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TABLE OF CONTENTS / INDICE

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NEW TOOLS FOR THE EU AGRICULTURAL SECTOR AND RURAL AREAS. WHAT ROLE FOR PUBLIC POLICY IN PROMOTING PAYMENTS FOR ECOSYSTEM SERVICES?

JEL classification: Q56

Francesco Marangon*, Stefania Troiano*

Abstract. *In this paper we examine whether it is possible to create a market for ecosystem services deriving from rural landscape and environmental conservation.*

First of all to do this we consider the results of some studies we have conducted in recent years about monetary and non-monetary environmental evaluation. These studies help us first to identify some rural landscape features which improve or worsen landscape appearance and secondly, to discover the willingness of beneficiaries to pay for maintaining these landscape and environmental resources. Then, in order to understand whether social benefits can be increased by using market and economic measures for conservation of landscape and environmental resources, we study Payments for Ecosystem Services (PES). PES are economic instruments used to support the conservation and improvement of ecosystem services. We describe PES for landscape (PaLBeS) and discuss the suitability of introducing it in favour of some ecosystem services in Italy.

Keywords: *payment for ecosystem services, landscape, environmental resources.*

1. Introduction

Rural landscape and environmental resources play a crucial role in providing ecosystem services (Millennium Ecosystem Assessment, 2005). Nevertheless, many landscape features and environmental resources are increasingly being lost in rural areas throughout the world (FAO, 2009). Such loss is of great concern also as regard socio-economic aspects. This is in particular the case of Italy, where rural landscape and environmental resource conservation is essential for developing and improving tourism.

In spite of their importance, the sustainable management of these resources and the provision of their services for the benefit of society are only partially financed by public institutions (Grammatikopoulou *et al*., 2013).

Consequently, in recent years, the use of Coasian approaches such as Payments for Ecosystem Services (PES) are being seen as a complementary tool to guarantee provision of ecosystem services deriving from landscape and environment.

In this paper first we analyse the role of demand and supply for ecosystem services deriving

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from landscape and environmental resources in order to note whther a range of demand and supply factors are leading to an increase in adoption of PES.

Secondly we describe the task of public intervention in favour of PES.

Finally we try to identify the opportunities for developing PES in Italy.

2. Demand for rural landscape ecosystem services

To identify the desired features of landscape, i.e. those that combine to determine a "beautiful landscape", is a highly difficult task (Jindal and Kerr, 2007). Despite having an objective component connected to the features that characterize the landscape, a "beautiful landscape" is a subjective concept, as well illustrated by the European Landscape Convention. In fact, it relates to the different perceptions that people express in relation to landscape attributes (Tempesta and Thiene, 2006). Nevertheless, it is possible to identify some features that generally seem to be able to improve or worsen the beauty of a landscape.

This goal was pursued, for example, by the authors (Marangon *et al.*, 2009) who carried out 1,778 interviews during the period 1999-2008 in order to analyse the preferences of citizens that had utilised or enjoyed the rural landscape in different areas of the North-Eastern part of Italy. Citizens were asked to indicate which objects in the landscape helped to improve or worsen the visible features. They had to assign a 1 to 4 rating scale ("4" means "very important") to these objects. The results of these investigations are set out in Table 1, in which the average values and the standard error of the mean for each are reported.

The results show that the presence of some features could improve the beauty of landscape. In detail, they are: rivers, streams and other waterways; forests; meadows; hedges and rows of trees; typical rural buildings; vineyards; orchards; headlands; poplars. On the one hand, these features and their ecosystem services may become the object of trade in a specific market. On the

Tab. 1- Landscape features assumed to be influential

Variables	Average	Std. Error
Features assumed to improve the landscape		
Rivers, streams, etc.	3,720	0,012
Woodlands	3,660	0,014
Meadows	3,630	0,013
Hedgerows and rows of trees	3,370	0,016
Typical rural buildings	3,370	0,019
Orchards	3,210	0,019
Vineyards	3,170	0,020
Dirt roads	2,960	0,022
Poplars stands	2,570	0,022
Features assumed to worsen the landscape		
Pylons	3,600	0,016
Highways	3,570	0,016
Urban areas	3,390	0,017

Source: Marangon et al., 2009

other, some features contribute to deterioration of the appearance of the landscape, i.e. pylons, motorways and urban areas.

