



## Direct Payments to Provide Environmental Public Goods and Enhance Farm Incomes: Do Allocation Criteria Matter?

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**Abstract:** The Common Agricultural Policy 2023-2027 introduces a new result-oriented approach based on a new delivery model. At the core of this model lies the need to ensure a higher consistence between stated objectives and the implementation of policy tool, such a direct payment. Enhancing farm income and fostering the provision of environmental public goods represent relevant policy goals that the new basic income support for sustainability is aimed to pursue. However, the use of land-based payments has been largely criticized as ineffective and unfair. To this purpose, we use “Italian Farm Accountancy Data Network” data, in order to descriptively analyse whether and how different criteria used to allocate this payment are differently correlated with farm income distribution and the use of chemical inputs and natural resources. Findings reveal that other parameters, rather than land, may be also taken into account in order to improve the effectiveness of the basic income support for sustainability in achieving its specific goals. However, there is not a first-best solution aimed to ensure at the same time a fairer distribution of the income support, by rewarding farmers that make a lesser use of input.

**JEL classification:** Q18


**Keywords:** CAP, Direct payments, Result-based, Income, Sustainability, Farm Accountancy Data Network, Italy

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# 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.

After a long negotiation process that lasted almost three years, the agreement on the reform of the CAP 2023-2027 was formally ratified on December 2, 2021 (European Commission, 2022). The new implementation model (so-called “new delivery model”) requires that each Member State creates a CAP Strategic Plan for the entirety of its territory that includes all the requirements for interventions under both EAGF and EAFRD-financed pillars (Regulation (EU) 2115/2021).

Such a new delivery model entails a different way of managing CAP public spending, which shall be intrinsically result-based (European Union, 2019). However, criticisms are at stake, mainly related to the fact that CAP outcomes are neither easily measurable nor enforceable (Azcarate and Folkeson, 2020; Lovec et al., 2020).

In such a framework, the provision of environmental public goods and climate actions still remains one of the main general objectives of the CAP (European Commission, 2017; 2018). The CAP aims to play a relevant and important role in strengthening the relationship between agriculture and the environment, and this implies alignment with other relevant European policies. Indeed, the new CAP will play a central role in furthering the European Green Deal and accompanying strategies, such as the Farm to Fork Strategy and the Biodiversity Strategy. As a matter of fact, the EU presented in 2019 a package of policy initiatives aimed at furthering Europe's green transition with the goal of achieving climate neutrality by 2050 (European Commission, 2019a). At the heart of the European Green Deal is the Farm to Fork strategy that aims to make food systems fair, healthy and environmentally friendly; this is accompanied by a biodiversity strategy to preserve nature and reverse the degradation of ecosystems (European Commission, 2019b).

In order to align with environmental targets, the CAP has allocated 40% of its budget to climate-relevant interventions (European Commission, 2021).

Moreover, the Regulation foresees that environmental purposes must be combined with another traditional and longstanding CAP objective, which is the enhancement of farm incomes. In this regard, it must be noted that the CAP already represents nearly 40% of farm income (Bateman and Balmford, 2018). These two objectives are closely related because the increased frequency and intensity of adverse climate events, which are brought on by anthropogenic activities like agriculture, have a direct impact on many business areas, especially in the agricultural sector, where crop and livestock yields are very weather-dependent. In order to achieve agricultural sustainability and food security, the policy must find a balance

between providing farmers with an income that is sufficiently steady and broader sustainability goals (Boysen et al., 2022).

Accordingly, it is not surprising the decision to introduce for the period 2023-2027 a basic income support for sustainability (BISS) in the Pillar 1 specifically aimed to support farmers' income due to their contribution to providing environmental public resources. Regulation (EU) 2115/2021 establishes that basic support will be granted either in the form of a decoupled annual payment per eligible hectare to active farmers, maintaining the system of payment entitlements (titles), or in the form of a uniform amount per hectare, who commit to comply with what is stipulated in the Good Agricultural and Environmental Conditions (GAECs) and statutory management requirements (SMRs), identified by each Member State, under enhanced cross-compliance.

