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DIRECT PAYMENTS 2014-2020: A QUALITATIVE METHOD FOR EVALUATING RESOURCE ALLOCATION SCENARIOS IN ITALY

JEL classification: Q18

Stefano Ciliberti*, Angelo Frascarelli*

Abstract. *The recent inter-institutional decisions about the Common Agricultural Policy (CAP) 2014-2020 introduced a strong national flexibility to the management of European agricultural policy. Italy and the other Member States (MS) play key roles in the allocation of resources from Pillar 1, which establishes the percentages of the financial ceiling that will be assigned to each specific support scheme, from a more target-oriented perspective.*

The need to implement an efficient and effective policy involves an objective and impartial evaluation of the potential effects that could be caused by the application of different measures and this could aid politicians in their decision-making process. The article takes six different allocation scenarios that combine all of the new typologies of direct payments (mandatory or optional) and proposes a new qualitative method for evaluating the consistency between the possible results and the priorities that were identified by the European Commission (EC).

The purpose is to show how a qualitative evaluation method may be helpful in demonstrating the main potential economic and social effects of certain interesting allocation scenarios and be used to analyse how different combinations of direct payments could affect the Italian agricultural sector in different ways, either achieving or missing certain targets.

Keywords: *CAP, direct payments, policy assessment.*

1. Introduction

The debate over the Common Agricultural Policy (CAP) 2014-2020 began several years ago. After an extensive public discussion, the European Commission began an inter-institutional debate with the Communication 'The CAP towards 2020' (European Commission, 2010), which defined the challenges that are faced by the incoming reform (Greer and Hind, 2012; Swinbank, 2012). In the meantime, the European Parliament (EP), which was involved in the initial definition of the CAP, adopted on its own initiative a report about the reform and its implications for the Europe 2020 Strategy (EP, 2010). These discussions contributed to the debate on the proposals that were presented by the Commissioner for Agriculture and Rural development, Dacian Ciolos, on 12 October 2011[1]. In that text, the EU tried to respond to

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[1] European Commission (2011). Proposal for a Regulation of the European Parliament and of the Council establishing rules for direct payments to farmers under support schemes within the framework of the Common Agricultural Policy. COM 625 final/2.

new economic, social, environmental, climate-related and technological challenges by identifying new objectives and new policy measures that could improve the socio-economic condition of European farmers (Huang *et al.*, 2010). Ciolos's proposals confirmed the current CAP architecture (i.e. 2 pillars and 2 funds) and introduceds several new elements, especially into Pillar 1, 'Direct Payments'.The need for a better targeting of support, which would improve the quality of spending and remunerate farmers for the public goods that they provide, led to an innovative scheme of direct payments (Westhoek *et al.*, 2013). They will be organised into seven different components, which will be described in detail in the following paragraphs.

The method that was adopted enables the authors to express some preliminary remarks about the future set-up of CAP in each Member State (MS), with special attention being given to Italy. It clearly shows that each allocation scenario of direct payments simulated has different impacts on the expected objectives identified by the European Commission (EC) (Piorr *et al.*, 2009). The article is organised into four parts. After a brief description about the future direct payments scheme and the role of MSs in adopting a broad national flexibility, the CAP objectives and the related indicators of their results are described, and a quantitative simulation of six different allocation scenarios is provided. The qualitative method for evaluating each scenario is then presented and the main findings are discussed, with reference to summary tables.

2. The new direct payments

CAP is currently organised into two pillars, with the first one being related to direct payments and Common Market Organisations (CMO) and the second one being related to rural development policy. Historically, Pillar 1 is the most important pillar in financial terms, and it currently consumes more than 60% of the overall CAP resources (Erjavec *et al.*, 2011; Henke and Coronas, 2011). The current direct payments system, which is known as the Single Payment Scheme (SPS), will be redesigned by the future CAP reform 2014-2020, which has a few similarities to the Swiss scheme (EP, 2010). To this purpose, the Communication '*The CAP towards 2020'* introduced six direct payment components[2].

During the following months, the European Parliamentary Committee on Agriculture and Rural Development[3] and the Agriculture and Fisheries Council wrote their counterproposals and defined another direct payment, which was called the 'redistributive payment'. Finally, on 26 June 2013, the three EU Institutions reached an agreement and approved the new direct payments scheme, which was organised into several components that will come into operation in January 2015 (DEFRA, 2013).

2.1. A brief description of the new direct payments scheme

The new direct payments system will preserve certain features of the current SPS (Tranter *et al.*, 2007). Farmers must own or obtain entitlements[4] and possess eligible hectares, as well as

[2] These include the basic payment, the payment for agricultural practices that are beneficial for the climate and the environment (greening), the young farmers' scheme, the coupled support, the payment for areas that have natural constraints and the small farmers' scheme.

[3] European Parliament (2013). Decision of 13 March 2013 on the opening of, and on the mandate for, inter-institutional negotiations on the proposal for a regulation of the European Parliament and of the Council establishing rules for direct payments to farmers under support schemes within the framework of the Common Agricultural Policy.

[4] To hold the new entitlements, farmers must satisfy an 'active farmer test' that is set up by MSs.

observe the cross compliance rules (DEFRA, 2013). The new scheme will be composed of an income support component (the basic payment and young farmers' scheme) and a 'public goods provision' component (greening) (Overmars *et al.*, 2013). As shown later, MSs are able to activate other optional payments (Table 1). This policy choice will determine the financial ceilings

Tab. 1 Direct payments, CAP 2014-2020

Payment	Mandatory/Optional	Financial ceiling
Basic payment scheme	Mandatory	Residual (68%-18%)
Redistributive payment	Optional	30% max
Payment for agricultural practices that are beneficial for the climate and the environment (greening)	Mandatory	30%
Payment for young farmers	Mandatory	2% max
Payment for areas that have natural constraints	Optional	5% max
Coupled support	Optional	13% max + 2% (support protein crops)
Small farmers' scheme	Optional	10% max (sourced from direct payments scheme)

Source: Regulation (EU) No 1307/2013 of the European Parliament and of the Council of 17 December 2013

for each payment because only the greening percentage is established directly by the EU[5].

The basic payment and the greening and young farmers' schemes must necessarily be activated by each MS. The basic payment scheme's ceiling is obtained by deducting from the national ceiling the amounts that are utilised for the other (mandatory or optional) payments[6].

The payment for agricultural practices that are beneficial for the climate and the environment will receive a fixed percentage, 30%, of the annual ceiling. To receive this payment, the farmers must comply with three standards[7].

The young farmers' scheme will receive a percentage of the annual national ceiling that is not higher than 2%; it provides a payment to farmers with specific features[8]. With regard to the optional payments, the coupled support scheme could be used to maintain levels of production in certain sectors[9] or in certain regions where specific types of farming or specific agricultural

[5] Regulation (EU) no 1307/2013 of the European Parliament and of the Council of 17 December 2013 establishing rules for direct payments to farmers under support schemes within the framework of the Common Agricultural Policy and repealing Council Regulation (EC) No 637/2008 and Council Regulation (EC) No 73/2009.

[6] It could, therefore, vary from a minimum of 18% to a maximum of 68%.

[7] These include crop diversification (which refers to cultivating at least two or three crops, based on the amount of arable land that is owned), permanent grassland (which does not allow farmers to plough the designated, environmentally sensitive areas), ecological focus area (EFAs) (which refers to maintaining at least 5% of arable land as EFA.

[8] These features include the following:
1) being no more than 40 years of age when submitting the direct payment application;
2) setting up, for the first time, an agricultural holding as the head of the holding or setting up such a holding previously during the five years that preceded the first submission of an application to the basic payment scheme;
3) respecting further criteria regarding skills and/or training requirements.

[9] These include cereals, oilseeds, protein crops, grain legumes, flax, hemp, rice, nuts, starch potato, milk and milk products, seeds, sheep meat and goat meat, beef and veal, olive oil, silk worms, dried fodder, hops, sugar beet, sugar cane and chicory, fruit and vegetables and short rotation forestry.

sectors encounter difficulties and are particularly important for economic, social and/or environmental reasons. Because Italy allocated more than 5% of its amount available for payment to granting the specific supports to Article 68[10] for the period of 2014-2020, it might decide to use the maximum percentage (13%) of the annual national ceiling[11]. This percentage may be increased by up to 2 percentage points in those MSs that decide to support the production of protein crops.

The payment for areas that have natural constraints could be granted to farmers whose holdings are fully or partly situated in disadvantaged areas, which are designated by MSs. To finance this payment, up to 5% of the annual national ceiling could be used.

The redistributive payment could receive up to 30% of the amount that is available for direct payments. If Italy adopts this option, no more than the first thirty hectares of each farm will receive a supplement, which could reach up to 65% of the average payment per hectare.

Finally, the small farmers' scheme will replace the other direct payments. To finance this payment, MSs shall deduct the amounts to which the small farmers would be entitled from the other direct payments funds[12].

2.2. The role of MSs

The main result of the inter-institutional debate, which is known as Trilogue, was the increase in national flexibility for implementing the CAP. It was probably this new administrative and managerial set-up that led to the final agreement between the EP, which is the defender of stakeholders' interests, and the Agriculture and Fisheries Council, which is the expression of national Governments, because it provides MSs with a large amount of freedom of choice. Each MS shall provide a list of decisions to the EC by 1 August 2014. The decisions most importantly include the allocation of payment entitlements in 2015[13], the way to apply the payment scheme[14], the annual ceiling for the basic payment, the value of these entitlements and the list of areas that are considered EFAs. Furthermore, the Governments will have to decide on the optional payments to be activated and their annual ceilings (DEFRA, 2013).

These decisions will represent a crucial turning point for orienting the political actions of every MS. For this reason, investigating a few of the likely effects related to different resource allocation scenarios could be a useful research issue. National flexibility should allow greater coherence between national socio-economic targets and the policy instruments; therefore, the CAP 2014-2020 will offer an opportunity for the creation of a better-targeted policy action due to Pillar 1 funds (Erjavec *et al.*, 2011; Westhoek *et al.*, 2013).

[10] Council Regulation (EC) No 73/2009 of 19 January 2009 establishing common rules for direct support schemes for farmers under the Common Agricultural Policy and establishing certain support schemes for farmers, amending Regulations (EC) No 1290/2005, (EC) No 247/2006, (EC) No 378/2007 and repealing Regulation (EC) No 1782/2003.

[11] Through the use of derogation, MSs that have allocated, during at least one year of the 2010-2014 period, more than 10% of their available payment amount to grant specific support (Article 68) may decide to use more than 13% of the annual national ceiling if the Commission approves.

[12] Farmers who are included in this simplified system will be exempt from the greening rules and receive an amount that is no less than €500 and no more than €1,250.

[13] This possibly establishes a limitation on the number of payment entitlements to be attributed and on the minimum size per holding (which is expressed by the amount of eligible hectares), for which the allocation of entitlements may be requested.

[14] Regional or National level.

3. CAP objectives and related indicators

3.1. CAP 2014-2020: general and specific objectives

The need for improving the effectiveness of the spending of public resources requires a clear link between policy decisions and CAP targets (Grant, 2010; van Ittersum *et al.*, 2008). Obviously, these choices must also be related to the national context and its priorities and, therefore, should be adopted only after a thorough analysis of the primary sector's socio-economic indicators. To meet this goal, allocation criteria that orient policymakers' decisions should be defined, as shown by Monteleone and Pierangeli (2012)[15].

As is known, the CAP 2014-2020 will address a set of challenges, a few being unique in nature and a few being unforeseen, that put pressure on the EU to make a strategic choice for the long-term future of its agriculture[16] (Figure 1).

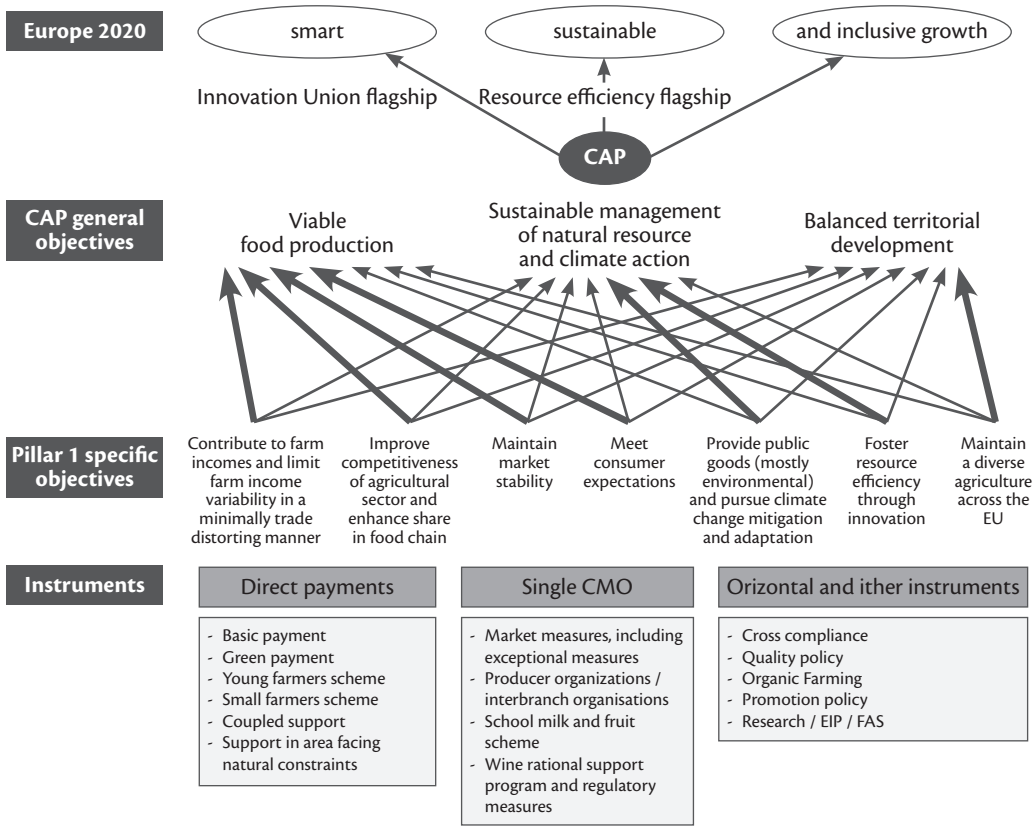
On the basis of these main targets, certain priorities have been acknowledged for each pillar. The logic for intervention under Pillar 1 involves seven specific objectives that are to be achieved by direct payments:

a. contribute to farm incomes and limit farm income variability in a manner that involves minimal trade distortion;
b. improve the competitiveness of the agricultural sector and enhance its share of value in the food chain;
c. maintain market stability;
d. meet consumer expectations;
e. provide public goods and pursue mitigation of and adaptation to climate change;
f. foster resource efficiency through the use of innovation;
g. maintain diversity in agriculture across the EU.

