motivate farmers to produce more environmental public goods, the key policy question is to what extent the greening measures actually contribute to improve the environmental output linked to agricultural production (Gocht et al., 2017). The agro-economic body of literature is mirrored by very few studies focusing on various indicators to evaluate the environmental impacts of CAP greening (Gocht et al., 2017 for a systematic review). Studies are very diverse based on indicators used and methodology adopted. In details, a key distinction is between analyses that use farm type (representative) model or (more suitable) individual (real) farm model (Czekaj et al, 2014; Louhichi et al., 2015; Solazzo et al., 2015; Solazzo and Pierangeli, 2016). The efficiency of greening measures (EFA, permanent grasslands, crop diversification) is very low since: a) a high proportion of farmers is already complying with the basic requirements, and therefore payments for production-oriented EFA options offer gains with no actual costs ("windfall gains"), b) lack of spatial design entails that payments are spatially disorganized and lose efficiency; and c) collaborative measures for greening implementation were taken up by only two Member States (Pe'er et al., 2017). Accordingly, several empirical evidences revealed that the greening payment only marginally impacts on the environment, causing a low reduction of GHG emissions and a marginal

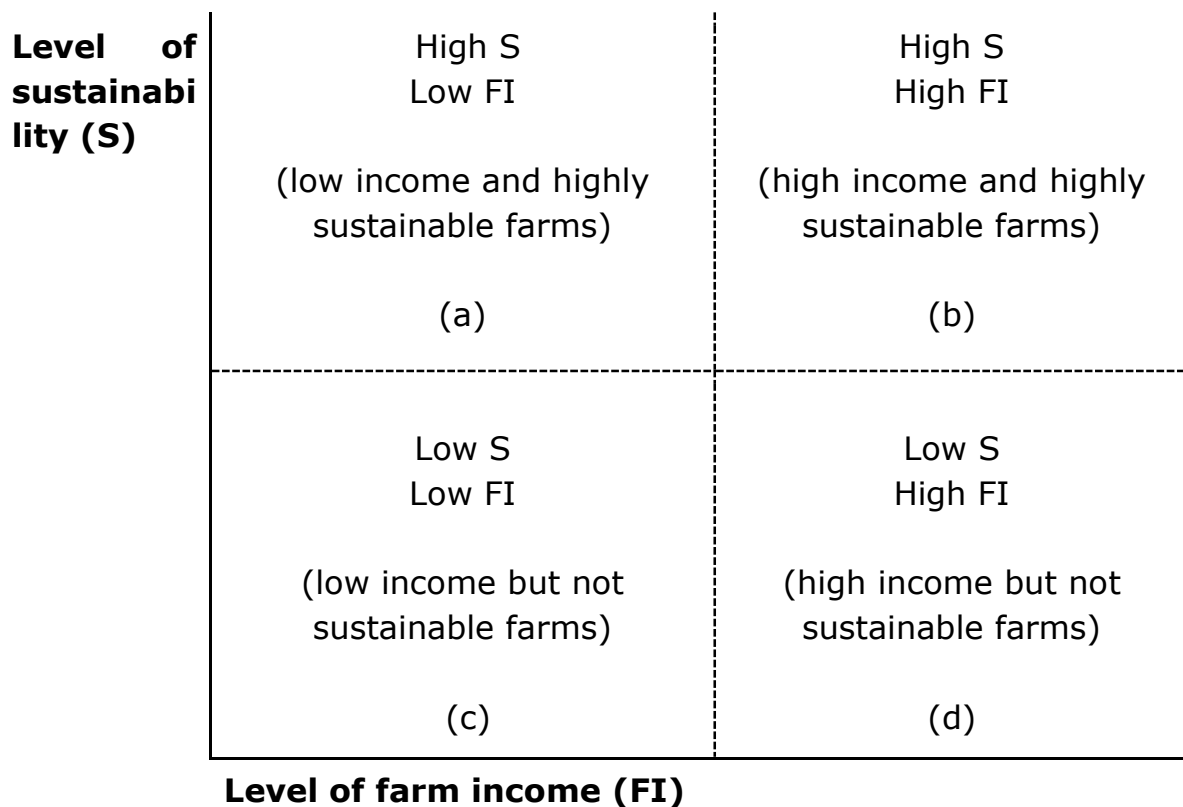
improvement of biodiversity (Gocht et al., 2017; Cortignani and Dono, 2015;), even though some effects on environmental indicators are also observed (Cortignani et al., 2017). What indirectly emerges is therefore that current approaches to agricultural subsidy for the provision of environmental public goods suffer from inefficiencies associated with paying for actions which may not deliver the desired benefit. Conversely, paying for delivered benefits is more efficient and somehow mimics private markets in which consumers pay for what is delivered (Bateman and Balford, 2018).