Since the new delivery model 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 their national strategic plans. In this regard, the present paper aims to contribute to the ongoing debate over the CAP by proposing a preliminary quantitative evaluation of the potential effectiveness of the BISS in Italy, using data from the Italian version of the Farm Accountancy Data Network (FADN).

In this regard, attention is paid to verifying whether and how BISS may be able to foster the achievement of CAP's main goals. Research questions to be addressed are therefore twofold: is the application of BISS in Italy able to effectively enhance farm incomes by fostering the provision of public goods?

What are alternative solutions able to positively/negatively affect the ability of the BISS 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 direct payments, then conceptualises a possible approach aimed to increase public expenditure effectiveness. Section 3 describes the methodology and data adopted in order to address the research hypotheses. Section 4 shows the main results obtained, which are then discussed based on existing the literature in Section 5. Finally, conclusions are provided bringing suggestions for both policymakers and stakeholders.

## **2 Policy and Theoretical Framework**

### ***2.1 The Evolution of CAP Support***

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 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 production and market equilibria caused by coupled direct payments, 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 direct payments 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 introduced a new scheme with seven components of direct payments, 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.

Following the legislative proposals presented by the Commission in June 2018, a long negotiation process began that led to the approval of the new CAP legislative framework consisting of three regulations: the CAP Strategic Plans Regulation, the Horizontal Regulation, and the Common Market Organization (CMO) Regulation.

With this new legislative framework, the EU introduced a new support scheme with six types of direct payments: a basic income support for sustainability, two complementary income supports (redistributive income support for sustainability and income support for young farmers), a scheme for the climate and environment, a coupled income support, a round sum payment for small farmers. Table 1 reports the comparison between direct payments for 2014-2022 and 2023-2027.

Focusing on BISS, what emerges is that – in line with the old basic support scheme - such a new payment is an income support to bridge the gap between farmers' income and that of other sectors, increasing at the same time their resilience and taking into account that agriculture is a sector producing public environmental goods (Ciliberti and Frascarelli, 2018; Matthews, 2017; Engel and Muller, 2016).

The support is therefore a remuneration for sustainability, outlined by the introduction of enhanced cross-compliance commitments. As a result, BISS is aimed to reconcile two main objectives, such as environmental

sustainability on the one hand and the enhancement of farm income level on the other hand.

**Table 1 – Direct Payments: a Comparison between 2014-2022 and 2023-2027 and their Characteristics**

2014-2022		2023-2027	
Payment	Mandatory (M)/optional (O)	Payment	Mandatory (M)/optional (O)
Basic payment scheme (BPS)	M	Basic income support for sustainability (BISS)	M
Payment for agricultural practices beneficial for the climate and the environment (“greening”)	M	Schemes for the climate, the environment and animal welfare (“eco-schemes”)	M
Redistributive payment	O	Complementary redistributive income support for sustainability	M
Payment for young farmers	M	Complementary income support for young farmers	O
Voluntary coupled support	O	Coupled income support	O
Payment for areas with natural constraints	O	:	:
Small farmers scheme	O	:	:

Source: own elaboration

However, it will continue to be associated with land, whether or not a Member States opts for abolishing payment entitlements.

It follows that a strong link between these new payments and land will be still at stake, which is expected to strongly affect the way BISS is able or not to sustain farm incomes and foster the provision of public goods at the same time (Frascarelli, 2020). Henceforth, both these aspects are investigated in the light of the existing literature.

## **2.2 Direct Payments to Enhance Farm Income (?)**

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 evidence 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 direct payments (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 the concentration of direct payments, it must be noted that even though they represent basic income support for farmers, serious concerns have been expressed regarding the inequitable distribution of strongly concentrated direct payments (Allanson, 2006). Indeed, the distribution of direct payments 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 direct payments are approximately granted to 20% of the biggest beneficiaries in terms of the amount of direct payments (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, direct payments 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 direct payments given in the year 2015 reveals that just 5% of direct payments 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).