[15] The method that leads to this goal includes the following:
i. identify general political objectives;
ii. describe priority/specific objectives;
iii. break these objectives and priorities into indicators (criteria);
iv. select and define the suitable indicators for a defined geographical level (i.e., EU, MS, regional level);
v. calculate the value by considering caveats regarding the use of data.

[16] To respond to these future challenges, three general objectives have been identified:
A. guarantee viable food production;
B. promote sustainable management of natural resources and climate action;
C. foster a balanced territorial development in rural areas.

Fig. 1 - Intervention logic for Pillar 1



Source: 4th meeting of the EGMEC (2014)

3.2. Indicators used to measure CAP 2014-2020 performance

Article 110 of the Horizontal Regulation[17] proposed the establishment of a common monitoring and evaluation framework that includes a set of indicators to measure the performance of the CAP[18]. To this end, the Expert Group on Monitoring and Evaluating the CAP (EGMEC), which assists the EC in the preparation of legislation and in policy definition, has provided a set of indicators for each pillar. Table 2 shows a selection of indicators that refer to Pillar 1[19] and can be used to create an *ex ante* evaluation of the results produced by national choices (e.g., distribution of the financial ceiling for direct payments) (van Ittersum *et al.*, 2008).

[17] Regulation (EU) no 1306/2013 of the European Parliament and of the Council of 17 December 2013 on the financing, management and monitoring of the Common Agricultural Policy and repealing Council Regulations (EEC) No 352/78, (EC) No 165/94, (EC) No 2799/98, (EC) No 814/2000, (EC) No 1290/2005 and (EC) No 485/2008.

[18] Regulation (EU) no 1306/2013 of the European Parliament and of the Council of 17 December 2013 on the financing, management and monitoring of the Common Agricultural Policy and repealing Council Regulations (EEC) No 352/78, (EC) No 165/94, (EC) No 2799/98, (EC) No 814/2000, (EC) No 1290/2005 and (EC) No 485/2008.

[19] Presented at the 3rd meeting of the EGMEC held in Bruxelles (Belgium) on February 27, 2013.

Tab. 2 - First pillar objectives and indicators

General objectives	Specific objectives	Result indicators
Viable food production	Enhance farm income	- Share of direct payments in agricultural income - Variability of farm income
	Improve agricultural competitiveness	- Share of value added for primary producers in the food chain - Share of exports in world markets - Share of high value-added products in exports
	Maintain market stability	- Commodity price compared to the rest of the world - Commodity price volatility - Commodity price volatility compared to the rest of the world
	Meet consumer expectations	- Share of organic area in total UAA - Share of organic livestock in total livestock
Sustainable management of natural resources and climate action	Provide environmental public goods	- Share of (permanent) grassland in agricultural land - Share of arable land - Share of EFA in agricultural land
	Climate change mitigation and adaptation	- Net greenhouse gas (GHG) emissions from agricultural soils
Balanced territorial development	Maintain diverse agriculture	- Structural diversity (distribution of holdings according to their size in Ha) - Share of UAA that is supported in the area that has natural constraints

Source: 4th meeting of the EGMEC (2014)

This approach could permit the assessment of different allocation scenarios avoiding subjective considerations and providing reliable indications to the Italian Government if there were no critical limits to consider (EC, 2012). It must be considered that for certain indicators, the national level is the smallest geographical breakdown, and this might create complications or limitations regarding evaluations where a more detailed geographical level is needed[20]. Moreover, given the wide range of data used, much effort should be made to facilitate access to the indicator data. Finally, certain indicators are influenced by both the contributions of Pillar 1 and of Pillar 2 measures, and more detailed statistics are difficult to provide.

4. Objectives and scenarios

The shift from the SPS to the new direct payments architecture is a milestone of the CAP 2014-2020. As a MS, Italy has the option of redistributing the direct payments funds between farmers, but it also has the responsibility for using these resources to obtain certain significant policy results. The new CAP offers an important opportunity to adapt economic and financial instruments (direct payments) better to the policy targets (Erjavec *et al.*, 2011). For this reason, policymakers' choices should be based on rational and objective criteria.

This article aims to provide a few elements that could guide the policy decision process in

[20] The Italian Government could have difficulty in exercising certain national options without a previous political agreement with regional authorities.

Italy. In the framework of the national allocation of the budgetary ceiling for direct payments[21] and the flat-rate for the entitlement values in 2019[22], it shows how different allocations of the national ceiling between the seven components of direct payments may affect the results. These results are considered in terms of their relationship to the specific objectives (priorities) of Pillar 1, which are defined by the EC, and the related result indicators that are provided by the EGMEC (EC, 2010). The article describes six scenarios[23] (Table 3) that differ in their allocation of national ceilings between the components of direct payments[24]:

A. undifferentiated support scenario, which only presents the three mandatory components (basic payment, greening and young farmers);
B. productivistic scenario, with a large amount of attention given to coupled support;
C. public goods scenario, which provides funds to the areas that have natural constraints;
D. redistribution choice scenario, which applies payments to the 'first hectares';
E. target-oriented scenario, which describes the 'all inclusive' solutions;
F. policy agreement scenario, which simulates a feasible political option for Italy.

Next, the EGMEC's result indicators were used for the investigation of every scenario through the use of a qualitative approach, which attempts to do the following:

- note the single impacts on each specific objective;
- analyse the overall effects/results produced;
- evaluate these results by attributing them a numerical rating;
- show policy implications;
- provide indications to Italian policymakers.

Tab. 3 - Allocation scenarios in Italy (value expressed as % of the national ceiling)

Scenario	Basic payment	Redistributive payment	Greening	Areas that have natural constraints	Young farmers' scheme	Coupled support
Undifferentiated support	68	0	30	0	2	0
Productivistic	53	0	30	0	2	15
Public goods	63	0	30	5	2	0
Redistribution	38	30	30	0	2	0
Target-oriented	18	30	30	5	2	15
Policy agreement	48	5	30	0	2	15

5. A qualitative simulation of resource allocation scenarios

An objective evaluation of the effects related to different allocations of direct payment components established by EU Institutions needs to be supported by a reliable quantitative reference.

[21] This discards the hypothesis of a regional allocation of the national ceiling, which is also suggested in the draft Regulation.

[22] Article 22, paragraph 5 of the Regulation of new direct payments states 'As of claim year 2019 at the latest, all payment entitlements in a Member State or, in case of application of Article 20, in a region, shall have a uniform unit value'.

[23]

[24] The small farmers' scheme has not been considered because, to finance it, MSs must deduct the amounts to which the small farmers would be entitled from the other direct payments funds. Therefore, this option will not imply a specific allocation choice.

Table 4 clearly states how the amounts of each direct payment in Italy, in regard to the hypothesis of a national flat-rate system in 2019, will vary depending on the national choices, with the only exceptions of greening (€93/ ha, if calculated as the annual payment for eligible hectares[25]) and young farmers' support[26] (€45/ ha). By allocating the various percentages of the Italian ceiling[27], which are established by the Regulation (EU) No. 1307/2013 for direct payments, between the unfixed components[28] and then distributing the obtained amounts to potentially eligible hectares[29], the result is that the remaining mandatory payment (the basic one) will range from 210 €/ha in the undifferentiated scenario to only €56 /ha in the target-oriented one. The redistributive payment[30] will vary from €/0ha, if it is not activated, to €/141ha in the redistribution and target-oriented scenarios. The payment for areas that have natural constraints would be €30 for public goods and in target-oriented scenarios and €0 in the other scenarios.

The simulations show that Italian choices about the allocation of the Pillar 1 national ceiling will influence the distribution of CAP financial resources between the various typologies of farms and agriculture, depending on their physical characteristics (size and location), their organisational and productive structure (age of farmers, method of cultivation and type of production) and their managerial decision (repartition of cultivated areas).

Tab. 4 - Amounts of Italian direct payments in 2019 according to six allocation scenarios (€/ha)

Scenario	Basic payment	Redistributive payment	Greening	Payment for areas that have natural constraints	Young farmers' scheme	Coupled support
Undifferentiated support	210	-	93	-	45	-
Productivistic	164	-	93	-	45	n.a. (*)
Public goods	193	-	93	30	45	-
Redistribution (30 hectares)	118	141	93	-	45	-
Target-oriented (30 hectares)	56	141	93	30	45	n.a. (*)
Policy agreement (10 hectares)	133	35	93	-	45	n.a. (*)

(*) Not available. In fact, the coupled support payment depends on sectors and products that will benefit from this financial aid. Which agricultural sectors and products will receive this support and how it will be calculated is not currently predictable.
Source: Authors' calculations

[25] Alternatively, a MS that, by way of derogation from the calculation method referred to in the first paragraph of article 22, would differentiate the value of payment entitlements in 2015 on the basis of their initial unit value, could calculate the greening payment as a percentage of the total amount of basic payment annually received by each farmer.

[26] The amount of the young farmers' payment can be calculated by four different formulas. In this simulation, it is calculated as 25% of the amount obtained by dividing a fixed percentage of the national ceiling for the calendar year 2019 by the number of all eligible hectares declared in 2015.

[27] It will gradually decrease from 3,902 M EUR in 2015 to 3,752 M EUR in 2019.

[28] Coupled support is not calculable as payment per hectare, despite its potential importance for specific sectors and products.

[29] As reported in the 6th General Census of Agriculture carried out by Istat in 2010.

[30] Assigned to the first thirty hectares of each farm in the 'target-oriented' and 'policy agreement' scenarios and to the first ten hectares of each farm in that of the 'policy agreement'.

6. Materials and methods

6.1. Recent methods for evaluating the CAP

Over the last two decades, the need for evaluating the possible effects that are related to the implementation of public policies has been strongly increasing due to the scarcity of financial resources. Over time, CAP instruments have a tendency to increase their complexity by progressively combining several policy aims (Gomez y Paloma *et al.*, 2013). Consequently, a large amount of research has improved the ability to investigate how policy instruments can affect the private domain also by paying particular attention to environmental effects. The latter aspect has become increasingly important relative to the application of CAP reforms, especially since the beginning of 21st century, when, by dismantling the old market policy, certain environmental issues (particularly the provision of public goods) became the main aim of European agricultural policy (Henke and Coronas, 2011; Westhoek *et al.*, 2013).

Because the new CAP grants MSs a greater freedom of choice in implementing certain policy measures, the need for a well-balanced allocation of resources at the national level is greater. This is particularly evident for future direct payments because, as previously stated, each MS may perform a broad decision-making process, but in the meantime, it should also try to evaluate the main related effects caused by different allocation scenarios (Viaggi *et al.*, 2010).

6.2. A qualitative evaluation of the allocation scenarios

A way to evaluate these impacts is to consider how a distribution of resources between some/all of the components of direct payments could affect the result indicators that EGMEC has identified to be representative of and consistent with the specific objectives of CAP 2014-2020. This exercise corresponds to the first step in a greater *ex ante* evaluation process that is useful in guiding the decision process that Italy and other MSs will have to undertake. The methodology that is adopted consists of applying a scale of values that range from 1 to 5[31] and refers to the probable impacts of a single allocation scenario to each EGMEC's result indicator. After completion of this evaluation, an algebraic operation allowed two simple but fundamental questions to be answered:

– which is/are the best scenario/s for each specific objective?
– which is/are the main objective/s that is/are achieved by each single scenario?

These answers are obtained by calculating a weighted average of the sum of impacts that are assigned to specific result indicator(s), as well as to the respective maximum impact levels for each objective[32]. By this method, each scenario is evaluated with a qualitative analysis that allows the authors clearly to highlight:

– how the scenarios could contribute in different ways to the achievement of a single objective;
– how a single scenario is differently tailored to all of the specific objectives.

Finally, comparing this information could show the overall consistency of the scenarios with the specific objectives of Pillar 1 and also suggest, as a first approach, which combinations of direct payments are the most or least appropriate for Pillar 1 purposes.

[31] Here, 1 means no impact, 2 means limited impact, 3 means clear impact, 4 means marked impact and 5 means great impact.

[32] As shown later, for each objective, the result is obtained as a weighted average of the sum of the impacts that are assigned to specific result indicator(s) and their respective maximum impact levels (for instance, 2/5 = 4/10 = 6/15).

7. Main findings

7.1. The coherence between the scenarios analysed and the objectives of the CAP

The qualitative evaluation, carried out directly by the authors, using EGMEC's result indicators (Table 2) and their subsequent transformations into numerical values (Table 5) allows assessment of the coherence of each different allocation scenario with specific Pillar 1 objectives. The results (Tables 6 and 7) show that the 'public goods' scenario appears to be the one that is most consistent with the aims that the EC assigned to Pillar 1 payments (EC, 2010). In fact, it is able to contribute strongly to the achievement of a great number of objectives[33]. At the same time, this scenario presents two weak points because it would not be able sufficiently to guarantee the stability of the Italian (and European) agricultural markets[34] or to improve agricultural competitiveness. The 'target-oriented' scenario is another scenario that could contribute to a positive outcome as regards Pillar 1. Its direct payment allocation would provide a significant contribution to the achievement of almost all of the objectives. This approach, which is better than the others, would allow every payment to be adapted to a specific objective, which would result in a high level of effectiveness and efficiency regarding public expenditure (Tangerman, 2011; Solovyeva and Nuppenau, 2012).

On the other hand, the 'productivistic' scenario presents many critical points in achieving the priority targets, and it would be unable to face the future challenges of Italian (and European) agriculture. In fact, over the past ten years (Fischler reform), the CAP has shifted from a protectionist/productivistic approach to a liberal/public goods approach (Lowe *et al.*, 2010; Tranter *et al.*, 2007) by dismantling the market policies (CMOs) and promoting a decoupled direct payment that is neutral in the market equilibrium mechanisms (Henke, Coronas, 2011). Therefore, this type of scenario currently appears to be extremely anachronistic because it aims to guarantee markets and farmers income stability in a time of high turbulence and price volatility rather than to foster the provision of public goods (Westhoek *et al.*, 2013).