As a consequence, some remarks on the allocation of public support for environmental public goods are inevitable. While it might seem more natural to address the amount of subsidy first and then consider its allocation, this is not the best approach with regarding to environmental improvement payments. The natural environment is highly diverse and the same level of spending allocated to different places can yield widely differing levels of benefit. By first ensuring that funds are allocated appropriately it can be avoided highly wasteful misallocation and therefore ensured that budgets go further and generate much greater value for money (Bateman and Balford, 2018).

Against this backdrop, what clearly emerges therefore is that DDPs have been strongly criticized by both stakeholders and influential think-tanks that propose to overcome such an efficient system of public aid contractually supporting farmers (Buckwell et al., 2017). Other scholars suggest that in light of these challenges, future CAP reforms should aim at designing a decoupled payment scheme in a way that is not the owners of agricultural assets, e.g., land, but farmers who benefit from CAP subsidies (Ciaian et al., 2017). As concerns the Italian case, Cortignani et al. (2018) suggest the use of payments differentiated by groups of territories based on socio-economic and/or agronomic conditions in order to obtain major

economic, social and environmental objectives, whereas Ciliberti and Frascarelli (2018) show that the choice of the parameters is not neutral since it deeply affects the distribution of aids among farmers with different characteristics (location, size, use of inputs and so on). However, to the best of the authors' knowledge, apart from focusing attention on different adverse effects of the linkage between DPs and land, analyses of effective solutions among possible scenarios of allocation of public aids have not been provided yet. They would be useful in order to identify possible solutions in order to increase direct payments' ability to enhance farm incomes and foster the provision of environmental public good, according to the conceptual scheme reported in figure 1.

Figure 1 - Sustainability and farm income: scenarios of possible allocation of DDPs and characteristics of beneficiaries



Source: own elaboration

Figure 1 highlights that a public support aimed to enhance farm income and foster the provision of public goods should mainly go to farms characterized

by low level of income and high level of sustainability (scenario "a"). Such a solution would make the DDPs both equally distributed and able to adequately remunerate the most sustainable farms: it would therefore represent a first best option that allows to achieve both results of enhancing farm income ensuring a sustainable management of natural resources. Scenario "b" and "c" do not represent optimal scenarios but they are somehow conflicting, since the former favours sustainability instead of equity and the latter does the opposite: in both cases trade-off between main CAP objectives are at stake. Lastly, scenario "d" surely represents in any case the worst option since it does not ensure any consistency with CAP targets.

According to this scheme, in the lights of the theoretical and policy framework, with reference to the Italian case, the present paper aims to test the following hypotheses:

H1. Compared to other parameters land is not an effective parameter to enhance farm incomes and foster the provision of environmental public goods.

H2. There are other parameters that can ensure a more effective enhancement of farm incomes fostering the provision of environmental public goods.

3. Methodology used

The role of land in influencing the allocation and distribution of DPs is indeed clear. The step beyond is to analyse whether there are other parameters that more effectively sustain farm incomes and foster the provision of environmental public goods. For this purpose an original evaluation is proposed, with explicit reference to the DDPs aimed at enhancing farm income and sustaining the provision of environmental public goods. It is referred to Italy, where DDPs absorbs about 90% of DPs budget (that is

about €13.0 billion for the 2015-2020 period) and therefore represents the main component of the direct payment scheme in Italy.

In more details, a correlation analysis is adopted in order to test the hypotheses. It is a well-known method of statistical evaluation used to study the strength of a relationship among continuous variables. In this specific case, it is mainly aimed to:

i) estimate the strength of the relationships between DDPs, farm incomes and some environmental indicators identified by the project pilot FLINT¹, that measures the intensity of the use of nitrogen, water, pesticides and the amount of livestock (Poppe et al., 2016; Latruffe et al., 2016; Vrolijk et al., 2016).

ii) compare the Pearson's coefficients according to different parameters that are used to allocate the DDPs in order to establish a ranking based on ability to effectively enhance, on the one hand, farm incomes and to sustain the provision of public goods, on the other hand.