It is worthwhile observing that a beautiful landscape often derives from the combination of several features with sustainable management practices. Consequently, landscape beauty can be the result of the provision of many features and services/benefits by multiple managers. It could, therefore, be difficult to identify a specific service/benefit connected to a qualitative aspect of the landscape. Moreover sometimes it may be necessary to involve several (or all) potential suppliers of landscape beauty to obtain a visual benefit, since otherwise it may not be possible to guarantee an optimal provision of ecosystem services from the social point of view.

In spite of these difficulties, it could be useful to develop innovative markets to improve the maintenance and conservation of some landscape complements in order to increase opportunities of local socio-economic development.

3. Supply of rural landscape ecosystem services

The multifunctional role of agriculture emphasizes the ability to provide not only market goods, such as food and fibers, but also further goods (or "bads"), which are not all traded on the market. Within this latter group of goods are also the ecosystem services derived from landscape and environmental resources. These further goods are produced jointly with market goods (Commodity Outputs - COs). Some of these "secondary" products are traded on proper markets, but most of them are externalities or public goods (Non-Commodity Outputs - NCOs). The lack of adequate markets or their malfunctioning creates market failure, which requires the intervention of government, in order to obtain an optimum level of supply.

The institutional intervention can use different tools, such as Command and Control instruments or economic/financial incentives, to support the provision of ecosystem services from the conservation of landscape resources. But the first type of instrument has proved to be inadequate to counteract the loss of ecosystem services resulting from the abandonment of a landscape, especially in rural areas, while the second seems to be more effective. In detail, financial incentives have been adopted not only to maintain rural landscape and environmental features, but also to support projects to enhance their level of quality.

Financial incentives act with the intention of securing the provision of ecosystem services/public goods using different types of schemes. Nevertheless, this institutional intervention aimed at cancelling the divergence between private and social costs is able only partially to support the provision of ecosystem services.

As regards intervention by the European Union through the Common Agricultural Policy (CAP), the presence of financial incentives in favour of sustainable management of rural landscape are to be found in the documents created to support rural development, the Rural Development Programmes.

These documents contain some financial measures created to improve the quality of rural landscape. The incentives are present mainly in the axis devoted to environmental intervention (Rete Rurale Nazionale, 2009) and, more precisely, in the so-called agri-environmental measures. These economic tools commit farmers to adopt a sustainable practice, that goes beyond usual good-farming practices concerning rural landscape and environmental resources, for a minimum period of five years. The incentive compensates contractors for additional costs and income losses resulting from the commitment. This type of financial incentive is not coupled, which helps to

limit the distorting effects. Nevertheless knowledge of the impacts of these institutional incentives on the landscape and the provision of ecosystem services is still lacking. In fact, despite the great importance attached by the European Commission to the financial support in favour of the preservation and improvement of rural landscape, there is only occasional use of environmental evaluation methods in order to quantify the benefits deriving from the implementation of such measures. These institutional financial incentives are, moreover, able to support only a part of the provision of ecosystem services.

4. Payments for Ecosystem Services

In order to avoid distortions and inefficiencies it appears necessary to identify the most appropriate tool to support the provision of landscape ecosystem services which should be targeted, flexible and transparent.

Institutional intervention is not necessarily always the best choice, as there may be alternative, better tools.

Although it may seem paradoxical to use market instruments for a situation of market failure (Farley and Costanza, 2010), sometimes the use of these tools appears to provide a suitable solution.

The market-based instruments include direct payments (subsidies, tax incentives and payments). This aggregate gathers various types of incentives used to maintain or restore the supply of ecosystem services and includes PES.

PES is constituted by a payment for the provision of an ecosystem service (or use of the soil which allows the service to be produced). This service must be configured as an externality. In fact, while some ecosystem services are produced with the specific intention of being sold/consumed, others are configured as externalities.

Although the identification of the importance of the services provided by landscape and environmental resources is not recent, the introduction of the concept of PES can be placed at the end of the 'nineties, due to the rapid development of the tool.