The remaining scenarios have intermediate characteristics. In descending order of coherence with the specific objectives of Pillar 1, the 'undifferentiated support' shows an optimal attitude in enhancing farm income, as well as a satisfactory capacity to provide public goods and meet consumer expectations, but it would not bring any benefit to agricultural competitiveness. The 'redistribution choice scenario' reconciles, to a certain extent, the target of environmental sustainability with that of food security, but it fails to promote competitiveness and market stability. Finally, the 'policy agreement' scenario, which simulates an allocation scheme that could fit in the current Italian agricultural framework, has a good capacity only for stabilising agricultural markets and (weakly) improving farm competitiveness, but it would make only a marginal contribution to the attainment of the other objectives.

7.2. A few considerations about the EGMEC's indicators

The results of this qualitative evaluation largely depend on the authors' points of view, the scale of values that is adopted, the aggregation method that is implemented and the EGMEC's

[33] In particular, this scenario contributes to the following:
- meet consumer expectations;
- provide environmental public goods;
- climate change mitigation and adaptation;
- maintain diverse agricultures.

[34] This specific objective has been entrusted to the new Common market organization (Regulation No 1308/2013).

indicators. Although the first three shortcomings could be overcome in the future by using valuations that are produced by a well-established panel of experts and introducing a sensitivity analysis, the latter intrinsically reflects the main orientations of the EC, which culminated in the Communication 'The CAP towards 2020.' It clearly reflects the fact that the debate over the CAP 2014-2020 began more than five years ago when the European agricultural sector and all of the national economies used a completely different framework, where environmental issues received a large amount of attention from policymakers. Over that period, the provision of public goods was announced to be the only way to continue guaranteeing direct support for farmers, without any distortion of competition, to avoid the violation of WTO agreements (Daugbjerg and Swinbank, 2012). Therefore, these aims strongly shaped the CAP architecture by increasing the budget share for environmental measures, particularly in the European Agricultural Guarantee Fund, due to the introduction of a 'greening' payment, as well as the instruments that were adopted for the evaluation of Pillar 1 results (Lowe *et al.*, 2010).

In this regard, a straightforward analysis of EGMEC documents (2014) clearly shows that a large number of the indicators that are provided is linked directly or indirectly to environmental issues, while only a few of them are related to 'traditional' specific objectives[35]. The different attributions of importance between the various objectives also tends to unbalance the same evaluation logic by giving more importance to the 'green side' of the CAP rather than to the production and market-related aspects. Accordingly, the allocation scenarios that mainly focus on a sustainable and diverse agriculture receive a better overall assessment than the ones that aim to realise a more competitive market that is able to provide food security.

[35] Sustaining farm income, improving competitiveness, and stabilizing the market.

Tab. 5 - Evaluation of allocation scenarios using result indicators by EGMEC

Pillar 1 specific objectives	Result indicators	Undifferentiated support scenario	Productivistic scenario	Public goods	Areas that have natural constraints	Young farmers' scheme	Coupled support
Enhance farm income	Share of direct payments in agricultural income	□□□□□□	□□□	□□□□	□□□□	□□	□□□
	(Limit) Variability of farm income	□□□□□□	□□□	□□□□	□□□	□□	□□□
Improve agricultural competitiveness	(Increase) % of value added for primary producers in the food chain	□	□	□	□	□	□
	(Increase) Share of MS exports in world markets	□	□□	□	□	□□	□□
	(Increase) Share of high value added products in MS exports	□	□	□	□	□	□
Maintain market stability	(Stabilise)MS commodity price compared to the rest of the world	□	□□	□	□	□□	□□
	(Limit) MS commodity price volatility	□	□□	□	□	□□	□□
	(Limit) MS commodity price volatility compared to the rest of the world	□	□□	□	□	□□	□□
Meet consumer expectations	(Increase) Share of organic area in total UAA	□□	□□	□□□	□□□	□□	□□
	(Increase) Share of organic livestock in total livestock	□□	□□	□□□	□□□	□□	□□
Provide environmental public goods	(Increase) Share of permanent grassland in agricultural land	□□	□	□□□□	□□	□□□	□□
	(Increase) Share of arable land	□□□□	□□□□□	□□□□□	□□□	□□□□	□□□
	(Increase) Share of EFA in agricultural land	□□□□	□□	□□□□	□□□	□□□□	□□
Climate change mitigation and adaptation	(Limit) Net greenhouse gas (GHG) emissions from agricultural soils	□□□□	□□	□□□□□	□□□□	□□□□	□□□
Maintain diverse agriculture	(Increase) Distribution of holdings, according to their size in Ha (structural diversity)	□□□	□□	□□□	□□□□□	□□□□	□□□□
	(Increase) Share of UAA that is supported in areas that have natural constraints	□□	□	□□□□□	□□	□□□□	□□

□ = 1 = no impact; □□ = 2 = limited impact; □□□ = 3 = clear impact; □□□□ = 4 = marked impact; □□□□□ = 5 = great impact

Tab. 6 - Consistency with Pillar 1-specific objectives(*)

Pillar 1-specific objectives	Undifferentiated support scenario	Productivistic scenario	Public goods	Areas that have natural constraints	Young farmers' scheme	Coupled support
Enhance farm income	1	0.6	0.8	0.7	0.4	0.6
Improve agricultural competitiveness	0.2	0.25	0.2	0.2	0.25	0.25
Maintain market stability	0.2	0.4	0.2	0.2	0.4	0.4
Meet consumer expectations	0.4	0.4	0.6	0.6	0.4	0.4
Provide environmental public goods	0.65	0.55	0.85	0.55	0.75	0.45
Climate change mitigation and adaptation	0.8	0.4	1	0.8	0.8	0.6
Maintain diverse agriculture	0.5	0.3	0.8	0.7	0.8	0.6
Total	3.75	2.9	4.45	3.75	3.8	3.3

(*) For each objective, the result is obtained as a weighted average of the sum of the impacts assigned to specific result indicator(s) and the respective maximum impact level (for instance, 2/5 = 4/10 = 6/15)

Tab. 7 - Best and worst scenarios for each Pillar 1-specific objective

	Enhance farm income	Improve agricultural competitiveness	Maintain market stability	Meet consumer expectations	Provide environmental public goods	Climate change mitigation and adaptation	Maintain diverse agriculture
Best scenario(s)	Undifferentiated support	Target-oriented/ productivistic/ policy agreement	Productivistic/ target-oriented/ policy agreement	Public goods/ redistribution choice	Public goods	Public goods	Public goods/ target-oriented
Worst scenario(s)	Target-oriented	Undifferentiated support/ public goods / redistribution choice	Undifferentiated support/ public goods/ redistribution choice	Undifferentiated/ productivistic/ target-oriented/ policy agreement	Policy agreement	Productivistic	

8. Final remarks

This article makes a contribution to the policy debate about the implementation of the 2014-2020 CAP reform. The role of MSs is to pursue the general and specific objectives of Pillar 1, which were declared by the EC in 2010. This aim is not easy, and the paper seeks to offer a contribution. It shows, by means of a qualitative evaluation that uses EGMEC's result indicators, why the authors believe that six simulated resource allocation scenarios may provide different contributions in Italy to achieving the main targets established by EU institutions. The method adopted could be particularly interesting for future analyses that address the resource allocation of Pillar 1, but a well-established panel of experts who are involved in the evaluation process could provide further improvements.

Obviously, ways better to adapt the method adopted in this work to a single MS should account for the relevance of each EGMEC indicator, possibly varying quite a bit, depending on both the characteristics of every national agri-food system and on the political sensitivity to a specific issue (e.g., agricultural productivity rather than environmental sustainability). However, as demonstrated, the general guidelines and settings of the CAP 2014-2020, although intensely modified during the inter-institutional debate that ended in September 2013, have remained strongly oriented to the provision of public goods that have a target-oriented approach. These two elements (i.e. the positive externalities of agriculture and a policy with more targeted measures) will continue to lead CAP away from the traditional and protectionist phases (1965-1992), which aimed too strongly at productivistic targets. In a framework that is characterised by such a strong national flexibility, further insights ought to be provided to specify more accurately how different allocation scenarios are able to contribute to the attainment of specific national objectives, both in Italy and in the other EU Countries.

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WHICH ORGANIZATIONAL MODELS STIMULATE HIGHER ACCESS TO AGRICULTURAL EXTENSION SERVICES? EMPIRICAL EVIDENCE FROM ITALY

JEL classification: Q16, Q18

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Abstract. *The growing complexity of agricultural extension services (AES) has stimulated the debate on which organizational model fits best with farmers' participation in extension programs. The paper aims, on the one hand, to analyse the access to agricultural extension services by farms working in regions with different organizational models; on the other hand, the paper tries to test the effectiveness of different organizational models in terms of greater utilisation of AES by farms.*

The results show profound differences in access to AES in different organizational models and provide for a normative solution to stimulate organizational adjustments in the supply of AES.

Keywords: *Agricultural extension services, privatization, contractualisation*

1. Introduction

The theme of the paper is agricultural extension services, that is "*a set of agricultural organizations and/or persons, and the links and interaction between them engaged in such processes as the generation, transformation, transmission, storage, retrieval, diffusion and utilization of knowledge and information, with the purpose of working synergically to support decision-making, problem solving and innovation in a given country's agriculture"* (Röling, 1990). The aim of our paper is to verify which organizational model fits best with farmers' participation in extension programs supplied by Italian regions. Special attention will be devoted to marginal rural areas, where the multifunctional paradigm of agriculture is at stake: in these areas, it could be of interest to test the rates of adoption of services by farms with different models of governance. To this end, in the next paragraph we offer a brief theoretical note; then, following a summary of the methodological approach, we present the results of an empirical research carried out in Italy, concerning access to AES by farms situated in regions with different organizational models.

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2. Theoretical background

The setting up and evolution of the multifunctional paradigm of agriculture have called for a renewal in the supply and governance of agricultural extension services in enabling multifunctionality (Cukur *et al.*, 2013). A coherent adaptation of agricultural extension services to the new scenario should integrate economic, social and environmental aspects into the definition of strategies for knowledge transfer (Brunori *et al.* 2009). As a consequence, agricultural extension systems have been entrusted with a set of goals aimed at fostering the transition toward more sustainable and multifunctional agriculture (Anderson, 2007). On the institutional side, the evolution of extension has been sustained by a parallel development of agricultural policy during the last programming phase (2007/2013). The most important measures aiming at improving the supply of extension at farm level concern vocational training and information s, the use of advisory services and the establishment of rules for management, relief and advisory services (Ascione, Vagnozzi, 2011). As pointed out by the Standing Committee on Agricultural Research, this policy aims to empower human capital and farmers' attitudes towards innovation (EU SCAR 2012); therefore, pluralistic views of provision of extension supply have recently been established to stimulate higher rates of farmer participation in agricultural services (Anderson, 2007). Mixed models of extension have become dominant all over the world, with the prevalence of public presence in underdeveloped countries, as compared with developed economies (Johnson, 2002). As a matter of fact, in developed countries a marked trend towards an organizational model of extension services based on co-payments for services is taking place. For example, starting from a cost-recovery process, some northern-European countries have arrived at completely privatized extension systems (Laurent *et al.*, 2006). However, the success of privatized systems of extension depends on participatory multi-actor models: universities, public agencies, non-governmental associations, international agencies and other local stakeholders cooperate in order to promote more efficient systems of extension, thanks to processes of institutional innovation (Wolf, Zilberman, 2001). On the other hand, a total privatization of services could be discriminating for a relevant share of small-scale farmers (Laurent, Labarthe, 2009), or in developing countries. By recalling Schwartz's (1992) analysis, Foti *et al.* (2008) emphasize issues concerning the privatization of traditionally publicly provided agricultural extension services: will "fee for service" systems, necessarily lead to greater efficiency and equity? what are the implications for social aspects, income distribution and marketing, as regards access to the services by small farmers and the rural poor? Will farmers be willing to pay for the extension services? (p.96).

Against this background, Best Fit approaches are particularly useful in the analysis of a "good" supply of agricultural extension, which makes it possible to reach all types of potential beneficiaries of agricultural services (Birner *et al.*, 2009). As a matter of fact, the objective of avoiding "result paradox" (Benvenuti, 2000) could be reached by involving all types of farms, even small and marginal ones, and by considering their multifunctional role (Labarthe, 2005; Labarthe, Laurent, 2009). Therefore, an intense debate on which organizational model fits best with the necessity to foster farmers' greater participation in extension programs has been developing in recent years: do privatization and contractualisation lead to higher levels of participation? Is it necessary to maintain a minimum presence of the public sector, due to the "public" nature of some services? In this setting, provision and use of agricultural extension services could be strictly linked to the production of externalities: for example, positive externalities could arise in the case of free access to information and innovative practices from other actors, through informal hori-

zontal mechanisms of transmission and self instruction, above all within specific regions well-known as learning regions (Lundvall, 2006; Umali, Schwartz, 1994). Similarly, other examples of positive externalities are diffusion of good agricultural practices, practices of animal welfare and sustainable use of natural resources. Market failure linked to the presence of externalities (either positive or negative) may be reduced by public policy: it could happen in cases of provision of a complete public service, where the role of services takes on the nature of a public good. This is particularly true in certain rural areas, classified by the European rural policy as marginal, where both environmental and physical characteristics reduce the propensity to offer private services to farmers. However, as underlined in the literature, public intervention in economics could be ineffective and government failure may emerge (Stiglitz, 2000).

For this reason, other relevant research questions emerge: do progressive decentralization and privatization of AES really fit in with growing territorialisation of rural development policies? Is a good penetration of AES in rural marginal areas granted within a privatized system of services? Should a "core" public intervention be kept in these areas? In order to answer these questions, we present an analysis of the access to AES: the analysis makes reference to Italian farms located in different rural areas and in regions classified with different models of governance. The paper intends to match diversified levels of governance with different degrees of access to AES on the basis of different degrees of rurality.

3. Materials and method

By considering farmers as consumers of agricultural services (Charatsary *et al.*, 2011), the paper presents a comparison of access to AES on the basis of territorial characteristics and models of governance: models of governance have been defined in previous studies (La Rocca, 2012). Key aspects considered to define models of governance are: functions, actors, type of service. We make reference to this criterion to compare different Italian regions on the basis of different models of governance, more precisely, by comparing:

a) regions with prevalently public structures of governance (Piedmont – northwestern Italy and Campania – southern Italy);
b) regions with decentralized structures of governance (Umbria – central Italy);
c) regions with private and NGO structures of governance and balanced participation (Lazio - central Italy);
d) regions with pluralistic, privatized and participated models of governance (Veneto – north-eastern Italy).

In each region, we refer to rural areas, according to the classification in the national strategic plans, as:

– urban poles (A);
– areas with intensive agriculture (B);
– intermediate rural areas (C);
– marginal rural areas (D).