In details, the parameters alternative to land (measured as utilized agricultural area, UAA) used for allocating DPs to more efficiently enhance farm incomes and provide environmental public goods are the work (measured as annual work unit, AWU), the value-added (VA), as well as ratios obtained by combining them, such as work/land (AWU/UAA), value-added/work (VA/AWU) and value-added/land (VA/UAA). The source of data is represented by the Italian version of the Farm Accountancy Data Network – better known as *Rete Italiana Contabile Agraria* (RICA) – provided by the Council for Agricultural Research and Analysis (CREA). The FADN is a commonly used dataset for the economic assessment of the CAP, since it is the only source of harmonized micro-economic data that is representative of commercial agricultural holdings in the EU (European Commission, 2010). The dataset adopted for the quantitative analysis concerns 2016, that is the second year of application of the new DDPs scheme for the 2015-

¹ Acronym of Farm Level Indicator for New Topics aimed to develop a data-infrastructure needed by the agro-food sector and policy makers to provide up to date information on farm level indicators on sustainability and other relevant new issues

2020 period. The FADN dataset allows for the isolation of the componentz of DDPs that is directly aimed at enhancing farm income (e.g., basic payment scheme) and at sustaining the provision of environmental public goods (e.g., greening) and as well as to investigate structural and economic characteristics, such as cultivated land (utilized agricultural areas), employment (work units) and performance (farm income, valued added). Here, it is assumed that these latter are continuous variables that could be alternatively used as parameters for the allocation of DPs in order to compare their effectiveness in sustaining farm incomes. Table 1 reports the descriptive statistics of the variables used with reference to the Italian version of the FADN for 2016.

Table 1 – List of variables and descriptive statistics of the sample

Variable	Code	Description	Unit	N. Obs.	Mean	Sd	Min	Max
Farm income	FI	Remuneration to fixed factors of farm production (work, land and capital) and to entrepreneur risks (loss/profit) in the accounting year.	€	9,807	54,584.4	165,006.2	-679,295	6,419,699
Value-added	VA	Remuneration to the fixed factors of production (work, land and capital), whether they be external or family factors.	€	9,807	77,595.3	202,280.3	-571,165	8,005,278
Annual Work unit Utilized	AWU	Total labour expressed in full-time person equivalent.	n.	9,807	1.8	2.1	0.1	68.23
agricultural area	UAA	Consists of land under owner occupation, rented land and land in share-cropping.	Hectare	9,807	34.2	58.1	0	1,273.53
Decoupled direct payments	DDPs	Sum of basic payment scheme, greening, payment for young farmers, small farmers scheme	€	9,807	12,075.1	33,645.3	0	1,792,999
Use of nitrogen	N/ha	Amount of nitrogen per hectare	n.	7,495	349.7	1,4274.7	.1	873,635.4
Use of pesticides	Pesticides/ha	Amount of pesticides per hectare	n.	8,003	44.4	1,875.3	.1	118,509.2
Water consumption	Water/ha	Litres of water used per hectare	n.	9,809	8,239.4	384,828.4	0	26,900,000
Livestock units	LU/ha	Number of livestock units per hectare	n.	9,803	2.3	36.0	0	2,219.0

4. Main findings

This section reports the main results obtained by analysing the impact of alternative parameters used for allocation of the DDPs in Italy.

To reallocate the budget for the DDPs (that is, approximately 0.12 billion euros in the RICA sample) among farms of the RICA dataset, first, all average national values (ANV) for each parameter are calculated (Table 2).

Table 2 – Alternative parameters and average national values of BPS (€)

Parameters	ANV (€)
UAA	353.16
AWU	6691.54
VA	0.16
AWU/UAA	53291.19
VA/AWU	0.35
VA/UAA	1.87

Source: Our elaboration on 2016 RICA dataset

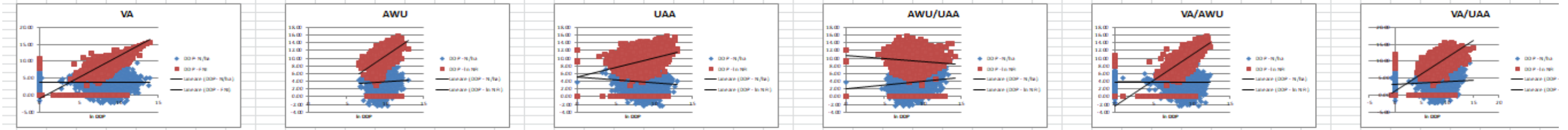
Such values are used for distributing the DDPs on the basis of each parameter, by multiplying the ANV for the value of each parameter at the farm level. The application of this procedure causes different allocation of payments at the farm level, with specific impacts on the redistribution of DDPs.