Additionally, Scown et al. (2020) explored how CAP payments were allocated in 2015 and found that spending on the programme affects income inequality in the agriculture sector. According to the author, more than €24 billion of direct payments went to regions where average farm incomes are already higher than the EU median income.

Moreover, because eligibility for direct payments 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, direct payments 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 the land they own.

Therefore, it is a quite straightforward relationship that the greater the share that goes to land and landowners, the less effective direct payments are as a means of supporting farmers' income. What emerges is a highly distributive leakage of the benefits of direct payments to non-farm groups that may reduce transfer efficiencies of direct payments. 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; 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 direct payments 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 direct payments. 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 direct payments (Latruffe and Le Mouel, 2009).

### ***2.3 Direct Payments for the Environment (?)***

The 2003 CAP reform introduced cross compliance related to direct payments. 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 evidence showed that cross compliance rules seem to contribute to slowing down soil erosion and mitigating 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 farmers. It maintained direct payments as a major policy instrument in the 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 for farmers receiving direct payments. It accounted for 30% of the total direct payments funds and entails compliance with explicit commitments to foster the provision of public goods by farmers. In more detail, the aim of this payment has been to impose a stronger link between the direct payments 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 improving the environmental output linked to agricultural production

(Gocht et al., 2017). The agro-economic body of literature is mirrored by a few studies focusing on various indicators to evaluate the environmental impacts of CAP greening (Gocht et al., 2017 for a systematic review). These studies are very diverse based on the indicators used and the methodology adopted. In detail, 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) was 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 evidence revealed that the greening payment only marginally impacts 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).

Lastly, the greening of the CAP, despite having received more funding, was less effective than agri-environment-climate measures (AECM), and as a result, has not made a significant impact on biodiversity preservation or climate change mitigation (Pe’er et al., 2019).

### 3 Conceptual Framework

Current approaches to the 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 (Baterman 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 regarding 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 (Baterman and Balford, 2018).

Against this backdrop, what clearly emerges therefore is that direct payments have been strongly criticized by both stakeholders and influential think-tanks that propose to overcome such a system of public aid contractually supporting farmers (Buckwell et al., 2017). Other scholars suggest that in light of these challenges, 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 allocation criterion 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 direct payments and land, analyses of effective solutions among possible scenarios of allocation of public aid 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 goods, according to the conceptual scheme reported in Figure 1.

**Figure 1 - Sustainability and Farm Income: scenarios of Possible Allocation of Direct Payments and characteristics of beneficiaries**

<b>Level of sustainability (S)</b>	High S Low FI  (low income and highly sustainable farms)  (a)	High S High FI  (high income and highly sustainable farms)  (b)
	Low S Low FI  (low income but not sustainable farms)  (c)	Low S High FI  (high income but not sustainable farms)  (d)
	<b>Level of farm income (FI)</b>	

Source: own elaboration

Following the approach proposed by Bateman and Baldford (2018) where payments should be properly pre-allocated in line with specific policy targets, we assume that public support (i.e., BISS) aimed to enhance farm income and foster the provision of public goods should mainly go to farms characterized by a low level of income and high level of sustainability (scenario "a" in Figure 1). Such a solution would make the direct payments

both equally distributed and able to adequately remunerate the most sustainable farms: this would therefore represent a first best option that allows achieving both results of enhancing farm income and ensuring sustainable management of natural resources.

Scenario “b” and “c” equally represent sub-optimal (or second best) 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 among 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 light of the theoretical and policy framework, with reference to the Italian case, the present paper aims to test the following hypotheses:

- H1.** Land is a parameter that is not able to ensure an effective allocation of BISS, because it is positively correlated with farm income and the use of chemical input and natural resources.
- H2.** Parameters obtained considering farm input (i.e. the amount of annual work unit) and output (i.e. the value added) may be more able than land to ensure an effective allocation of BISS, because they are differently correlated with farm income and use of chemical input and natural resources.