The underlying reasoning that in a region characterized by the prevalence of public governance, higher levels of access to services should be granted in marginal rural areas, where privatized systems of services are less involved. To test this hypothesis we have classified farms on the basis of degree of access to agricultural extension services: to this end, we have borrowed a previous

classification of Italian farms based on the propensity to make use of agricultural services (De Rosa *et al.*, 2013). This classification takes into account:

a) farm's utilization of services and motivation;
b) degree of satisfaction expressed by farmers about the utilization of services;
c) motivations for not utilizing services.

Starting from this classification, we have obtained four relevant groups of farms:

1. farms with full use of AES (farms with regular access to AES in all possible sources: training, information and advising);
2. farms with partial use of AES (use of one or more services, with the exclusion of others);
3. farms without any voluntary use of AES (farms which do not consciously use services, due to their inadequacy or due to farmers' self-reliance);
4. farms with lack of access to AES (farm not using services due to informational asymmetries or to a set of unsustainable costs).

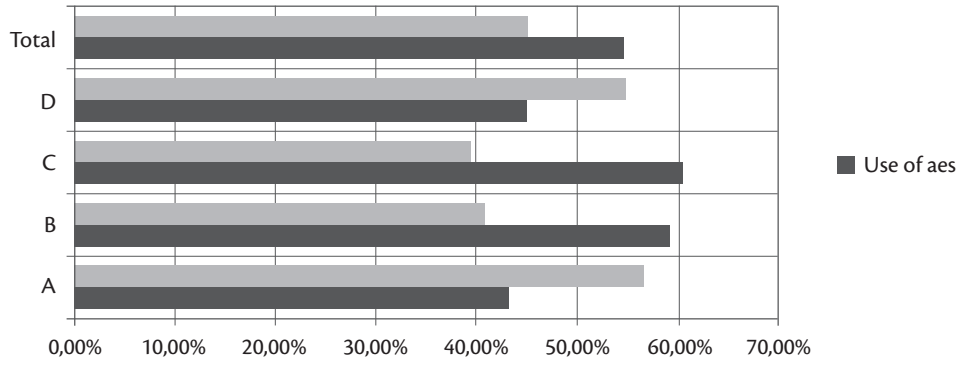
Differences among the two groups of farms not using services are attributable either to a farmer's choice or to a sort of difficulty in gaining access to agricultural advisory services. In the first case, either negative previous experiences or a total lack of interest have limited the potential demand of farmers for advisory services.

In the case of lack of access, there is a problem of informational asymmetry: many farmers are not aware of the opportunity of supporting their activity through advisory services. A further possible gap is due to different types of cost the farmer has to sustain to adopt the services (opportunity costs included). In the following paragraphs we present the results of our empirical tests, by elaborating on the possible link between organizational regional models of AES and their use by farms.

4. Results

Figure 1 depicts the aggregate situation concerning the use of AES in the entire sample. Slightly more than half make systematic use of agricultural services, while more than 40% do not use them. The share of farms using services rises in areas with intensive agriculture and in intermediate rural areas, while it falls in urban poles and marginal rural areas. In these latter areas the majority of farms do not utilise agricultural services. In order to get confirmation of connections between types of rural areas and access to services, a *chi-squared* test has been applied.

Fig. 1 - Use of agricultural services (% of farms per type of rural area)



A = urban poles; B=areas with intensive agriculture; C = intermediate rural areas; D = marginal rural areas.

The test illustrated a relationship between rural zones and access to services, underlining profound differences among the various rural areas designated by the national strategic plan. In this sense, innovation does not spread out in a linear and uniform way, as affirmed in some regional perspectives on diffusion of innovation (Hagerstrand, 1965). As stressed in *best fit* approaches, a contextualization of analysis should be preferred to linear models of innovation (Knickel *et al.*, 2009). To get more precise information linking models of governance, types of rural areas and access to agricultural services, it is necessary to compare regions characterized by different organizational models.

4.1. Results at regional level

Tables 1-4 show access to services in regions with different organizational models. From the tables some interesting differences emerge in marginal rural regions

In regions with prevalently public structures of governance, the situation is depicted in table1 referring to farms in the north and south of Italy. In marginal rural areas, rates of full utilization are lower than the national average (33% vs. 36%), both in the north and south of Italy. In the south, partial use of services is evident, while in the north, the percentage of use is limited to full access: that means two thirds of the total have no access to AES in northern Italy.

Areas with intensive agriculture show the highest percentage of access to services, with higher percentages in the north than in the south.

Tab. 1 - Access to AES in regions with prevalently public structures of governance (% of farms per type of rural area)					
North (Piemonte)					
	A	**B**	**C**	**D**	**Total**
full utilisation	42,9	56,7	52,7	33,3	49,3
no voluntary use	6,0	9,4	6,8	19,3	9,1
partial use	6,0	2,4	3,4	0,0	3,1
difficulty in access	45,2	31,5	37,2	47,4	38,5
Total	100,0	100,0	100,0	100,0	100,0
South (Campania)					
	A	**B**	**C**	**D**	**Total**
full utilisation	38,6	39,2	40,0	33,9	38,1
no voluntary use	11,6	12,9	12,5	11,6	12,1
partial use	20,5	19,9	17,5	23,2	20,4
difficulty in access	29,3	28,1	30,0	31,3	29,4
Total	100,0	100,0	100,0	100,0	100,0

As concerns *regions with decentralized structures of governance*, table 2 shows the relative results. The region considered is characterized by the presence of only C and D rural areas: in marginal areas access to AES, either full or partial, involves a high percentages of farms (73,6%). Another relevant result is evident: the difficulty in access is practically absent: therefore, AES gets an effective system to spread out information to farmers. As a consequence, voluntary non-use affects few farms: 14% of farms in C areas and 26% in D areas.

Tab. 2 - Access to AES in regions with decentralized structures of governance (Umbria) (% of farms per type of rural area)					
	A	**B**	**C**	**D**	**Total**
full utilisation	0,0	0,0	37,2	32,4	36,1
no voluntary use	0,0	0,0	14,0	26,5	16,8
partial use	0,0	0,0	44,6	41,2	43,9
difficulty in access	0,0	0,0	4,1	0,0	3,2
Total	0,0	0,0	100,0	100,0	100,0

In the regions *with private or Ngo structures of governance and balanced participation*, presented in table 3, a high level of utilization of services emerges in marginal rural areas: only one quarter of farms do not use services either voluntarily or due difficulty in access; therefore, higher access with respect to the national average is found.

Tab. 3 - Access to AES in regions with private or Ngo structures of governance and balanced participation (Lazio) (% of farms per type of rural area)					
	A	**B**	**C**	**D**	**Total**
full utilisation	54,8	44,0	38,7	35,9	41,8
no voluntary use	16,7	19,3	19,9	15,4	18,9
partial use	23,8	29,4	29,8	38,5	29,9
difficulty in access	4,8	7,3	11,6	10,3	9,4
Total	100,0	100,0	100,0	100,0	100,0

Finally, the highest percentage of full utilisation of AES (67,6%) has been found in *regions with pluralistic, privatized and participatory models of governance* (Table 4). More precisely, in marginal rural areas (D) more than 58% of farms gain access to all type of services, while in intermediate rural areas (C), the value rises to 75%. A relevant share of access is also registered in areas with intensive agriculture (67,4%) and in urban poles (58,3%).

Tab. 4 - Access to AES in regions with pluralistic, privatized and participatory models of governance (Veneto) (% of farms per type of rural area)					
	A	**B**	**C**	**D**	**Total**
full utilisation	58,3	67,4	75,0	58,1	67,6
no voluntary use	33,3	8,2	3,3	6,5	8,9
partial use	0,0	0,3	3,3	3,2	0,9
difficulty in access	8,3	24,2	18,5	32,3	22,6
Total	100,0	100,0	100,0	100,0	100,0

5. Conclusions

Europe 2020 strategy draws up new scenarios where a renewed role for agricultural extension systems is foreseen, within a process of building a Knowledge-based Bio-Economy (Materia, 2012). The framework designed by the strategy Horizon 2020, moreover, points to the relevance of interactions between different operators working in systems of agricultural knowledge, through the establishment of new networks and new subjects, like operational groups (van Oost, 2013). As a consequence, institutional assets will have to be revised to introduce a more efficient system of knowledge governance. In this context, our paper has tried to link (public/private/mixed) systems of governance with the adoption of extension services by farms, with particular attention to farms located in marginal rural areas. The regional governance of extension activities is arranged through the involvement of a multiplicity of actors, with different objectives (Vagnozzi, 2009). For this reason, a comparison of regional organizational models has been put forward, with the aim of testing relative effectiveness.

On the whole, the results show a progressive reduction in the access to services in the case of farms located in marginal areas. In these areas multifunctional agriculture is relevant and a multifunctional role of agriculture should be the key concept in maintaining a public role for agricultural services: in fact, in these areas, we have emphasized the role of public goods taken on by extension services. As demonstrated in other studies (Celik, 2013), supporting a public

structure to fulfill specific territorial needs is a priority in some territorial contexts. However, this may not always be true, as in cases of government failure, well explained by Stiglitz (2000) and analyzed in other studies (Caggiano, 2014).

Our empirical evidence shows a high percentage of access in regions with pluralistic, privatized and participatory models of governance, even in marginal rural areas: penetration indicators are satisfactory. On the contrary, public governance does not always seem able to stimulate farms to utilize agricultural services. How can the contradiction of a reduced rate of access to services with public governance in rural marginal areas be acconted for? The low efficacy of public intervention in AES has been widely explained in the literature: for example, McElwee (2006) illustrates this point when he underlines the lack of advice to support farmers and to orient them towards farm diversification in rural areas. In these cases, *poor and inconsistent advice prevents many farmers from attempting to expand their business* (McElwee, 2005).

To give an explanation of public failures in agricultural services, Birner and Anderson (2007) underline the following critical points: informational asymmetries, capabilities, bureaucracy and political interests. These ties are strongly exacerbated by the small structure of the Italian agricultural sector and make it difficult to develop demand-driven approaches (Rivera, Alex, 2004; Chipeta, 2006).

On the supply side, however, it cannot be denied that the role of the public sector is still relevant: new challenges are related to environmental and multifunctional aspects of agricultural activity, which makes it urgent to revise the role of the public sector in agricultural services, above all in rural marginal areas. Three main aspects should be on the agenda for revitalising the public role (Anderson, 2008): structure of governance, management and capability, methods of extension.

Finally, other tools to reduce failures in extension services call for action concerning an institutional design (Birner and Anderson, 2007): as our empirical analysis confirms, decentralization and participation could be a good answer for making services more coherent with local needs and to foster higher levels of performance.

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THE RELEVANCE OF DISTRICT CONTEXTS IN THE UTILISATION OF RURAL DEVELOPMENT POLICIES: EXPERIENCE FROM ITALY

JEL classification: Q12, Q18, R58

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Abstract. *The agrifood sector is characterised by the presence of small companies organized into agri-food districts, recognised by the Italian law n. 228/01 as "virtuous models of territorial development". Agri-food districts show considerable ability to capture and create value, with a positive impact on rural areas. This ability is sustained through the rural development policies of the EU, which aim at improving the competitiveness of farms and diversification of economic activity in rural areas. These opportunities, however, are not always well exploited by potential beneficiaries: the purpose of this article is to check the existence of a "district effect" in the implementation of rural development policies in Italy. To this end, the authors analyse demand for and funds obtained by farms, by comparing in-district and off-district farms.*

Keywords: *rural development policies, district effect, policy utilisation funds, farms.*

1. Introduction

The debate about the persistence of local systems of production (LSP) is currently relevant, as these systems show a high ability to compete in an increasingly global scenario[1]. This can be observed also in the agri-food sector and in rural areas, where the main characteristic is the presence of small companies organized in agri-food districts (Terluin and Vanema, 2003; Iacoponi, 2002; Brunori, 2003; Fourcade, 2006). As a matter of fact, LSP highlight a remarkable capacity for persistence and sustainability, even in an increasingly globalized and competitive scenario, due to a strong association between the productive and the socio-institutional components. The persistence of local production systems has been widely explained: researchers underline the local systems' competitiveness through the action of "atmospheric", Marshallian-like phenomena, the flexible organisation of production (Pyke and Sengenberger, 1992), the presence of untraded interdependencies (Storper, 1997) and, consequently, the significant reduction in transaction costs (Becker, 1981; Pollack, 1985; Ben-Porath, 1982).

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[1] A local system of production is a territorially-based, endogenous model of development, where small family firms achieve adequate economic performance, due to the availability of tangible and, above all, intangible assets, which produce a particular model of organisation, commonly called "districts" (Becattini, 2004).

The literature highlights the role of the performance of agricultural districts (Brasili and Fanfani, 2010; Becattini, 1990), the dynamics of local consumption (Crevoisier and Jeannerait, 2009), the current reproducibility of the model not only in agriculture, but also in consumption (see for example the gastronomic districts evaluated by Bonnard, 2013). A general item of research concerns the persistence of agricultural and rural districts through time. On this topic, a relatively neglected field of research is the ability to gain access to rural development policies as a factor contributing to the endurance of territorial systems of production. Recent policies for rural areas have therefore stressed territorial dimensions: the neo-institutional perspective of local development (Amin and Thrift, 1994) proposes ascendant policy approaches, or *bottom-up*, in which the responsibility for territorial development is totally assigned to local subjects, according to EU guidelines. Community-led local development approaches, recently introduced within the framework of the future plans for rural development in the period 2014-2020, confirm these perspectives, by encouraging the involvement of local stakeholders as drivers for rural development[2].

As a consequence, rural development policies propose ascending and bottom-up approaches, where the responsibility for territorial development is taken by local actors, in a framework aiming to promote endogenous development models. This policy ensures resource availability that, if well exploited, can generate considerable opportunities for farms and for local development.

EU's rural development policy is a revealing example of this type of approach: available resources operate on two essential dimensions of rural development: the sectorial dimension, through measures for the competitiveness of farms, and the territorial one, in the promotion of an endogenous and integrated model of development (De Castro *et al.*, 2011; Berriet-Solliec *et al.*, 2009; Hodge and Midmore, 2008).