To evaluate these effects, the correlation coefficients between DDPs, farm income and the environmental indicators identified by the FLINT project (both expressed in logarithmic scale) are measured for each parameter adopted, so as to allocate public aids. Graph 1 shows the distributions of the DDPs according to the parameters used.

Graph 1 – Correlations among DDPs, FI and environmental indicators (N/ha, pesticides/ha, water/ha, LU/ha, FNI) with different parameters of allocation

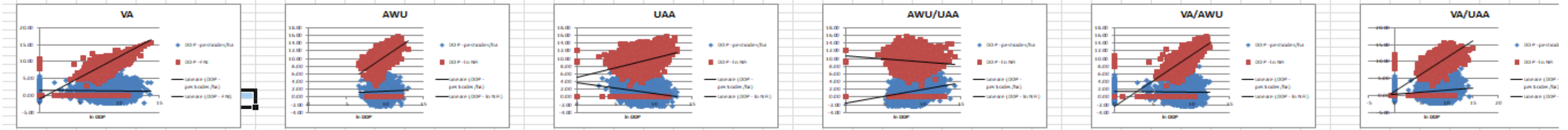
X-axis: ln DDPs
Y-axis

	DDPs - FNI
	DDPs - N/ha



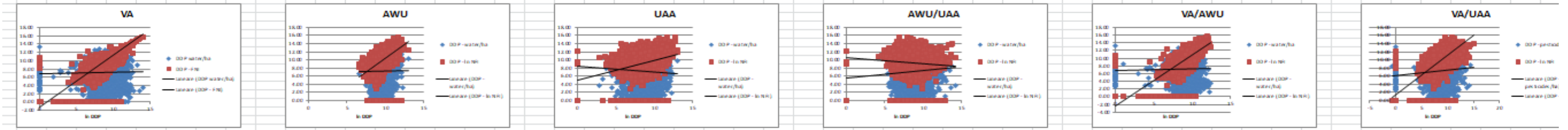
X-axis: ln DDPs
Y-axis

	DDPs - FNI
	DDPs - pesticides/ha



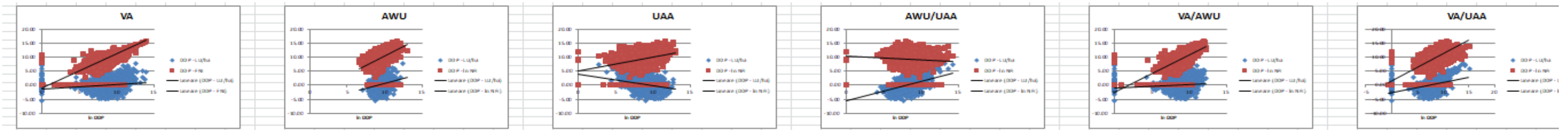
X-axis: ln DDPs
Y-axis

	DDPs - FNI
	DDPs - water/ha



X-axis: ln DDPs
Y-axis

	DDPs - FNI
	DDPs - LU/ha



Source: Our elaboration on 2016 RICA dataset

What clearly emerges is that there are some relevant differences in the correlations between DDPs and farm income levels in the simulated scenarios. This is a first indication that parameters matter in affecting the distributions of the DDPs, so if the aim is to enhance farm income and foster the provision of environmental public goods, a parameter with specific characteristics should be identified. More in detail, an effective parameter should be weakly or negatively correlated with farm income and with environmental indicators (meaning that the distribution of public support does not provide advantage to the farms with the highest level of income or with the most intense use of resources and inputs).

Table 3 compares the impacts on the correlation coefficients between public aids, farm income level and environmental indicators, due to the use of alternative parameters for the allocation of DDPs.