The concept of PES is sometimes implemented using alternative labels, such as Compensation for Ecosystem Services (CES), or Compensation and Rewards for Environmental Services (CRES).

A definition produced by Wunder (2005) tries to clarify the concept, indicating five basic principles for better indentifying PES. In detail, PES is: i) a voluntary transaction, in which ii) a well-defined ecosystem service (or a use of land to secure it) iii) is acquired by at least one buyer from, iv) at least one supplier (farmer, manager of a protected area, etc.) that actually controls the supply of the service, v) if and only if the provider ensures the provision (conditionality). According to a revised, broader definition (Tacconi, 2012, p. 35) PES is "a transparent system for the additional provision of environmental services through conditional payments to voluntary providers".

5. Payments for Rural Landscape Beauty Services

As stated above PES is built on compensation flows from the beneficiaries of an ecosystem service to its provider. Here we call attention to what can be termed "Payments for rural Landscape Beauty Services" (PaLBeS).

PaLBeS provide compensations in favor of landscape managers that supply aesthetical and recreational benefits to residents, tourists, hunters, fishers or other citizens. It is necessary to

consider that from the landscape we can derive further services (i.e. spiritual, religious, intrisic, existence, etc.) (World Resources Institute, 2009).

From a PES scheme created in Costa Rica, several, further PES have been created in favor of landscape beauty. Mainly they have been built according to the public scheme. In fact, the public administration has provided several measures for safeguarding rural landscape conservation, such as, for example, the agri-environmental payments in the European Union, which provide financial resources to farmers for adopting more friendly practices[1] towards landscape ecosystem services This type of publicly-financed PES, however, is unable to reach optimal levels of effectiveness and efficiency (Pagiola and Platais, 2007).

On the basis of users' preferences and their willingness to pay (WTP) for specific landscape features, it seems suitable to create some user-financed PES schemes to counteract the problems of publicly-financed PES: as stated above they could be named PaLBeS tools.

In this type of PES, we can identify the relevant presence of direct payments provided by tourism enterprises in order to assure the presence of landscape beauty, as it is very important tourist attractions (Allali, 2009; UNESCAP, 2009). In these cases, landscape managers receive directly from tourism enterprises a payment to maintain a sustainable practice, conserve or improve specific features of rural landscape, or assure the presence of more biodiversity.

In some cases, PaLBeS are created among tourism enterprises and local communities in order to avoid shooting in the areas frequented by tourists for bird-watching, nature photography, etc. (Wunder, 2005). PaLBeS can be concluded by a tour operator belonging or not to the affected area. The creation of a PaLBeS by local tour operators could be an important tool also for developing local socio-economic activity thus bypassing the mechanisms of vertical integration implemented by larger tour operators.

It is possible to create two schemes of PaLBeS: tour operators may i) contract directly with land managers to maintain an ecosystem service or ii) create contracts for the local supply of labor, food, etc., paying a premium price (Robertson and Wunder, 2005). In the latter case, the premium price is designed as a PaLBeS.

We can identify a PaLBeS scheme also in (or near) protected areas when a portion of the ticket paid by visitors is given to local land managers. In detail, the payment is stipulated in favor of local managers in order to protect and maintain the existing landscape features (Milder *et al.*, 2010).

Although the benefits arising from the development of PaLBeS in favor of rural landscape are usually considered to benefit only local residents and tourists, or those who can easily enjoy landscape for recreational purposes, it must not be forgotten that i) there are some benefits that potentially affect a greater portion of present and future users and ii) some people derive a benefit simply from the awareness of the existence of a natural beauty (i.e. non-use values).