The access (and its relative cost) to economic policies for local development is a particularly interesting theme of analysis; more precisely, a relevant topic for territorial production systems concerns higher propensity for gaining access to funds provided by rural development policies for businesses in a district context as compared with that for off-district ones. The underlying hypothesis is that what is called socialization space in district contexts engenders higher levels of access to rural development policy. This is due to the classic marshallian district ingredients: reduced costs of access to policies, for example the costs of bureaucracy[3] or cognitive limitations, that cut down transaction costs[4]. Have these elements the same relevance in district areas as in off-district territories? This paper attempts to analyze this issue by placing it in a territorial perspective, linked to the attitude towards adopting policies for rural development. The aim is to verify if the district atmosphere also produces regional differences in the economic and market policies. We argue that the location in district areas fosters higher access to policies.

After a brief survey of the Italian legislation about rural and agri-food districts, and after a brief methodological note, the paper continues by demonstrating the differences in the market access policies, with particular reference to inclusion or exclusion from districts (district/off-district). Some interpretative hypotheses and conclusions will end the paper.

[2] See the European Network for Rural Development.

[3] DG AGRI 2007.

[4] The reduction of transaction costs in district contexts has been well demonstrated in literature. See, among others, Dei Ottati, 1986, Serarols *et al.* (2008).

2. Agricultural districts in Italy

The debate about agri-food districts (ADs) in Italy raised in the early 90's (Iacoponi, 1990, Cecchi, 1992), has been led by the success of the studies about industrial districts[5] (IDs) and the introduction of the law for IDs[6]. It continued during the following decade (Pacciani, 1997, 2003; Becattini, 2000; Iacoponi, 2000, 2002; Angeli, 2000; De Benedictis, 2000; De Filippis 2000; Albisinni, 2002; Carbone, 2000; Masini, 2001), up to the introduction of the law for ADs[7].

The Italian authorities introduced this tool pursuing a dual purpose[8]: a support for farm competitiveness and an incentive for integrated development in rural areas. In fact, in order to shape ADs, the Italian government has looked at IDs as well as at Leader methodology (EU Rural Development Policy) and even at the French *Contrat de Pays* experience (Albisinni, 2002; Toccaceli, 2012).

The effect of devolution from central to regional governments is that ADs are regulated and recognized by Regions in different ways. Nevertheless, a common (although implicit) methodological pattern can be read through the different regional laws and two basic components are highlighted. At a local level, the partnership among different local actors (farms, firms, municipalities, and civil society), stimulates higher participation in rural development programs. Rural governance also plays the lever role in this socio-economic mechanism in different European experiences (Torre and Rallet, 2005; Angeon and Lardon, 2008). The second component refers to the institutional level, and concerns the (formal or informal) insertion of district projects into planning, programming and implementing policies, particularly at a regional level[9]. In this territorial-institutional mechanism, governance again plays a lever role bringing better coordination in government actions (Jessop, 2006) and a change for more successful implementation of policies (Stoker, 1998).

The expected results are both higher levels of effectiveness and efficiency in public spending (or in policy application), a growth in rural economy, and often a better management of environment resources.

This means that when an AD is identified and recognized by a Region, this is only the beginning of its path for achieving those expected results. So, ADs which are not following their own path nor getting results can be called "not virtuous" or "paper" districts[10].

Regarding the "district effect" (DE), there is a wide difference between IDs and ADs. Much literature has been generated on IDs,[11]with the aim of understanding the real causes behind their higher efficiency in productivity and persistence. Different paths were tested, both in accordance with the "new economic geography" approach, which considers the location of economic activity

[5] An industrial district is "*a social and territorial entity that is characterized by the active presence of both a community of people and a group of enterprises in a natural and historically determined area*" (Becattini, 1990).

[6] Law 317/1991 article n. 36.

[7] Legislative Decree 228/0, article n. 13.

[8] Both are defined as *local production systems (such as IDs).* Agri-food districts *"are characterized by significant local economic presence and interrelationship and interdependence of farms, as well as one or more certified products and safeguarded in accordance with applicable Community or national regulations, or by traditional or typical products."* Rural Districts *"are characterized by the homogenous historical setting and territorial identity derived from the integration between agricultural activities and other local activities, and the production of specific goods or services, in accordance with traditions and natural and territorial vocations".*

[9] In Italy, European structural policies are planned and implemented by Regions.

[10] Some reasons, but not exhaustive, for district failure are analysed in this paper.

[11] General synthesis in Becattini and Musotti (2004), and in Becattini *et al*., (2009). Italian examples: Signorini (2000) and Sforzi (2009).

over space, and a micro-economic approach, which focuses the firms' production functions in an off- and in-district area.

A concept of district effect for ADs was introduced by Pacciani (2003), with regard to a macroeconomic effect resulting at a local level in the first Italian experience of rural district in Tuscan Maremma. In this case, particular attention was paid to the capacity for organising demand and supply of financial resources in order to implement a well organised block of entrepreneurial projects. On the other hand, this means that a significant effect was produced regarding policy implementation.

District effects for ADs have been less analysed in recent literature: it has been demonstrated with respect to the economic performance of farms and organizational models; however, little attention has been dedicated to the ability to obtain funds through rural development policies.

In this paper, we try to highlight the differences between in-district- and off-district areas located in the Region of Lazio and to evaluate the *district effect* in the access to rural development policies

3. Materials and methods

In this paper, we define application of policies as the ability to obtain funds from 2007-2013 Rural Development Plans (Rdp). The reference to rural development policies leads us to compare intra-regional areas, ruled by Rdp's regional context. Therefore, the text presents the results of empirical analysis conducted in the Lazio Region, in Italy. This study looks into the adoption of policies by farms operating in districts compared with off-district farms. More precisely, the research analyses all the agricultural farms located in the recognized districts of the provinces of Rome, Latina and Frosinone.

The following officially recognized districts have been considered:

- *agri-food quality districts:*
  - in the Province of Rome, the Agri-food District of Excellence of the Roman Castles and Prenestini Mountains (it includes 24 municipalities);
  - in the Province of Latina, Agri-food Quality District of Fruit and Vegetable (it includes 15 municipalities);
- *rural district:*
  - in the Province of Frosinone, Rural District and Agro-energy Valley of the Latins (it includes 20 municipalities).

  All farms located in the remaining communes in the provinces and outside the district areas, have been included in the analysis as off-district areas, and more precisely:
  - the comparison with the fruit and vegetable district of Latina has been carried out with fruit and vegetables farms located in the areas classified as A and B by the regional plans for rural development[12];
  - agricultural farms located in the district of the Roman Castles and Prenestini Mountains have been compared with other agricultural farms of central and southern Latium, located in A and B areas of the regional rural development plan;

[12] The municipalities of the agri-food district of latina are prevailingly located in similar areas (A+B), as well as the municipalities of the Roman Castles district.

– to compare farms of the agro-energy district, we have taken into account all farms located in rural areas, that is area C and D of the rural development plan.

Before moving on to empirical analysis, it is appropriate to highlight the peculiarities that emerged due to the amendments of the Lazio Region. The scenario has 3 different developmental stages of the district:

1) the Agri-food District of Excellence of the Roman Castles and Prenestini Mountains (in the Province of Rome), is operating at a local level, which corresponds to a local community identity. It is a clear example of a multi-specialized district, which started its activity with the launch of Rdp 2007-2013. In addition, the district has been successfully carrying out integrated rural development projects, thanks to the good organization and relational capacity between farms, institutions and territory;
2) the Agri-food Quality District of Fruit and Vegetable (in Latina) is an active and evolving district;
3) the Rural District and Agro-energy Valley of the Latins (in Frosinone) is a district which has not yet been started, but has only been recognized by the regional law.

To verify the *district effect* with reference to the exploitation of rural development policies, we will analyse the number of funded farms, distributed according to the measures of the Rdp for the period 2007-2013; we have considered the measures according to the Ist and IIIrd axes, which are measures of investment. All the available measures for single farms have been taken into account, as provided by the single axes of the Rdp in the programming period 2007-2013. Our data refers to the end of October 2013. Specifically, the Ist axis of the Rdp focuses on improving the competitiveness of the agricultural and forestry sector, with the purpose of supporting each measure to increase sector competitiveness. The IIIrd axis addresses the issue of quality of life in rural areas and diversification of the rural economy with particular attention to areas risking marginalization or abandonment[13].

An index of association is calculated, in order to bring out the associations between the variables discussed, aiming to verify the degree of attraction between the political and territorial context. The assumption is that the in-district area is more attractive than the off-district areas, in terms of obtaining funds from Rdp. In this case, the degree of association may be estimated by an index which compares the incidence of the specific class with respect to a particular response, with the overall incidence on the sample. The index is the ratio between the two incidence rates:

$$A_{i,j} = \frac{n_{i,j} / n_{.j}}{n_{i.} / n_{.}}$$

Where:

- $A_{i,j}$ is an indicator of the degree of association between the dimensional class *i* and answer *j*,
- $n_{i,j}$ is the number of farms that fall in the size class *i* that have responded positively to the question *j*,
- $n_{.i}$ is the number of farms that fall in the size class $_j$ and *n* is the total number of farms.

[13] RDP 2007-2013, Lazio Region

- $n_{i.}$ is the number of farms that fall in the size class *i* and *n* is the total number of farms.
- $n_{..}$ is the total number of farms.

The indicator takes on a value greater than 1 in cases of positive association. Finally, in order to emphasise possible district effects, we will put forward a comparison between the motivation in applying policy referring to farms located inside the district area and farms outside it. To this end, a questionnaire was proposed to a sample of farms. The sample was extracted through a self-weighting sampling plan: a total of 264 farms (146 farms outside the district and 118 farms within the district) answered the questionnaire; 83% are considered to be valid answers.

4. Results

Table 1 highlights the main results[14], by comparing district and off-district areas: off-district farms show a greater tendency to utilise policy measures, the only exception being that of the fruit and vegetable district in the province of Latina. On the other hand, 8.9% of farms in the agri-food districts of Rome gained access to Rdp funds, against the 14.3% of farms in off-district areas. In the rural district of Frosinone, the share of access was 4.1% against 7.1% of other farms located in rural areas.

Therefore, a *district effect* limited to the case of agri-food district of Latina has been found[15]. On the other hand, the two districts in the provinces of Rome and Frosinone get lower levels of funding with respect to off-district areas.

The association index confirms what has been previously stated. A positive index of association in the agri-food district of the province of Latina emerges, while a substantial indifference in the district of Rome is evident.

[14] The authors thank Prof. Luca Bartoli for suggestions about data.

[15] This result confirms previous empirical analysis (Bartoli *et al.*, 2010).

Tab. 1 - Adoption of RDPs by district and off-district areas (number of farms)			
Area	**No**	**Yes**	**Total**
Agri-food fruit and vegetable district (Latina)	2,912	693	3,605
Agri-food district (Rome)	3,695	362	4,057
Rural district (Frosinone)	6,216	268	6,484
Outside agri-food district	7,298	1,222	8,520
- fruit and vegetable farms	624	118	742
Outside rural district	31,750	2,413	34,163
Total	51,871	4,958	56,829
Row percentages			
Agri-food fruit and vegetable district (Latina)	80.8	19.2	100.0
Agri-food district (Rome)	91.1	8.9	100.0
Rural district (Frosinone)	95.9	4.1	100.0
Outside agri-food district	85.7	14.3	100.0
- fruit and vegetable farms	84.1	15.9	100.0
Outside rural district	92.9	7.1	100.0
Total	91.3	8.7	100.0
Association index			
Agri-food fruit and vegetable district (Latina)	0.9	2.2	
Agri-food district (Rome)	1.0	1.0	
Rural district (Frosinone)	1.1	0.5	
Outside agri-food district	0.9	1.6	
- fruit and vegetables farms	0.9	1.8	
Outside rural district	1.0	0.8	
Source: own calculations.			

From the first empirical analysis, a sort of "territorial indifference" emerges, due to the lack of a systematic district effect. More detailed information can be gathered from the average amount obtained by farms (tables 2 and 3): 1,344 farms obtained funds from the first axis (total expenditure equal to € 118,421,355.00), while only 112 obtained funds from the IIIrd axis[16] (€ 11,924,878.00). Our data on average sums countervail previous information. A considerable sum of money has been granted to district contexts of Latina and Rome,thus providing partial evidence for a stronger district-effect as compared with the access of farms.

As far as the Ist axis is concerned, the highest average amount obtained by farms is located in the agri-food district of Latina, followed by the district of Rome. That means these two districts have proved attractive to funds from rural development policies; on the contrary, off-district attract higher average sums as compared with district contexts. This appears to show that there is a lack of specific financial assistance for implementing the programme in the district, even with programming from "the top" of the mesh of the districts on this portion of territory.

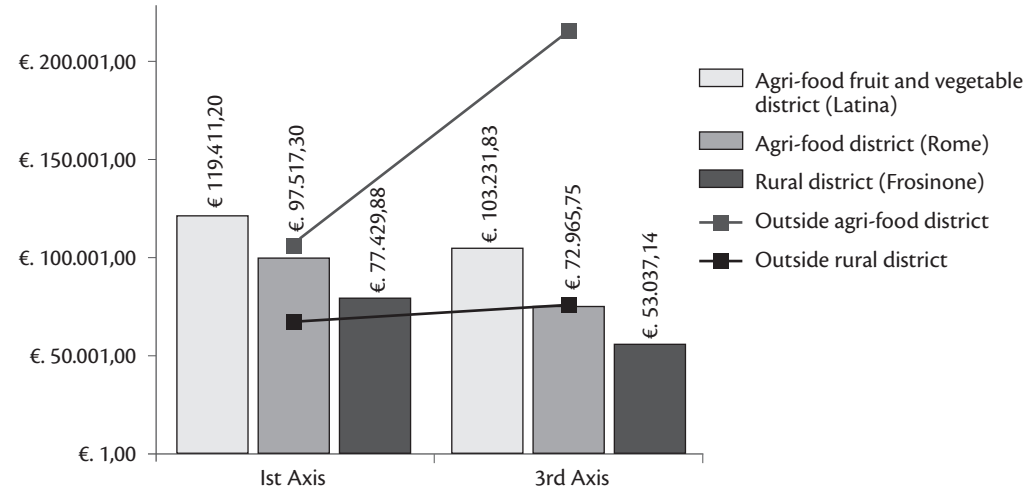
[16] As well-known, the total available funds are higher for the first axis.