Table 3 – Pearson correlation coefficients (PCC) between DDPs, FNI and environmental indicators: a comparison among possible scenarios of allocation of DDPs

PCC	nitrogen/ha	water/ha	pesticides/ha	LU/ha	FNI
VA	0.039	0.031	0.015	0.149	0.967
AWU	0.075	0.089	0.017	0.145	0.473
UAA	-0.044	-0.024	-0.036	-0.017	0.338
AWU/UAA	0.374	0.086	0.135	0.114	-0.032
VA/AWU	0.003	0.034	0.024	0.063	0.406
VA/UAA	0.415	0.022	0.130	0.432	0.168

Source: our elaboration on 2016 Rica dataset

Findings highlights that when VA is used (alone or with other parameters), the distribution of the DDPs is positively correlated with farm income level

($\rho_{VA}=0.96$ and $\rho_{VA/AWU}=0.40$) and environmental indicators (e.g., $\rho_{VA/UAA}=0.41$ for N/ha and $\rho_{VA/UAA}=0.43$ for LU/ha). Likewise, when AWU is adopted as a parameter, DDPs show a positive correlation with farm income level ($\rho_{AWU}=0.473$) and all the environmental indicators (mainly LU/ha and water/ha), revealing a strong relationship between the presence of workforce in agriculture and the use of input and resources detrimental for the agro-ecosystems.

On the other hand, the use of land as a parameter for the distribution of DDPs (representing the *status quo*, even though in Italy the flat rate payment has not been adopted in favour of the so-called 'Irish model' of partial convergence by 2019), causes a strong and positive association of these aids with farm income level, but at the same allows to allocate public support to farms that are more environmental friendly. Indeed, the negative correlation between this allocation of DDPs and all the environmental indicators taken into account reveals that land is a proxy for a more sustainable use of resources (water and soil) and a reduced use of input (both pesticides and nitrogen), that represents a sort of first-best solution when environmental sustainability is a specific policy goal.

Unlike, when land is associated to work (AWU/UAA), the opposite is true. In details, using this parameter DDPs are positively correlated with all the environmental indicators (mainly N/ha and pesticides/ha), showing an important relation between factor endowment and an intensification in the use of resources with negative effects on the environment. However, compared to the other parameters adopted, AWU/UAA represents the optimal solution for guaranteeing the fairest distribution of DDPs, since it is negatively correlated with farm income level.

To sum up, it is now possible to evaluate each scenario of allocation of DDPs based on its ability to achieve CAP goals under investigation. Adopting value added, work and proxies of both land and labour productivity would cause a distribution of DDPs concentrated in the sector "d" of the figure reported

in the section 2 with a strong concentration of DDPs among farms with the highest level of income and an intense use of input and natural resources and input (low sustainability). AWU/UAA in turn would cause a distribution of DDPs more concentrated in the sector "c" of the figure 1 (farms with low income and low sustainability), with an optimal allocation in terms of equity but not in terms of sustainability. Lastly, a flat rate payment based on land (UAA) represents a suitable solution to make DDPs able to remunerate the provision of environmental public goods, at the expense of a fair distribution of the public aid. This parameter generates a concentration of DDPs in the sector "b" of the figure 1 (farms with high income and high sustainability).

5. Discussion and conclusions

The present paper provided empirical evidences based on the Italian FADN dataset that can contribute to the debate over DPs in Italy. It showed that the choice of the parameter for the allocation of these public aids is pivotal in affecting their ability to achieve specific policy goals, such as enhancing farm incomes and fostering the provision of environmental public goods.

With regard to the first hypothesis tested, quantitative evidence highlights that land is an ineffective parameter to sustain farm incomes, since it is strongly concentrated and, above all, strongly correlated with pre-support farm income level. However, it represents the only parameter able to allow an accurate remuneration of environmental public goods, since it is negatively correlated with a less intense use of natural resources and chemical input. A trade-off between a fairer redistribution of farm income support and a more effective aid to foster sustainable practises in agriculture is therefore at stake.

As a consequence, concerning the second hypothesis, the analyses revealed that, whereas land indeed represents a sort of first best solution as parameter for the allocation of DDPs when environmental sustainability

is a specific goal, the situation change when also farm income support represents a policy objectives. Some alternative parameters can strongly improve the effectiveness of direct payments aimed to enhance farm incomes in Italy. In more details, correlation analysis clearly revealed that both work and value-added, when combined with land (WU/UAA, VA/UAA), allow a more effective and fair allocation of DDPs, since this latter is weakly (or even negatively) correlated with farm income level. Such a results would imply therefore a public support mainly concentrated in the lowest deciles of farm income distribution.