## 4 Material and Methods

The role of land in influencing the allocation and distribution of direct payments is straightforward. 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 direct payments aimed at enhancing farm income and sustaining the provision of environmental public goods.

It is referred to Italy, where direct payments absorb about 90% of the direct payments budget (that is about €13.0 billion for the 2015-2022 period) and therefore represents the main component of the direct payment scheme in Italy.

In more detail, a correlation analysis (using the Pearson’s correlation coefficient) is adopted in order to test the hypotheses. Such a descriptive analysis is in line with the research questions since it allows for every allocation parameter under evaluation to quantify the direction (the sign) and the strength of the association with both farm incomes and proxies for environmental sustainability.

In doing so, it allows to properly address both research hypotheses, without any pretence to establish a causal nexus among variables. Going into detail, correlation analysis is mainly aimed to:

- 1) estimate the strength of the relationships between the basic payment scheme or BPS (that is the antecedent of the BISS, therefore used as a proxy for this payment), farm incomes and some environmental indicators identified by the project pilot FLINT<sup>1</sup>, 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);
- 2) compare Pearson's coefficients according to different parameters that are used to allocate the basic payment scheme in order to establish a ranking based on the ability to effectively enhance, on the one hand, farm incomes and to sustain the provision of public goods, on the other hand.

In detail, the parameters alternative to land (measured as utilized agricultural area, UAA) used for allocating direct payments to more efficiently enhance farm incomes and provide environmental public goods are the work (measured as an 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 correlation analysis concerns 2016, which is the second year of application of the direct payments scheme for the 2015-2022 period.

The FADN dataset allows for the isolation of the components of direct payments 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) as well as to investigating 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 direct payments in order to compare their effectiveness in sustaining farm incomes. Table 2 reports the descriptive statistics of the variables used with reference to the Italian version of the FADN for 2016.

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<sup>1</sup> 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.

**Table 2 – 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	AWU	Total labour expressed in full-time person equivalent.	n.	9,807	1.8	2.1	0.1	68.23
Utilized 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	direct payments	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

Source: own elaboration

## 5 Main Findings

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

To reallocate the budget for direct payments (that is, approximately 0.12 billion euros in the RICA sample) among farms of the RICA dataset, first, all average national values (ANV) of BPS for each parameter are calculated (Table 3).

**Table 3 – 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 direct payments 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 allocations of BPS at the farm level, with specific impacts on the redistribution of direct payments.

To evaluate these effects, the correlation coefficients between direct payments, 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 aid.

Table 4 compares correlation coefficients between public aid, farm income level and environmental indicators, due to the use of alternative parameters for the allocation of BPS (for a detailed illustration of the distributions of direct payments according to the parameters under analysis, see figures provided as supplementary material).

What clearly emerges is that there are some relevant differences in the correlations between BPS (used as a proxy of BISS) and farm income levels in the simulated scenarios. This is a first indication that parameters matter in affecting the distributions of this payment, which is a close predecessor of the BISS, so if the aim of this latter is to enhance farm income and foster the provision of environmental public goods, a parameter with specific characteristics should be identified. It comes out that 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 an advantage to the farms with the highest level of income or with the most intense use of resources and inputs).

In more detail, findings highlight that when VA is used (alone or with other parameters), the distribution of the BPS 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).

**Table 4 – Pearson Correlation Coefficients ( $\rho$ ) between Direct Payments, FNI and Environmental Indicators: A Comparison among Possible Scenarios of Allocation of Direct Payments**

$\rho$	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

Likewise, when AWU is adopted as a parameter, BPS 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 direct payments (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 BPS with farm income level, but at the same allows to allocate public support to farms that are more environmentally friendly. Indeed, the negative correlation between this allocation of BPS 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 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 with work (AWU/UAA), the opposite is true. In detail, using this parameter, BPS is positively correlated with all the environmental indicators (mainly N/ha and pesticides/ha), showing an important relation between factor endowment and 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 our proxy for BISS, since it is negatively correlated with farm income level.