Tab. 2 - Funding streams and funds obtained from RDP by axis (number of farms)		
Area	**Ist Axis**	**IIIrd Axis**
Agri-food fruit and vegetable district (Latina)	369	18
Agri-food district (Rome)	70	4
Rural district (Frosinone)	81	7
Outside agri-food district	215	23
- fruit and vegetables farms	23	4
Outside rural district	609	60
Total	1,344	112
Funds obtained		
Agri-food fruit and vegetable district (Latina)	€ 44,062,734.00	€ 1,858,173.00
Agri-food district (Rome)	€ 6,826,211.00	€ 291,863.00
Rural district (Frosinone)	€ 6,271,820.00	€ 371,260.00
Outside agri-food district	€ 22,367,295.00	€ 4,980,887.00
- fruit and vegetable farms	€ 1,593,891.00	€ 580,854.00
Outside rural district	€ 38,893,295.00	€ 4,422,695.00
Total	€ 118,421,355.00	€ 11,924,878.00
Source: RDP 2007-2013, Lazio		

Tab. 3 - Average funds per farm RDP by axis		
Area	**Ist Axis**	**IIIrd Axis**
Agri-food fruit and vegetable district (Latina)	€ 119,411.20	€ 103,231.83
Agri-food district (Rome)	€ 97,517.30	€ 72,965.75
Rural district (Frosinone)	€ 77,429.88	€ 53,037.14
Outside agri-food district	€ 104,033.93	€ 216,560.30
- fruit and vegetable farms	€ 69,299.61	€ 145,213.50
Outside rural district	€ 63,864.20	€ 73,711.58
Total	€ 88,111.13	€ 106,472.13
Source: own calculations.		

Figure 1 synthesises the results and confirms the relevance of district contexts in just one district and only for measures of the first axis. On the contrary, as far as the third axis is concerned, higher average sums have been gained by off-district farms. This is coherent with the sectorial characteristics of the district considered. With the exception of the rural district of "Valle del Sacco", the other districts are agri-food districts: as a consequence, higher inclination to support farm competitiveness (measure of the Ist axis) is revealed.

Fig. 1 - Average funds per farm from Rdp by axis



Source: own calculations

Two considerations stem from the foregoing analysis: the first is related to the low percentage of farms which have gained access to Rdp funds: it is necessary further to investigate the reasons for which policy has not been applied (see next paragraph). The second concerns the unclear influence of the district context in the access to Rdp funds. Only in one district a full district effect is evident (percentage of farms and average funds obtained higher than off-district contexts), while in another district a partial district effect is evident; finally in the district of Frosinone, no district effect has been detected. In the next paragraph we will call this a non--virtuous district.

To obtain more information about the access to policy,the next paragraph investigates the causes impeding full access to policies for farms.

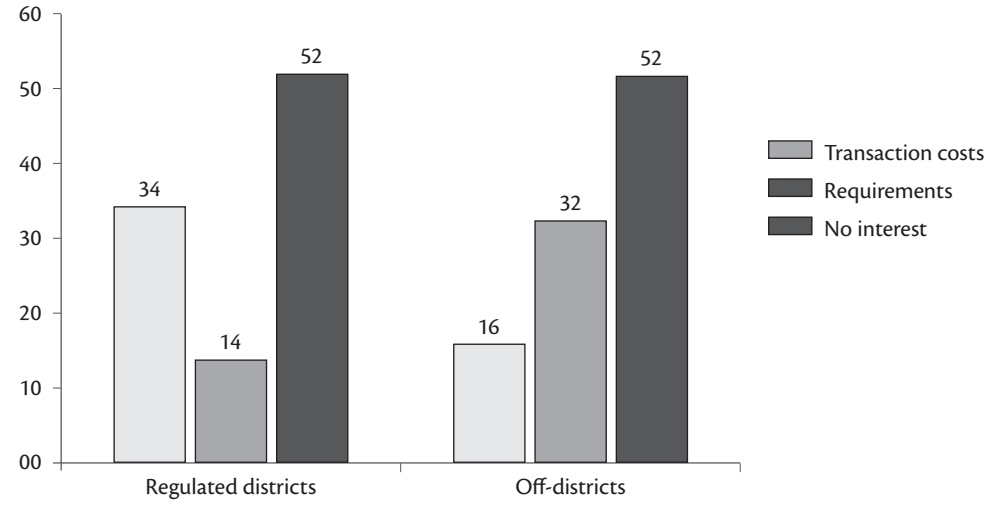
4.1 Reasons for not applying policies

The reasons why farms fail in applying for funding can be classified into three areas:

- the high level of transaction costs: the use of transaction costs (TC) to explain the access to rural development policy is strictly linked to informational markets and to the costs of bureaucracy. To this end, we put forward Dahlman's scheme (Dahlman, 1979) by dividing up TC into two categories: *ex ante* and *ex post* transaction costs. In our framework, the application for funds is like a transaction whose ex ante costs are linked to search for essential information to gain the funds. The costs of bureaucracy come to light after the application and are classifiable as *ex post* TC. The long delay in actually obtaining the funds completes this scenario; it also increases the total amount of costs of access to policy;
- low interest in access to Rdp (or no interest at all), due to negative past experience or other unspecified factors;
- lack of requirements such as, for example, age, farm location etc.

Geographical differences may be found in figure 2.

Fig. 2 - Reasons for not applying policies (% farms)



Source: own calculations

The absence of interest in applying policies is certainly the most important reason for about half of the farms in all areas, without any difference between district and off-district contexts. Transaction costs are the second reason for non-application in district areas (34%), followed by the absence of requirements for application; on the other hand, in the off-district territories, the second reason is the absence of requirements, while the transaction costs become the third leading cause of non-application. This data is significant when the transaction cost is expected to be significantly lower in 'real' districts.

A more detailed analysis suggests, however, that results should be examined distinguishing non-virtuous districts (or 'paper districts') from the "pure district" and, secondly, within the transaction costs, those relating to bureaucracy (which explain the inefficiencies of Local Public Administration) and those due to information asymmetry (highlighting the costs of information). Table 4 details our results.

Tab. 4 - Reasons for not applying policies

Reasons		No district	Virtuous district	"Paper" district
Transaction costs	Costs of bureaucracy	11.1	21.4	21.7
	Information asymmetry	4.8	0	16.7
Absence of requirements		32.4	21.5	11.6
No interest		51.7	57.1	50
Total		100.0	100.0	100.0

Source: own calculations.

By distinguishing between costs of bureaucracy and cost-related asymmetric information, some differences emerge. As a matter of fact, in the "pure district", the costs of access to market information are practically zero, while those of the bureaucracy are relevant and even higher than

in off-district areas. As evident from the table, the absence of Marshallian atmosphere characterises the difference between the paper district and the pure district (16.7% of informational asymmetry). Therefore, transaction costs are greatly accentuated by the lack of availability of information that penalizes local farms, with higher costs than those in the areas outside the district.

5. Conclusions

The paper has analysed the relevance of district contexts in the access to rural development policies; however, this is not observed to be uniform in the recognized districts: in fact, some gaps in the applications for Rdp were evident, with high transaction costs or bureaucracy. On the other hand, in pure districts, a genuine Marshallian atmosphere favours attraction of funds and avoidance of the aforementioned problems. This aspect detracts from the idea that territories exist as such, and it supports the hypothesis expressed by Colletis and Salle (2009), referring to the dynamic combination of three dimensions of proximity: spatial, organizational and institutional. The "district effect" becomes evident through the action of these three types of proximity, which allow a better use of the opportunities provided by the policy and determine the paths of sustainable development that do not neglect the history of the district.

On the other hand, a common element that links the district and off-district contexts is related to the high percentage of farms that are reluctant to apply: the motivations of those who do not apply are lack of interest, high costs, absence of necessary requirements, elements that should be drawn to the attention of policymakers.

Our results may have normative consequences: the presence of "district effects" suggests empowering, consolidation of the intangible ingredients of district especially through the political processes of relational planning. It suggests, moreover, some caution in identifying territorial district in order to avoid "district-mania", because, in many cases they are recognized according to policy logic, rather than a real presence of the classical attributes. That could give rise to situations of failure of rural governance. The call for a major prudence in identification of a district should be strongly considered by regional policy makers: in the future programming period 2014-2020, the relevance of district elements is evident. The importance of clustering of enterprises, together with the relevance of networks both of firms and of community-led local development, is strongly emphasised in the recently published regulation n. 1305/2013. As a consequence, a careful evaluation of the effective ingredients shaping organizational models of rural territories could be of help in addressing methods of district recognition, in order to avoid further cases of failure of rural governance.

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PRODUCTION OF RENEWABLE ENERGY IN AGRICULTURE: THE CURRENT SITUATION AND FUTURE DEVELOPMENTS

JEL classification: O13

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Abstract. *The role of agriculture in the field of energy is part of a wider framework of services that this sector can provide to the community, integrating the concept of multifunctionality already attributed to it. Whilst agricultural activity is an excellent means for protecting and enhancing the appearance of the territory, the production of agro-energy could become an opportunity for farmers to find new outlets, not only for their crops, but also for by-products and agro-livestock waste/slurry. In fact, energy production can be an important opportunity for farmers to diversify their business, broadening the prospects and scenarios for agricultural and livestock farms. The energy potential of a rural area through the use of biomass produced by agriculture will now be investigated in depth: the authors describe agro-energy production chains that specifically use biomass, ignoring other technologies (primarily photovoltaic and solar thermal) that can be developed, with profit, by the farmer, but which are not directly related to the traditional activity of a farm. Given a proven technology, the main problems for this energy chain are to be found in the procurement of biomass, costs of transport and management of biomass and digestate, and in the regulatory framework which is often difficult to interpret at the local level.*

The biogas chain will be examined in detail, especially in relation to the significant growth in the number of plants constructed. Through the study of the main features characterising the chain - procedure for authorization of plants, taxation of energy production, by-products of organic and agro-livestock origin and incentives and tariffs for energy production, - the economic sustainability of biogas production plants will be evaluated.

Finally the authors present a comparison between rates of incentive before and after 2012 in order to analyse the risks for the profitability of the chain.

Keywords: *economic evaluation; biomass; biogas; Italy.*

1. Introduction

In recent years there has been growing interest in the development of renewable energy due to the need to solve problems of increase in energy consumption and the instability of prices for raw materials of fossil origin, and because of concerns about pollution and its effects on climate change. In order to solve these problems there have been extensive studies into systems and processes capable of limiting the increase in "greenhouse" and so-called "climate changing" gases and, at the same time, to make countries increasingly independent from the energy point of view.

In Italy, similar considerations have taken on a special significance, precisely because of the

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increasing dependence on foreign energy (over 83% in 2009), the cost of energy and emissions harmful to the climate, all running counter to the objectives laid down at international level on the subject of global warming.

To tackle these issues, there is an increasing need to promote efficient long-term energy planning and to provide adequate public incentives for technological innovation and research in the context of improved efficiency in energy saving and technical alternatives to the consumption of fossil fuels.

In particular, the ongoing climate change will require greater commitment to take all possible measures to reach conditions of equilibrium and overall efficiency in the production and use of energy according to models of sustainability.

Faced with this scenario, the agricultural sector can play an important role in contributing to increased production of energy from renewable sources. Climate-related problems are directing agriculture towards new challenges and new opportunities, specifically in relation to its presence at local level, characteristic of the strategic activities of the sector.

In addition, agriculture can contribute directly to reducing net emissions of carbon dioxide (CO_2) and other greenhouse gases, both through the exploitation of various types of biomass for energy purposes, to be used as a substitute for fossil fuels, and through the adoption of agricultural practices that favour the accumulation of carbon in cultivated plants and the soil.

Indeed, the ability of plants to trap solar energy, converting and storing it permanently in the form of chemical energy is well known, as well as their ability to capture carbon dioxide from the atmosphere, retaining the carbon and emitting oxygen. In fact, in 1.0 g of dry matter there is about 0.5 g C which is obtained from 1.83 g of fixed atmospheric CO_2 (D. Coiante, 2010).

Therefore, the role of agriculture in the field of energy is part of a wider framework of services that it can provide to the community, integrating the concept of multifunctionality that has been attributed to it. Whilst agricultural activity provides an excellent opportunity to protect and improve landscape, the production of agro-energy could become an opportunity for farmers to find new outlets, not only for their crops, but also for by-products and agro-livestock waste/slurry. In fact, people are aware that there cannot be a single rapid replacement of existing energy resources with other more sustainable ones, and that the possible complementarity of new renewable energy sources (RES) must be studied in relation to the vocation of the territory in which its development is planned.

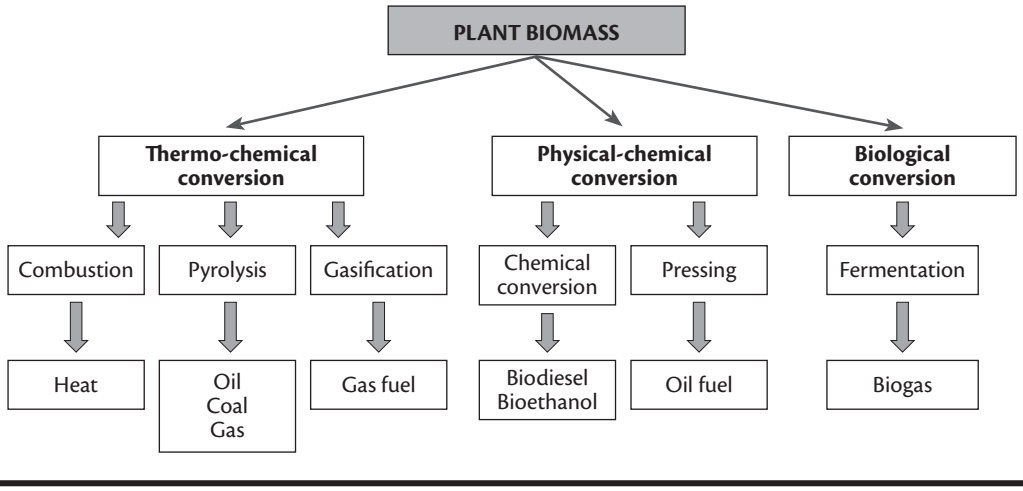
2. Agro-energy production: biogas production chain

From the foregoing it can be said that energy production provides an important opportunity for farmers to diversify their business, broadening the prospects and scenarios for agricultural and livestock farms. The energy potential of a rural area through the use of biomass produced by agricultural activity will now be investigated in depth: we will therefore describe the agro-energy production chains using biomass specifically, while ignoring other technologies (primarily photovoltaic and solar thermal) that can also be developed profitably by the farmer, but which are not directly related to the traditional activity of a farm.

Raw materials of agricultural origin can be destined mainly for the production of electricity, heat or biofuels, depending on intrinsic characteristics, following a variety of transformation processes. As shown in figure 1, the main energy production chains that can be activated on a farm are as follows:

- **Chain for production of solid biofuels** (thermo-chemical conversion process);
- **Chain for production of biofuels** (physical-chemical conversion process);
- **Chain for production of biogas** (biological conversion process).