The role of the private sector in developing PaLBeS could still be expanded (Landell-Mills and Porras, 2002; Milder *et al.*, 2010; Waage, 2007). In fact, potential customers in a market for beautiful landscape features and environment could be not only private tour operators, individual or associated, but also entrepreneurs in specific activities, hunters, fishermen and tourists. Amongst these it is important to focus attention on those engaged in sustainable tourism activi-

[1] We refer to farmers because "Agricultural landscapes hold tremendous potential for producing a diverse stream of ecosystem services" (Goldman *et al.*, 2007) and "since agricultural producers are the largest group of ecosystem managers in the world, their activities may produce (or reduce) ecosystem services" (Lipper *et al.*, 2009, p. 2). Moreover "Environmental services also comprise benefits associated with different types of actively managed ecosystems, such as sustainable agricultural practices and rural landscapes" (Muradian *et al.*, 2010, p. 1202).

ties with regard to environmental resources, such as eco-tourists (FAO, 2007). In fact, ecotourism can contribute to sustainable management and conservation of landscape ecosystem services, in particular if payments are addressed to conservation (Yadav *et al*., 2013). The creation of collective PaLBeS schemes could be suitable for ecosystem services provided by landscape derived from synergistic provision: firstly, they facilitate the creation of an aggregate PaLBeS where users can combine their payments and secondly they could improve cooperation among farmers. In fact, only if a sufficient number of farmers act to protect rural scenic beauty is it possible to achieve a high quality landscape (Goldman *et al*., 2007).

Nevertheless it has been found that the presence of a single buyer (monopsony) of landscape beauty services is rather frequent (Wunder, 2005).

According to a broad definition of PES, such as that proposed by FAO (2007) which takes into account the green premium price of a product, an interesting opportunity for the ecosystem services provided by rural landscape beauty seems to come from PES constructed through the certification of agricultural products (Robinson and Keenan, 2010). In particular, we refer to the case of certification that aims at maintaining specific landscape and biodiversity. The certification should permit the widest range of ecosystem services attributable to a specific landscape to be taken into account and, in particular, the services that are difficult to evaluate (Huberman and Shepherd, 2010). In this context, expanding the scope of PES schemes by creating some "landscape labels" (Ghazoul *et al*., 2009; Unseld, 2007) aimed at labelling all goods and services originating from a specific area/landscape should allow the inclusion also of those ecosystem services that arouse less interest owing to difficulties in their identification and quantification (i.e. cultural services). It is, nevertheless, important to be aware about the confusion deriving from the presence of a multitude of labels and their adverse effects, both in economic and environmental terms.

In favor of this type of PaLBeS some studies reveal significant positive effects for European Union farmers, whose products do not currently seem to be able to meet the growing demand for certified agricultural products (Forest Trends and The Ecosystem Marketplace, 2008).

The development of PaLBeS, schemes created on the basis of certification allows the involvement of different types of economic agents: for example, the sellers may have various structures,since both the producers (and also exporters, brokers, distributors, etc.) and consumers can act like buyers. A cooperative approach able to coordinate the actions of the economic agents involved is important in the case of certification: in particular it allows a reduction of costs involved in implementation of PaLBeS.

An important positive effect of a PES scheme that provides or maintains landscape beauty is the increase in the value of local resources, especially real estate, that benefit from a better landscape: the process of price appreciation can be evaluated through appropriate estimation methodology, such as the hedonic price method (Rosen, 1974).

On the one hand, PaLBeS seems to have significant positive consequences, especially in some landscape contexts, such as the Italian one. On the other hand, there are considerable difficulties in their implementation. An example of this situation is the impossibility, in certain contexts, of separating the ownership of the ecosystem services from landscape ownership in general. This problem prevents the creation of a market.

A further problem in the development of PaLBeS is the non-excludability faced by managers of landscape. This obstacle makes payments to the landscape similar to benefit-sharing schemes, or management at community level, rather than to PES schemes (Milder *et al*., 2010).

These difficulties are partially overcome if the rights to control access to landscape are put in the hands of local communities.

As stated above, the potential role of cooperative approaches is strategic, in particular when it supports the implementation of PaLBeS. In fact, conservation and provision of ecosystem services related to landscape are the result of the synergic action of all stakeholders present in an area. The achievement of consensus and sharing of rules are necessary steps for obtaining ecosystem services (Farley and Costanza, 2010).

Cooperation may be an opportunity for coordinating not only the supply side but also the demand for ecosystem services and consequently the purchasers of the services. Moreover a partnership approach can help reduce transaction costs associated with the implementation of PES schemes.