To sum up, it is now possible to evaluate each scenario of allocation of direct payments 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 BPS (and allegedly of BISS) concentrated in the sector “d” of Figure 1 (see section 2) with a strong concentration of this direct payment among farms with the highest level of income and intense use of input and natural resources and input (low

sustainability). AWU/UAA in turn would cause a distribution of BPS/BISS more concentrated in the sector “c” of 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 BPS/BISS able to remunerate the provision of environmental public goods, at the expense of a fair distribution of public aid. This parameter generates a concentration of the payment under investigation in the sector “b” of Figure 1 (farms with high income and high sustainability).

## 6 Discussion and Conclusions

The present paper provided empirical evidence based on the Italian FADN dataset that can contribute to the debate over direct payments in Italy. Results obtained thanks to a descriptive analysis based on Pearson’s correlation coefficient highlighted that the choice of the parameter for the allocation of a direct payment is pivotal in affecting its ability to achieve specific policy goals, such as those of the BISS (i.e. enhancing farm incomes and fostering the provision of environmental public goods).

What clearly emerges is that there is a strong link between land and basic payment, and that this strongly affects the correlation with the level of farm income and the provision of environmental public goods (Severini and Tantari, 2015).

With regard to the first hypothesis tested, quantitative evidence highlights that land is an ineffective parameter to distribute payments aimed to enhance farm incomes (such as the BPS and the BISS), since it is strongly concentrated and, above all, strongly correlated with pre-support farm income level (Allanson and Rocchi, 2008; Mishra et al, 2009; Severini and Tantari, 2015; Frascarelli et al., 2018).

As a result, in spite of the fact that CAP support increases the overall level of farm income, it also favours larger farms and increases inequality within the sector (Guth et al., 2020; Bateman and Balmford, 2018). In addition, another side effect of using these parameters is that subsidies are capitalized into the market value of the land, i.e., an important share of the benefits from direct payments is absorbed by rising land prices and rental prices (Buckwell et al., 2017, Ciaian et al., 2017; Ciliberti and Frascarelli, 2018,2019)

However, it represents the only parameter able to allow an accurate remuneration of environmental public goods by means of an input-based direct payment, since it is negatively correlated with a less intense use of natural resources and chemical input.

DeBoe has studied the impact of agricultural policies on the environmental sustainability and productivity of the agricultural sector. His studies show how total decoupling of payments, by reducing incentives for intensification, results in national improvements in nutrient balances (DeBoe, 2020). The Commission, with the aim of measuring progress toward the goals of the Farm to Fork Strategy, published an update in June 2022 which shows a 14% decrease from the 2015-2017 baseline period for all

pesticides and a 26% decrease for the most hazardous pesticides (European Commission, 2022). Nevertheless, several studies point out that despite numerous and continuous reforms, the CAP period has been characterized by unprecedented levels of environmental damage (Bateman and Balmford, 2018). Fully decoupled payments, although, are one of the least damaging support strategies among payment types (Henderson and Lankoski, 2019). Some analyses, therefore, have argued that decoupling reforms generally produced positive impacts, but this could be due to the presence of mandatory constraints such as GAEC (DeBoe, 2020). 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. In this regard, Scown et al. (2020) have also examined how agricultural regions that are more respectful of climate and biodiversity and the maintenance of high-nature-value farmland are those where less income is generated and tend to receive the same or less income support per worker because decoupled direct payments are based on area (Scown et al., 2020). Concerning the second hypothesis, the descriptive analyses revealed that, whereas land indeed represents a sort of first-best solution as a parameter for the allocation of direct payments when environmental sustainability is a specific goal, the situation changes when farm income support represents policy objectives. Whereas studies to investigate the action needed for the EU CAP to address sustainability challenges, have argued that the system of area-based direct payments with a low level of environmental requirements is inefficient, not only from the point of view of securing income for farmers but also with regard to environmental objectives (Pe'er et al., 2020). However, the correlation analyses revealed that these negative effects related to the land parameter could be overcome by adopting alternative parameters that take into account other economic and/or structural characteristics of farms (Ciliberti and Frascarelli, 2019). Indeed, some alternative parameters can strongly improve the effectiveness of a direct payment (such as BPS or BISS) which is aimed to enhance farm incomes in Italy. In more detail, 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 such a payment since this latter is weakly (or even negatively) correlated with farm income level. Such results would imply, therefore, that public support is mainly concentrated in the lowest deciles of farm income distribution (Scown et al., 2020).