5.1 Final remarks

The main contribution of the paper relates to the impact that different parameters of distribution of DDPs have on the ability of these public aids to effectively achieve specific policy goals. Since the proposal of the Regulation for the CAP after 2020 would aim to shift from a model based on compliance towards a performance based delivery model, where Member States are involved in the CAP strategic plans, what clearly emerges is that national decisions are strategic in order to improve the effectiveness the use of public resources for farms. In this sense, the paper sheds lights on the fact that two of the most important CAP goals – enhancing farm income and provide environmental public goods – are somehow conflicting and specific solutions must be considered in order to reduce trade-off and avoid side effects.

The paper reveals that the use of land as parameter for the allocation of DDPs is not an optimal solution in order to achieve CAP goals, but at most could represent a sort of second best option. Such a result is due to the fact that this parameter would allow to allocate resources among farms that reduce the production of negative externalities (due to a less intense use of natural resources and chemical input), but without achieving a fair distribution of public aids. However, other parameters – related to factor productivity or production factors – are not able to improve the

effectiveness of DDPs, since they cannot ensure both goals. The only exception is represented by the work, since introducing this parameter in relation to land (as a proxy of factor endowment) allows to obtain a fairer distribution of DDPs according to farm income level.

As a consequence, a flat rate payment allocated on the basis of the land (a situation quite close to from the status quo in Italy) could represent an optimal solution in order to achieve the environmental goals of the basic income support of sustainability, introduced by the European Commission in their proposal for the CAP after 2020 (articles 17-24). However, such a parameter would be not able to guarantee a fair support to farmers' income, since the distribution of the DDPs follows the distribution of land, which is in turn positively correlated with farm income. For this purpose work (expressed as AWU) should be considered as a key factor in order to contrast the concentration of DDPs that represents one of the main weaknesses of these aids.

To sum up, this paper provides interesting suggestions for policymakers, even though only circumscribed to one Member State. With reference to the Italian case, an evidence-based choice of parameters for the allocation of DDPs is strategic in affecting the ability to achieve specific goals and, in turn, to improve the effectiveness of public support. Findings, for instance, provide an interesting indication for the Italian policymakers, so as to properly use the redistributive tools/mechanisms provided by the CAP proposals (e.g., reduction of payments and/or of payment entitlements, the complementary redistributive income support), in order to eradicate distortions that hinder a fair redistribution of DDPs.

However, further improvement of the present paper could be obtained by introducing and analysing also other environmental and socio-economic indicators as well as to deepen the level of investigation, by analysing the impact of DDPs allocation at NUTS 2 level or for altimetric zones, within a wider time span. Likewise, such an evidence-based approach can be

extended to other Member States, by using FADN data. Indeed, since these parameters capture structural and socio-economic characteristics of farms (as well as their environmental impact), interesting analogies or differences can emerge between Mediterranean and continental Member States, depending on resource-use intensification and factors productivity, with interesting implication for European and national policymakers.

Acknowledgments

The authors acknowledge the Council for Agricultural Research and Agricultural Economics Analysis (CREA) for providing access to the Italian version of Farm Accountancy Data Network database.

References

Allanson P. (2006). The redistributive effects of agricultural policy on Scottish farm incomes. *Journal of agricultural economics*, 57(1): 117-128. DOI: 10.1111/j.1477-9552.2006.00035.x

Allanson P., Rocchi B. (2008). A comparative analysis of the redistributive effects of agricultural policy in Tuscany and Scotland. *Review of agricultural and environmental studies*, 89: 35-56. Available at: <https://ageconsearch.umn.edu/bitstream/188544/2/86-1-35-56.pdf> Last accessed: April 15, 2019.

Bateman I.J., Balmford B. (2018). Public funding for public goods: a post-Brexit perspective on principles for agricultural policy. *Land use policy*, 79, 293-300.

Breustedt G., Habermann H. (2011). The incidence of EU per-hectare payments on farmland rental rates: a spatial econometric analysis of German farm-level data. *Journal of agricultural economics*, 62(1): 225-243. DOI: 10.1111/j.1477-9552.2010.00286.x

Buckwell A., Matthews A., Baldock D., Matijs E. (2017). *CAP - Thinking Out of the Box: Further modernisation of the CAP – why, what and how?* Brussels: RISE Foundation. Available at: http://www.risefoundation.eu/images/files/2017/2017_RISE_CAP_Full_Report.pdf Last accessed: April 6, 2019.