The preparation of an adequate system of sharing and using resources collected by the local community should also allow management mechanisms free from distortion (corruption, waste of resources, etc.) (Lindsey *et al*. 2007).

The development of a PaLBeS requires the creation of synergy among different activities: i.e. conservation of rural landscape and environmental resources, eco-tourism, production of quality goods and marketing are some of the activities that must act in harmony (Robinson and Keenan, 2010).

It is necessary to make clear that PaLBes is only one part of a set of tools aimed at the conservation and improvement of landscape ecosystem services (Table 2).

Firstly there is the traditional institutional intervention that requires the preservation of a beautiful scenic resource through instruments such Command and Control approaches. The creation of parks and protected areas is an example of application of this measure, which draws on public funds, or funds raised through entrance fees, permits, etc. Similarly, the actions of urban planning are part of this type of intervention.

Secondly, we identify cases in which the market encourages the conservation of the landscape. In particular, on the real estate market assets near beautiful landscapes appreciate. Also the conservation of the provision of ecosystem services based on purchasing or renting of land passes through market as a normal transaction.

Further forms of payment mechanisms come from some experiences of joint ventures between tourism operators and managers of landscape (Landell-Mills and Porras, 2002).

Tab. 2 - Tools in favor of the conservation of landscape beauty

Command & Control	Payment for Ecosystem Services - PES				Market	Voluntary instruments
	public	public-private	private	(certification)		
Urban Planning Parks, Protected areas, etc.	Subsidies, agro-environmental payments, etc.	Tickets, entrance fees, etc.	Trading with tour operators, payments for leisure activities	Labels	Price of property	Sponsorship with Internet
	Management agreements				Lease or purchase	Voluntary contributions, donations

Source: our elaboration

A market in favor of landscape can be created even by philanthropic foundations that attempt to mobilize the willingness to pay of private individuals to maintain landscape beauty. In this case, public awareness of environmental problems is necessary and that seems still to be

lacking. It should also be considered that donations generally do not respect the character of conditionality and do not require an exact definition of the ecosystem service (Robertson and Wunder, 2005).

An innovative market for landscape beauty is also created by Internet: an example is the case of the site EcologyFund.com, in which users are given the option to "click" appropriate keys present in site to provide financial resources for the maintenance of landscape and environmental resources identified by specific associations. However, the funds do not come from users, but from the sponsors of the site.

In this framework, in an appropriate context it seems that PaLBeS could also play an important role in managing and conserving landscape and environmental resources (UNECE, 2007; Waage, 2007). Although these PES need to be supported by the work of specific organizations and implemented by appropriate flexible schemes (Landell-Mills and Porras, 2002), they seem to supply interesting opportunities for landscape ecosystem services provision.

Moreover PaLBeS seem to provide excellent prospects for socio-economic as well as environmental resources, both in developing countries and in developed countries, where PES schemes have been implemented almost exclusively under the public sector.

6. Payments for Landscape Beauty in Italy

Last, but not least, it seems interesting to explore the opportunities for implementing PaLBeS in the Italian context, where rural landscape is a resource of great interest for local socio-economic development. In particular, it has a positive impact on the development of local tourism activities.

To try to assess the opportunities for implementing PaLBeS schemes in the Italian context, the results obtained from the above mentioned studies carried out to identify citizen'preferences for landscape and environmental complements and to define a monetary estimate of them are of some interest..

These data and the results of recent studies conducted in other areas of Italy (Bossi Fedrigotti *et al.*, 2011; Tempesta and Thiene, 2006) allowed us to estimate that the preservation of the rural landscape produces benefits for the community of around € 60 per year per household (Tempesta and Thiene, 2006). Extending data to national level it is possible to quantify the national benefits from the preservation of scenic resources: they amount to € 1,290 million per year.

These results highlight the fact that ecosystem services deriving from landscape produce considerable benefits to citizens. These benefits received by the community from the conservation and enhancement of the landscape seem to be high. Therefore, in Italy there is the opportunity to develop some PaLBeS schemes in favor of rural landscape resources. In particular, it seems desirable to develop PaLBeS schemes in several Italian rural areas in accordance with the preferences expressed by respondents in favor of specific landscape features and their benefits.