## 6.1 *Final Remarks*

The main contribution of the paper relates to the impact that different parameters of distribution have on the ability to affect direct payment effectiveness in order to achieve specific policy goals. Since the CAP 2023-2027 imposes a shift from a compliance-oriented towards a performance-oriented implementation model, where Member States are involved in enforcing CAP strategic plans, what clearly emerges is that national decisions on the allocation of direct payments are strategic in order to improve both coherence with specific goals and effectiveness in the use of

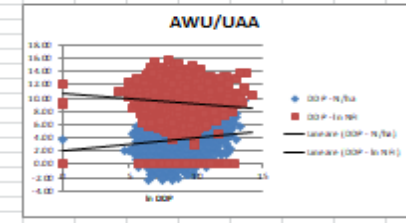
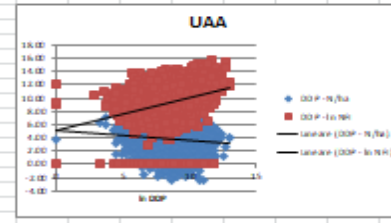
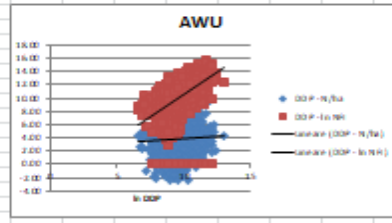
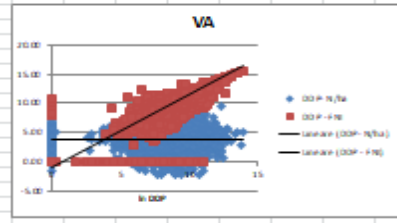
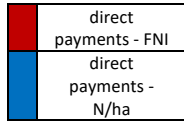


public resources for farms. In this sense, the paper sheds light on the fact that two of the most important CAP goals – enhancing farm income and providing environmental public goods – may somehow be conflicting and specific solutions must be considered in order to reduce trade-off and avoid side effects. Using the BPS as a reliable proxy, the correlation analysis conducted using FADN data reveals that the use of land as a parameter for the allocation of the future BISS 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 allocating this payment among farms that reduce the production of negative externalities (due to less intense use of natural resources and chemical input) but without achieving a fairer distribution of public aids. However, other parameters – related to factor productivity or production factors – are not able to improve the effectiveness of BISS, 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 obtaining a fairer distribution of BISS according to farm income level. As a consequence, a flat rate payment based on land (that is a scenario quite far from the status quo in Italy) could represent an optimal solution in order to achieve the environmental goals of the BISS. However, such a parameter would be not able to guarantee fair support to farmers' income, since the distribution of this direct payment 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 BISS, which indeed represents one of the main weaknesses of these aids. To sum up, this paper provides interesting suggestions for policymakers, even though only circumscribed to Italy. Here, an evidence-based choice of criteria for the allocation of BISS is strategic in affecting the ability to achieve specific goals and, in turn, to improve the global effectiveness of this aid. Findings, for instance, provide an interesting indication for the Italian policymakers, so as to properly use the redistributive tools/mechanisms provided by the new Reg.UE 2115/2021 (e.g., capping, degressivity, maximum level for the value of individual payment entitlements income support, redistributive payment), in order to eradicate distortions that hinder a fairer redistribution of direct payments. However, further improvement of such a descriptive approach could be obtained by introducing and analysing also other environmental and socio-economic indicators as well as deepening the level of investigation, by analysing the impact of direct payments allocation at NUTS 2 level or for altimetry zones, within a wider time span. Likewise, such an evidence-based descriptive approach can be extended to other Member States, by using FADN data. Indeed, since these allocation criteria 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 implications for European and national policymakers.