Ciaian P., Kancs d'A., Espinosa M. (2017). The Impact of the 2013 CAP Reform on the Decoupled Payments' Capitalisation into Land Values. *Journal of Agricultural Economics*. doi:10.1111/1477-9552.1225. DOI: 10.1111/1477-9552.12253

Ciaian P., Kancs d'A. (2012). The capitalization of area payments into farmland rents: micro evidence from the new EU Member States. *Canadian journal of agricultural economics*, 60: 643-673. DOI: 10.1111/j.1744-7976.2012.01256.x

Ciliberti S., Frascarelli A. (2018). Boosting the effectiveness of the Basic Payment Scheme in enhancing farm income: what really matters? Evidences from Italy. *Italian review of agriculture economics*, 73(2): 171-186. DOI: 10.13128/REA-24081

Cortignani R., Dono G. (2015). Simulation of the impact of greening measures in an agricultural area of southern Italy, *Land Use Policy*, 48,, 525–533.

Cortignani R., Severini S., Dono G. (2017). Complying with greening practices in the new CAP direct payments: An application on Italian specialized arable farms, *Land Use Policy*, 61, 265–275.

Czekaj S., Majewski E., Was A. (2014). The impact of the “greening” of the Common Agricultural Policy on the financial situation of Polish farms, *Problems of Agricultural Economics*, 4, 105–121.

European Commission (2010). *Farm Accountancy Data Network: an A to Z of methodology*. Brussels. Available at:

http://ec.europa.eu/agriculture/ricaprod/pdf/site_en.pdf Last accessed: March 21, 2019.

European Commission (2017). *Communication from the Commission To The European Parliament, The Council, The European Economic And Social Committee And The Committee Of The Regions "The Future of Food and Farming "*, Brussels, 29.11.2017 COM(2017) 713 final. Available at: https://ec.europa.eu/agriculture/future-cap_en Last accessed: March 21, 2019.

European Commission (2018). Proposal for the Regulation of the European Parliament and of the Council establishing rules on support for strategic plans to be drawn up by Member States under the Common agricultural policy (CAP Strategic Plans) and financed by the European Agricultural Guarantee Fund (EAGF) and by the European Agricultural Fund for Rural Development (EAFRD) and repealing Regulation (EU) No 1305/2013 of the European Parliament and of the Council and Regulation (EU) No 1307/2013 of the European Parliament and of the Council Available at: <https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:52018PC0392&from=EN> Last accessed: April 29, 2019.

Gocht A., Ciaian P., Bielza M., Terres J.-M., Roder N., Himics M. and Salputra G. (2017). EU-wide economic and environmental impacts of CAP greening with high spatial and farm-type detail. *Journal of agricultural economics*, 68, 3, 651-681.

Hansen H., Offermann F. (2016). Direct Payments in Germany - Income and Distributional Effects of the 2013 CAP Reform. *German journal of agricultural economics*, 65(2): 77-93. Available at: <https://yadda.icm.edu.pl/yadda/element/bwmeta1.../Kleinhanss.pdf> Last accessed: April 30, 2019.

Hendricks N.P., Janzen J.P., Dhuyvetter K.C. (2012). Subsidy incidence and inertia in farmland rental markets: estimates from a dynamic panel. *Journal of agricultural and resource economics*, 37(3): 361-378. Available at: <https://www.jstor.org/stable/23496722> Last accessed: April 29, 2019.

Kilian S., Salhofer K. (2008). Single payments of the CAP: where do the rents go? *Agricultural economics review*, 9(2): 96-106. Available at: https://ageconsearch.umn.edu/bitstream/178238/2/9_2_8.pdf Last accessed: April 20, 2019

Kilian S., Antòn J., Salhofer K., Röder N. (2012). Impacts of 2003 CAP reform on land rental prices and capitalization. *Land use policy*, 29: 789-797. DOI: 10.1016/j.landusepol.2011.12.004

Kirwan B., Roberts M. (2015). Who really benefits from agricultural subsidies? Evidence from field-level data. *American journal of agricultural economics*, 98(4): 1095-1113. DOI: 10.1093/ajae/aaw022

Kirwan B.E. (2009). The incidence of U.S. agricultural subsidies on farmland rental rates. *Journal of political economy*, 117(1): 138-164. DOI: 10.1086/598688

Klaiber A., Salhofer K., Thompson S.R. (2017). Capitalization of the SPS into agricultural land rental prices under harmonization of payments. *Journal of agricultural economics*, 68: 710-726. DOI:10.1111/1477-9552.12207

Latruffe L., Le Mouël C. (2009). Capitalization of government support in agricultural land prices: what do we know? *Journal of economic surveys*, 23(4): 659-691. DOI: 10.1111/j.1467-6419.2009.00575.x

Latruffe L., Diazabakana A., Bockstaller C., Desjeux Y., Finn J., Kelly E., Ryan M., Uthes S., (2016). Measurement of sustainability in agriculture: a review of indicators. *Studies in agricultural economics*, 118, 123-130.