Fig. 1 - Energy production chains using agro-livestock biomass



In particular, the term biogas refers to a mixture of gases, consisting primarily of methane (50-80%), obtained from the anaerobic fermentation of biomass of plant and animal origin.

This process is performed by microorganisms capable of metabolizing organic substances with consequent production of gas. Compared to the production chains described previously, that of biogas involves the development of active microorganisms, therefore it is essential to achieve an optimal environment for them, and to maintain it over time.

The raw materials involved in the biological conversion process are as follows:

– Energy crops: such crops, referred to as "*dedicated*" to energy conversion, are essentially maize, sorghum, triticum, wheat, rye, etc.
– Manure: this biomass has particular importance in the biogas production process because it is waste that can be exploited, and it also contains a large quantity of micro-organisms which act as inoculum in the transformation of the substrate into biogas.
– Crop residues: these refer to residues from agricultural production such as maize stalks, straw, fruit waste, etc..
– Agro-industrial by-products: this is organic waste that is commonly produced in the processing of food products. These substrates have a high potential, but may be subject to seasonal availability or specific authorization (as for slaughterhouse waste).
– The organic fraction of municipal solid waste: this category includes numerous materials, difficult to classify and usable only on the basis of the directives on "waste".

Regarding the technology used, the main distinctions concern the total solid content in the biomass used and the temperature of the process. Digestion, therefore, can be defined as "wet", if the substrate has a total solid content less than 10% and "dry" if the percentage is greater than 20%. In the first case, the material used can be mixable and pumpable, while in the second

case, the substrate is not mixable and special techniques are required for loading the plant. As regards the process temperatures, fermentation can be mesophilic, when the temperatures are kept between 38 and 40°C, thermophilic (between 55 and 57°C) or in psychrophilic (below 35°C, but this is uncommon). For each temperature, different families of microorganisms develop, suitable for carrying out the digestion process.

Typically, a wet digestion biogas plant with mesophilic operation, consists of one or more fermentation tanks made of steel or reinforced concrete, equipped with an internal heating system, a biomass mixing system and a gasometric covering capable of accumulating the biogas produced. A system of pipes delivers the gas to a purification complex, normally a chiller (or refrigerator) with a heat exchanger, for the elimination of water vapour, and subsequently to an internal combustion engine for the production of electricity. The motors used are able to recover the thermal energy deriving from the cooling system in order to heat the fermentation tanks and possibly other production premises or dwellings; in this case, the process is referred to as cogeneration.

The end product of the anaerobic digestion process is the digestate, which takes the form of stabilized organic matter (generally odourless) with organic and chemical characteristics derived from the substrate used as input to the system.

Faced with a proven technology, the main problems with this energy chain are to be found in the procurement of the biomass, costs for transport and management of the biomass and digestate and in the regulatory framework which is often difficult to interpret at the local level.

As mentioned, the current incentive rate of 0.28 euro/kWh of electricity fed into the grid (valid for plants built and in operation by 31/12/2012) has enabled the activation of large-scale power plants, also in those cases where it was difficult to procure supplies of the biomass necessary for the process, where most of it was purchased on the market and not produced directly on the farm. In these cases, the economic vulnerability of the plants increases, since their sustainability depends the economic parameters, which are unlikely to remain stable over time (rental cost of land, cost of the substrates on the market, costs for disposal of the digestate etc.), which have to be considered for at least 15 years, given the conditions for issuing incentive grants. On the basis of these considerations, and with the current reduction in the comprehensive rate, increasing attention has been focussed on the exploitation of waste raw materials to feed the digesters, and to size these according to the actual availability of substrates.

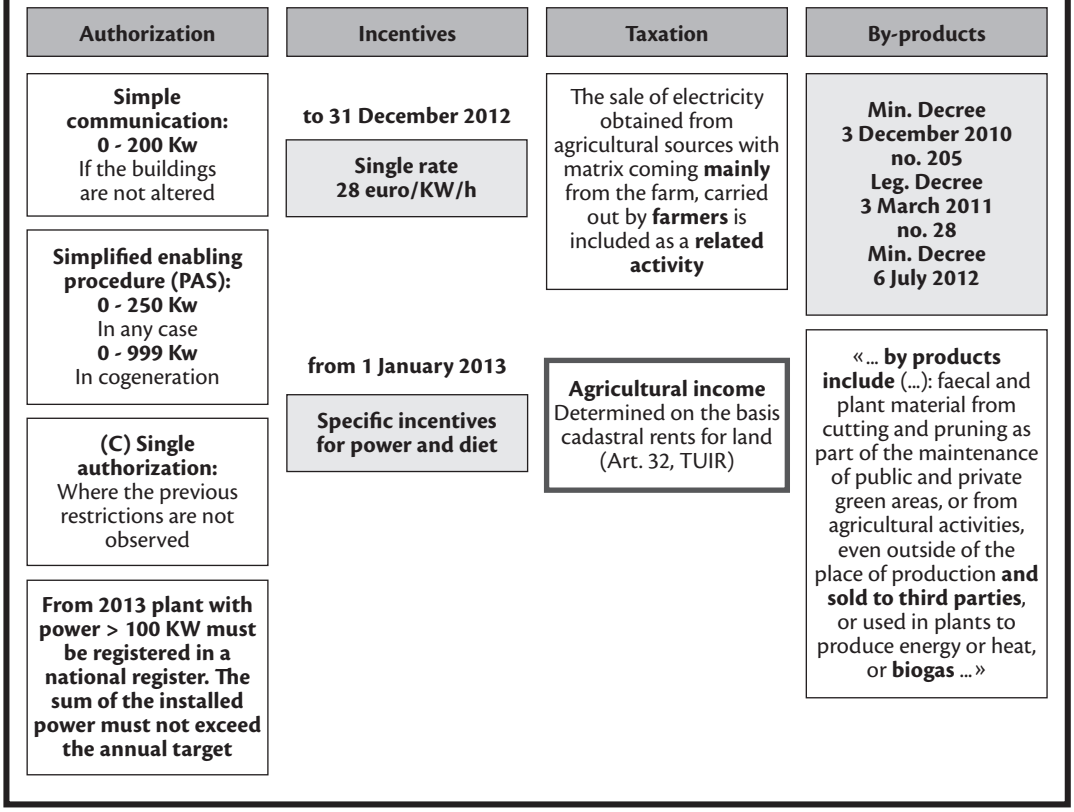
The biogas chain, which recently acquired an important role in rural areas, especially in relation to the significant growth in the number of plants constructed, will be examined in more detail below. In 2012, 994 biogas plants were recorded, corresponding to an output of about 750 MW of installed power (in 2012 alone, 350 were produced).

3. Reference Standards

The production of energy from biogas is subject to a complex legislative framework that is not always easy to interpret. This section summarizes the main aspects that regulate this energy chain, with reference to the legislation that authorizes and provides incentives for plants at national level (figure 2); in particular, the following aspects are considered:

– ***Authorization procedures;***
– ***Taxation of energy production;***
– ***Incentives for the production of renewable electricity*** (with particular reference to the Ministerial Decree of 6 July 2012).

Fig. 2 - Key regulatory elements for designing a biogas plant



3.1. Authorization procedures

The guidelines for authorization to construct and operate plants producing electricity from renewable sources were published in the Official Journal of 18 September, 2010 and inserted definitively in Legislative Decree no. 28 of 3 March, 2011, which implements the basic Directive 2009/28/EC on the promotion of renewable energy. The authorization process, followed by all Italian Regions, provides the following reference framework:

a. systems considered as freely constructed and subject to simple communication: in the case of installed electrical power <50 kW in a cogeneration scenario, or <200 kW if the property structure of the building is not changed;
b. plants that can be constructed through a simplified enabling procedure when the installed electrical power is <250 kW, or <1 MW in the case of cogeneration with heat recovery;
c. installations subject to a single authorization in all other cases.

Plants are, therefore, classified according to the installed power and cogeneration capacity, but the innovation in the Legislative Decree concerns the simplification of procedures introduced in an attempt to speed up the authorization procedure.

3.2. Taxation of energy production

An important element for the economic evaluation of the activity in question is the incidence of the tax burden. Art. 1 para. 369 of the 2007 Finance Act (Law no. 296/06) states that «*(…) the production and sale of electric and heating power from renewable agroforestry sources (...) constitute related activities pursuant to Article 2135, third paragraph, of the Italian Civil Code and are considered as producing agricultural income*». In this case, they involve taxation on a cadastral basis of limited importance for the balance sheet of the agro-energy business. The concept of related activity is linked to the principle of prevalence[1], according to which products must derive *primarily* from the main activities or from the use of equipment and/or resources normally used in the business. This taxation on plants has also been maintained in the latest regulatory references for projects that will require authorisation after 31/12/2012.

3.3. Incentives for the production of renewable electricity

Crucial elements among the decisive factors for the activation of a plant are the value and duration of financial incentives for the production of energy produced and sold to the network operator. This paragraph describes the procedures that apply according to the provisions of the Ministerial Decree 6 July 2012: *"Implementation of Art. 24 of the Legislative Decree no. 28 of 3 March, 2011 establishing incentives for the production of electricity by plants using renewable sources other than photovoltaic".*

The new incentive system for the production of electricity from renewable sources, as well as providing a mechanism for gradual reduction of the incentive level[2], is also characterized by the introduction of a maximum annual funding quota (5.8 billion euro per year) and the available power of incentivised energy (figure 3). The Decree provides for two types of incentives:

– a comprehensive incentive tariff (To) for plants with power <1 MW;
– an incentive (I) for plants with power > 1 MW and for those with power not exceeding 1 MW that do not opt for the all-inclusive rate, calculated as the difference between a fixed value (total revenue) and the time zone price of the energy (referring to the zone where the electricity produced by the plant it is fed into the grid).

[1] The principle can be satisfied according to the quantitative requirements (products used in performing related activities obtained from agricultural activity on the farm are prevalent compared to those purchased from third parties) or value (the value of the products obtained from agricultural activity is higher than the cost incurred to purchase third-party products). If neither of the two parameters can be adopted, as in the case of animal slurry, prevalence can be detected by a comparison between the energy deriving from its own products and that derived from products purchased from third parties.

[2] Art. 7 comma 1 (*…) for plants that come into operation in the years after 2013, the value of base incentive tariffs is reduced by 2% per year, with commercial rounding to three decimal places (…).*

Fig. 3 - Basic incentive rates for 2013 and premiums established by the Decree

BASE INCENTIVE			ADDITIONAL PREMIUMS			
Type of diet used	**Power**	**Base incentive rate 2013 for 20 years**	**Cogenerator light performance (Art. 8 para. 8)**	**High performance cogenerator with nitrogen recovery > 60% to produce fertilizers (Art. 16 para. 1 and 2 (*)**	**High performance cogenerator with 30% nitrogen recovery to produce fertilizers (Art. 26 para. 3a (*)**	**Removal of 40% nitrogen, not in cogeneration (Art. 26 para. 3b (*)**
	kW	**euro/kWh**	**euro/kWh**	**euro/kWh**	**euro/kWh**	**euro/kWh**
Products of biological origin	1<P≤300	0.180	0.040	0.030	0.020	0.015
	301<P≤600	0.160	0.040	0.030	0.020	0.015
	600<P≤1,00	0.140	0.040	0.030	–	–
	1,000<P≤5,000	0.104	0.040	0.030	–	–
	P≤5,000	0.091	0.040	0.030	–	–
By-products of biological origin (**)	1<P≤300	0.236	0.010	0.030	0.020	0.015
	301<P≤600	0.206	0.010	0.030	0.020	0.015
	600<P≤1,00	0.178	0.010	0.030	–	–
	1,000<P≤5,000	0.125	0.010	0.030	–	–
	P≤5,000	0.101	0.010	0.030	–	–

(*) Premiums can not be combined with each other.
(**) The by-products of biological origin are shown in detail in Table 1 attached to the Ministerial Decree of 6 July 2012.
Source: our calculations based on Min. Decree July 6, 2012.

As regards the **biomass used,** the classes of incentives indicate a desire to reward projects that use, above all, agri-livestock and agro-industrial by-products as substrates, as well as the organic fraction of waste (in a non-agricultural context), compared to plants designed for the use of "products" (as defined by the regulations) and, therefore, of crops dedicated to energy conversion (specifically, for example, grain silage). In this way, process waste matrices will be better exploited, while it is conceivable that projects related to the exclusive or priority use of dedicated crops will decrease.

As mentioned previously, the other distinguishing feature introduced with the new Decree, is the **"size**" of the system, understood as the installed electrical power. Five classes have been identified to which different tariffs are applied for the electricity produced and provided. The most important classes for the agricultural sector refer to power plants included in the category: 1 ≤ 300 kW, those in the range 300 ≤ 600 kW and thirdly, 600 ≤ 1,000 kW.

The introduction of so-called "bonuses" for cogeneration, for the removal of nitrogen and for the limitation of emissions, as well as achieving desirable targets for energy and environmental efficiency, also contributes to a further selection criterion for plants, based on the profitability that can potentially be obtained by integrating the various processes. This mechanism seems to respond more to business figures who make investments in a framework complementary to local resources and with the need to protect the territory, in reality limiting the spread of initiatives that may, however, be considered as unsustainable (such as high power biogas plants powered exclusively by maize and concentrated in small areas).

The duration of the new incentives, as defined in Annex 1 of the Decree, is extended to 20 years (compared with the 15-year period up to 2012), in order to provide a greater guarantee of stability of profits for the entrepreneur and a longer life time for the plant, so that it will not require final decommissioning after the end of the incentives, but will be allowed to continue operating.

Lastly, the Decree defines three different modes of access to the incentive mechanisms, depending on the power, which for biogas plants (new, fully rebuilt, re-activated, undergoing renovation or upgrading) are:

– **direct access** in the case of plants with power <100 kW
– entry in **Registers** in the case of plants between 100 kW and <5,000 kW;
– **competitive downward auction procedures**, if the power is > 5,000 kW.

4. Assessments of the economic sustainability of biogas production plants

The need for analysis of the cost-effectiveness of an anaerobic digestion plant for the production of biogas at all stages of the supply chain must be stressed: from the production of biomass, to transportation to the construction and operation of the plant, the production and sale of electricity and thermal energy, up to the management and transport of the final digestate.