**Appendix: Figure A.1 – Correlations Among Direct Payments, FI and Environmental Indicators (N/ha, pesticides/ha, water/ha, LU/ha, FNI) with Different Parameters of Allocation**

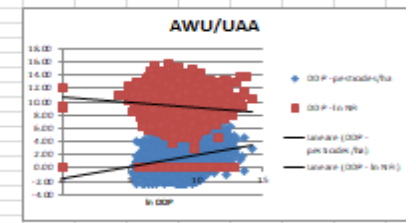
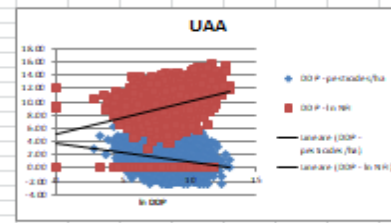
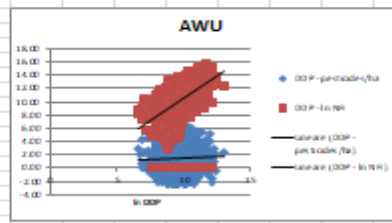
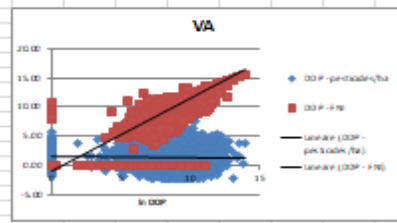
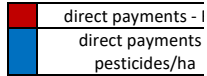
X-axis: In direct payments

Y-axis



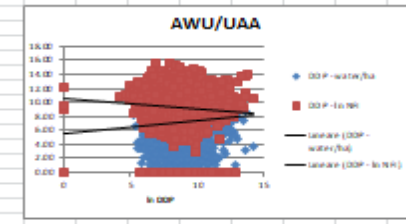
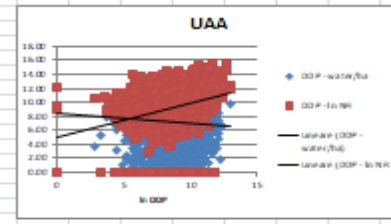
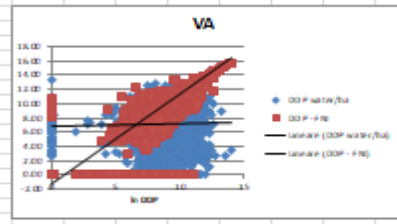
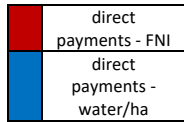
X-axis: In direct payments

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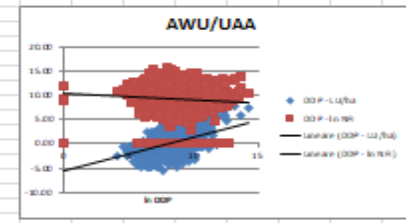
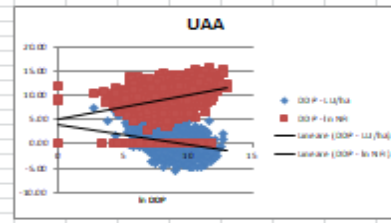
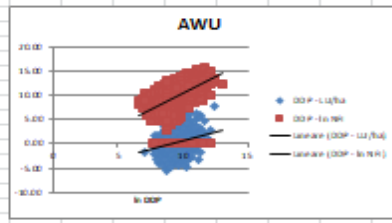
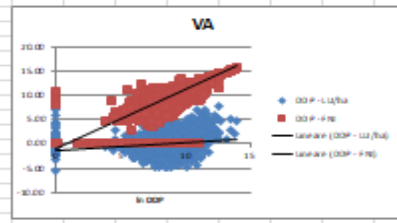
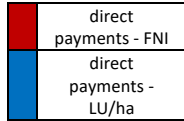
X-axis: In direct payments

Y-axis



X-axis: In direct payments

Y-axis



Source: our elaboration on 2016 RICA dataset

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