Louhichi K., Ciaian P., Espinosa M., Colen L., Perni A., Gomez y Paloma S. The impact of crop diversification measure: EU-wide evidence based on IFM-CAP model, Paper presented at the IAAE Congress, Milan, 9–14 August 2015.

Matthews A. (2016). The future of direct payments. Paper prepared for the Workshop on "Reflections on the agricultural challenges post-2020 in the EU: preparing the next CAP Reform". Brussels: European Parliament, Directorate General for Internal Policies. Available at: [http://www.europarl.europa.eu/thinktank/en/document.html?reference=I_POL_STU\(2016\)585898](http://www.europarl.europa.eu/thinktank/en/document.html?reference=I_POL_STU(2016)585898) Last accessed: March 26, 2019.

Matthews A. (2017). The challenges of the next CAP: doing more with less. *Agriregionieuropa*, 50. Available at: <https://agrireregionieuropa.univpm.it/it/content/article/31/50/challenges-next-cap-doing-more-less> Last accessed: May 2, 2019.

Mishra A.K., El-Osta H.S., Gillespie J.M. (2009). Effect on agricultural policy on regional income inequality among farm households. *Journal of policy modelling*, 31: 325-340. DOI:10.1016/j.jpolmod.2008.12.007

Patton M., Kostov P., McErlean S., Moss J. (2008). Assessing the influence of direct payments on the rental value of agricultural land. *Food policy*, 33: 397-405. DOI: 10.1016/j.foodpol.2008.01.001

Pe'er G., Lakner S., Müller R., Passoni G., Bontzorlos V., Clough D., Moreira F., Azam C., Berger J., Bezak P., Bonn A., Hansjürgens B., Hartmann L., Kleemann J., Lomba A., Sahrbacher A., Schindler S., Schleyer C., Schmidt J., Schüler S., Sirami C., von Meyer-Höfer M., Zinngrebe Y. (2017). Is the CAP Fit for purpose? An evidence based fitness-check assessment. Leipzig, German Centre for Integrative Biodiversity Research (iDiv) Halle-Jena-Leipzig.

Poppe K., Vrolijk H., Dolman M., Silvis H. (2016). FLINT - Farm-level indicators for new topics in policy evaluation: an introduction. *Studies in agricultural economics*, 118, 116-122.

Schmid E., Sinabell F., Hofreither M.F. (2006). "Distributional effects of CAP instruments on farm household incomes". Paper presented at the American Agricultural Economists Association Annual Meeting, Long Beach, California, 23-26 July, 2006. Available at: <https://ageconsearch.umn.edu/bitstream/21467/1/sp06sc04.pdf> Last accessed: March 26, 2019.

Severini S., Tantari A. (2015). Which factors affect the distribution of direct payments among farmers in the EU Member States? *Empirica*, 42(1): 25-48 DOI: 10.1007/s10663-013-9243-x

Solazzo R., Pierangeli F. (2016). How does greening affect farm behaviour? Trade-off between commitments and sanctions in the Northern Italy, *Agricultural Systems*, 149, 88-98.

Solazzo R., Donati M., Arfini A. (2015). Impact assessment of greening and the issue of nitrogen-fixing crops: Evidence from northern Italy, *Outlook on Agriculture*, 44, 215-222.

Von Witze H., Noleppa S. (2007) Agricultural and trade policy reform and inequality: the distributive effects of direct payments to German farmers under the EU's new Common agricultural policy. Working paper 79, Humboldt University, Berlin. Available at: <http://agris.fao.org/agris-search/search.do?recordID=US2016214880> Last accessed: April 29, 2019.

Vrolijk H., Poppe K., Keszthelyi S., (2016). Collecting sustainability data in different organizational settings of the European Farm Accountancy Data Network. *Studies in agricultural economics*, 118, 138-144.