In addition, new regulatory proposals relating to the value of the incentives as regards the all-inclusive tariff outline the analytical path that will be followed. In particular, the distinction of the rates on the basis of "power" and "diet" requires the valuation model to be set up distinguishing projects by the two categories of biomass that are of most relevance to agricultural enterprises (products or by-products of biological origin) and for two power ranges (from 1 kW to 300 kW, and from 301 kW to 999 kW)., Attention will therefore be focused on the four categories of plant resulting from crossing these two variables.

The goal is to verify how costs are distributed by enterprise and, consequently, to outline a profitability framework applicable to different businesses in the biogas sector, according to new specifications for incentive rates. In order to understand the significance of the results of the calculations, the basic assumptions must be specified, remembering that the indicators will be expressed in euro/kWh of electricity produced and sold:

1) the crop cost of the biomass from dedicated crops is estimated at around €1,750 /ha (based on direct surveys in areas of the Po Valley). To calculate the impact of the cost per unit of electricity produced we adopted the following parameters:
   – average energy yield of biomass: 333 kWh/ton;
   – average yield of maize silage: 55 ton/hectare.

   Therefore, the cost of cultivation of biomass is equal to **0.096 euro/kWh**
2) this cost increases when conditions of business self-sufficiency do not exist; it is then assumed that external land will be obtained through renting to gain some advantages in the operating of the plant: first, to limit external purchase of biomass, which is certainly subject to volatility in grain prices; and second, to meet the minimum requirement for energy production to be classed as a related activity and, therefore, subject to reduced agricultural taxation (self-production of raw material by the business must be above a minimum of 50%);
3) In terms of value, the land rent could, for example, cost €750/ha equal to:
   (750.00 euro/ha /55 t/ha) /333 (kWh/t) = 0.040 (euro/kWh)
   This additional portion of expenditure must be factored into the cost of cultivation, and

therefore for biomass produced on leased land, the total cost becomes **0.136 (euro/kWh)**

4) the transport of biomass entering and digestate leaving the plant is based on assumptions of a maximum distance of 15 kilometres for a maximum quantity of the organic matrix of about 64 t/kW (composed partly of silage and solid phase separated from the digestate). With a unit cost of 3 euro/t, the expense per unit of electricity produced is equal to:
(3.00 euro/t • 64 ton/kW) / (333 kWh/t biomass • 24 t/kW silage) = 0.024 euro/kWh
5) the construction costs of a plant are normally expressed in euro per kW of installed power. The market is currently oriented to values between €3,500 and €4,500 /kW for plants with a capacity up to 1 MW powered primarily by dedicated crops, and € 7/8,000 kW for small plants (~100 kW) powered mostly by manure.
6) the annual cost of operating a plant is mainly composed of: ordinary operating and maintenance costs, annual loan repayments and annual depreciation of capital. As a result, the highest value relates to a 100 kW plant, for which a unit expense of more than €7,000 /kW is assumed and external financing for 80% of the capital invested. For the 999 kW plant, on the other hand, a cost of approximately €4,000 kW is expected.

4.1. Plant management and operating cost

As is well known, the management of an anaerobic digestion plant requires special attention, above all, to ensure continuous operation in order to achieve high annual production of electricity: an indicative objective of 8,000 hours per year may be assumed. Undoubtedly, attaining this result is only viable if the biological, chemical, technical and mechanical aspects that govern the plant are carefully controlled.

It is difficult to indicate a value for average expenditure, although it can be assumed that the unit cost will increase as the power installed decreases, due to the presence of fixed costs that are difficult to eliminate. Therefore, for management expenses we used the same scalar approach as followed for implementation costs: it is estimated that the management of a plant with a capacity of 999 kW would require annual expenditure of approximately €0.030 /kWh of electricity produced, which is equivalent to a total amount of about €243 /kW per unit of power and approximately 243,000 euro in total.

4.2. Costs of finance

The financial costs relate to external financing are proportional to the capital required, the duration of the loan and the rate of interest. For the purposes of calculation, it was assumed that the entrepreneur would rely on an outside agency to obtain financing for 80% of the total investment, with the difference provided by the entrepreneur himself. For the share of external capital, the time assumed for return of capital to the funding entity is 20 years at a rate of 5.0%, while the owner's capital is allocated in a linear fashion during years in which the incentive rate is provided.

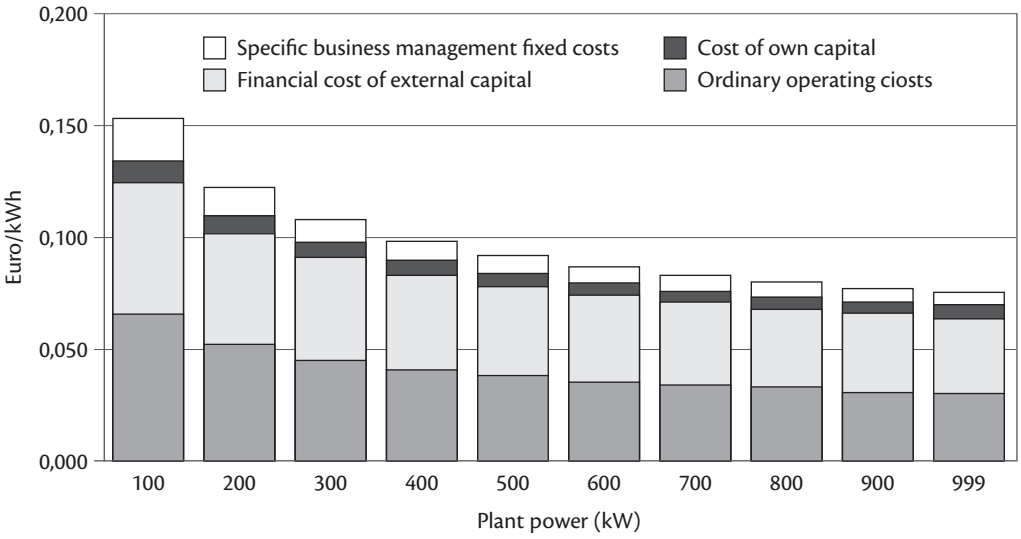
4.3. Common management costs of the agricultural business

It was considered appropriate, for the purposes of evaluation, to allocate part of the administration and management costs of the traditional farm enterprise to the management of the biogas plant. In fact, we assumed the project for the digester to be complementary to the agricultural activity, and a portion of more directly agricultural personnel and operating costs would be addressed to this new productive activity. Specifically, we assumed the need at least for an administrative check of about an hour a day and an amount equal to 1% of the value of the plant for management by the employees of the farm.

At this point we have the necessary values to set up the dynamics of the total management cost of a plant. Based on these assumptions, the total annual management cost for a plant can be estimated to be in a range from a minimum of €0.07-0.08 /kWh (for systems with high capacity) up to €0.15-0.16 /kWh for small installations (figure 4).

The decrease in annual running costs is mainly due to the high initial outlay for the construction of low power plants, which is reflected in an increase in the financial costs related to the issue of the loan. Therefore, the management of small installed power capacities (for example, <100 kW) must be suitably balanced with a supply of biomass at very low cost, such as the use of biological raw material (for example, manure or waste of agricultural origin), and only a very small proportion of silage.

Fig. 4 - Dynamics of the management cost of a biogas production plant with increasing power capacity



5. Risk analysis: comparison between rates of incentive before and after 2012

The rate of incentive for the production of renewable electricity must be compared appropriately with the costs described above. The main objective here is to compare the two situations prevailing before and after 2012, following the radical change in the single incentive rate of 0.28 euro/kWh which ended 31 December 2012 (figure 5). In particular, the following assumptions are made for the evaluation:

a) plants included in the model have increasing power capacity between 100 to 999 kW;
b) the power diet considered consists of the following:
   – biological products: dedicated crops produced on land belonging to the business and external land;
   – biological products: manure from the farm plus a possible maximum proportion of 30% by weight of silage.

c) Cost values for the various scenarios were considered as common: only the value of the rate of incentive and the composition of the diet for powering the plant are modified.

Fig. 5 - Reference scenarios for the analysis

Reference scenarios for a biogas production plant

Duration of payment of tariffs: 20 years — **Power (X)**

Diet (Y) — Variables	1<P≤300	300<P≤600	600<P≤1,000
Biological products	0.220 euro/kWh	0.220 euro/kWh	0.180 euro/kWh
Biological by-products	0.246 euro/kWh	0.216 euro/kWh	0.188 euro/kWh

COMPARATIVE ANALYSIS

BEFORE 31 DECEMBER 2012	AFTER 1 JANUARY 2013
Power range (100>999 kW) Diet: maize silage produced on and off the farm	Power range (100>999 kW) Diet: maize silage produced on and off the farm
	Power range (100>999 kW) Diet: manure and maize silage produced on and off the farm (up to 30% by weight)

The results we wish to obtain from the simulations have a dual purpose: firstly, concerning the single rate of €0.28 /kWh, to confirm the behaviour of the entrepreneurs in choosing to install mainly high power plants (>999 kW) powered with dedicated crops; and secondly, for the new incentive scheme, to identify strategies that must be followed to achieve a satisfactory level of profitability for the enterprise More detailed clarifications on the results obtained are outlined below (figure 6).

(A) Plants with power range of 100 to 999 kW powered by biological products before 2013

Until 2013, the design of a plant for the production of biogas powered by dedicated crops offered interesting opportunities for entrepreneurs, especially in the case where the entire area necessary to provide silage for the installed power was available on-farm. The growth in profitability was due to two main factors:

– the presence of significant economies of scale that are recorded in the costs for construction and operation of the plant with higher power installed; from 250 kW upwards, the profit became very significant;
– the increase in the cost for supply of biomass, at a rate less than proportional to the decrease in the operating costs of the plant; note that in the model a maximum amount of biomass produced externally on rented land of 49% was assumed.

The results obtained under the "old" incentive scheme led to the construction of a large number of installations with power around the maximum allowed and, only secondly, to consideration of procurement of biomass as an equally crucial factor for success; as mentioned several times, this strategy was risky and, in fact, we have recently begun to see tensions in grain markets and, above all, in land rental, which can cause problems for the total management cost of the plant.

(B) Plants with power range from100 to 999 kW powered by biological products after 1st January, 2013

The second scenario again considers plants powered by maize silage with the same cost characteristics as indicated in the previous case, but with revenues influenced by the incentive rate that began on 1 January, 2013.

The scenario changes dramatically and with a loss of income opportunities for all levels of power installed. Indeed, in this specific case, precisely because of the incentive rate that decreases as the power increases, large plants are the most penalized. The opportunity for profit margins does not exist for any level of power installed. Note, however, that the basic assumptions referred to a portion of leased land: therefore, savings in cost can be achieved if the biomass is completely self-produced, but there is still a high degree of risk for the enterprise.

(C) Plants with power range from 100 to 999 kW powered by biological by-products after 1st January, 2013

The third scenario takes into consideration plants powered by by-products with a maximum use of dedicated crops of less than 30% by weight. It is assumed that the business has available the manure to be used in the process of feeding the digester. In addition, in the case of power of 100 kW, the diet is composed exclusively of the livestock matrix, while as the power increases, an additional proportion of silage up to a maximum of 30% by weight was considered, as permitted by the regulations.

In this case, the theoretical operation proposed shows better operating margins. In fact, the net profit for each level of power installed is always greater than 0.03 euro/kWh, exceeding 0,05 euro/kWh for plants <300 kW.

In absolute terms, it is believed that the most interesting net profit is obtained at two specific points in the growth of the installed power: in fact, around 300 kW the effect of the higher incentive rate becomes relevant for the first stage; at 600 kW, the high power installed and the corresponding electricity produced, can enhance the profit per unit to €0.04 /kWh, although this is lower than for the plants with power up to 300 kW.

For the purpose of the evaluation, it was not deemed appropriate further to increase the size of the plants, because it would be necessary to have farms with herds of a size not commonly found in the Italian plains.

Fig. 6 - Analysis of scenarios										
Before 31 december 2012										
Power (kW)	**100**	**200**	**300**	**400**	**500**	**600**	**700**	**800**	**900**	**999**
Net base incentive rate	**0,249**	**0,249**	**0,249**	**0,249**	**0,249**	**0,249**	**0,249**	**0,249**	**0,249**	**0,249**
Plant costs	0,154	0,122	0,108	0,099	0,092	0,087	0,083	0,080	0,077	0,075
Biomass Costs	0,098	0,100	0,102	0,104	0,106	0,108	0,110	0,112	0,114	0,116
Transport Costs	0,024	0,024	0,024	0,024	0,024	0,024	0,024	0,024	0,024	0,024
Net income	**-0,026**	**0,003**	**0,016**	**0,023**	**0,027**	**0,030**	**0,032**	**0,033**	**0,034**	**0,035**
After 1 January 2013										
Power (kW) Biological products	**100**	**200**	**300**	**400**	**500**	**600**	**700**	**800**	**900**	**999**
Net base incentive rate	**0,196**	**0,196**	**0,196**	**0,178**	**0,178**	**0,178**	**0,160**	**0,160**	**0,160**	**0,160**
Plant costs	0,154	0,122	0,108	0,099	0,092	0,087	0,083	0,080	0,077	0,075
Biomass Costs	0,098	0,100	0,102	0,104	0,106	0,108	0,110	0,112	0,114	0,116
Transport Costs	0,024	0,024	0,024	0,024	0,024	0,024	0,024	0,024	0,024	0,024
Net income	**-0,080**	**-0,050**	**-0,038**	**-0,048**	**-0,044**	**-0,041**	**-0,057**	**-0,056**	**-0,055**	**-0,054**
Power (kW) Biological by-products	**100**	**200**	**300**	**400**	**500**	**600**				
Net base incentive rate	**0,219**	**0,219**	**0,219**	**0,192**	**0,192**	**0,192**				
Plant costs	0,154	0,122	0,108	0,099	0,092	0,087				
Biomass Costs	0,000	0,033	0,035	0,037	0,039	0,041				
Transport Costs	0,012	0,012	0,024	0,024	0,024	0,024				
Net income	**0,053**	**0,052**	**0,052**	**0,033**	**0,037**	**0,040**				

In conclusion, it can be argued - albeit with the caution necessary in treating data from theoretical approaches - that in the future, the entrepreneur will have interesting opportunities for plants with different power capacity in the context of scenarios that use biological products. In addition, the operating margin that can be obtained also allows a the possible expensive supply of biomass to be considered when the power installed is to be increased. Conversely, the risks run will be serious if the system is to be powered exclusively with dedicated biomass, especially with cereal silage.

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Politica Agricola Internazionale

INTERNATIONAL agricultural POLICY

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