On the basis of the importance of tourism in Italy, especially as regard tourism linked to nature, the idea of using the PaLBeS tool to support this economic activity could play a significant role in developing socio-economic systems and conserving landscape and environmental resources. In fact, "green" tourism, i.e. tourism linked to landscape and environmental resources, is experiencing positive trends, in contrast with other types of tourism (Ecotur, 2011). The increasing number of green-tourists in Italy points to the desire to spend leisure time in contact with landscape and environmental resources. This seems to offer a viable opportunity for

developing PaLBeS, in which tour operators or users of the same resources can act as buyers of ecosystem services provided by managers of these resources.

Moreover PaLBeS may be a useful tool to make explicit the costs and benefits associated with the use of portions of soil and landscape for the production of renewable energy sources. For example, there is a heated debate about whether land in Italy should be used for the installation of wind turbines or photovoltaic panels. The implementation of PaLBeS in this context could be a solution for balancing the needs of various stakeholders, such as, for example, on the one hand the desire to obtain benefits of increased income for land managers and minor environmental impacts (quality of air, water, etc.), and on the other hand, to consider costs related to the inclusion in the landscape of extraneous features and possible negative impacts on activities related to landscape resources.

The use of PaLBeS does not exclude the presence of other tools (Engel *et al.*, 2008). In particular, considering PaLBeS features it could be affirmed that it is not the most suitable approach in any field or the best solution for achieving any goal. In fact, the choice of the best instrument depends on the characteristics of the ecosystem service, taking into account the the relationship between the ecosystem service and other benefits provided by landscape.

7. What role for public policy?

Although PES originated as a market solution for the sustainable management of ecosystem services, with the specific goal of creating an alternative to public management, the role of government in developing PES could be decisive (Vatn, 2009). In particular, its role in reducing transaction costs related to the nature of the traded goods is relevant.

Public intervention in favor of the diffusion of PES can occur with several degrees of engagement. In fact, firstly we can have the traditional role of the institutional decision maker, secondly the government can act as an intermediary, a promoter/financier of PES, but it could also be a seller of ecosystem services. The latter is the case in which the government is the owner of the landscape and environmental resources. In this case, PES is necessary to fund the conservation activities carried out by the government (Pagiola *et al.*, 2002).

The government may take part in a PES scheme in order to remove barriers that could prevent or cause difficulties in starting a market between suppliers and users of ecosystem services. In fact, there are some situations that could prevent its development, among which, high transaction costs related to the implementation of a PES scheme and relative negotiation of agreements. These costs are often due to the presence of supply and demand by individual economic agents. In this case the key role that the government can play is that of bringing together buyers and sellers or stimulating the market mechanism by providing appropriate information, training and awareness in the community (Gutman, 2007). The institutional task is, moreover, to increase public awareness about the benefits deriving from the sustainable use of landscape and environmental resources, inviting citizens to ensure their protection, through the payment of a price for the benefit they receive.

Furthermore, the government must guarantee citizens the right to enjoy the essential ecosystem services, even when they have not the necessary financial resources to pay for them. In fact, it is important that ecosystem services are not considered as luxury goods. In this case the government must intervene directly by financing the creation of a PES.

There are several examples of PES where government is a buyer. The main example in the

European Union context is the case of agri-environmental payments, contained in the Rural Development Programmes. However, Pagiola and Platais (2007) pointed out that public-financed PES (government acts as a purchaser on behalf of users), such as the agri-environmental measures mentioned above, appears less efficient than those directly funded by users. Their inefficiency derives firstly from the lack of direct information about the value of the ecosystem services perceived by beneficiaries. Another source of inefficiency is the inability of the government to monitor the supply of the service, and the absence of incentives to ensure the efficiency of PES.

Publicly-financed PES is, moreover, often a uniform payment in favor of ecosystem services providers. It is characterized by a low spatial differentiation and a lack of specific targets. In addition Pagiola and Platais (2007) show that often in publicly-financed PES the payment is tied to the inputs rather than to the actual provision of services. The cause of this gap stems from the impossibility of observing the level of provision of ecosystem service that leads to adoption of incentives related to the use of production factors (e.g. land). This situation could create potential distortions at the expenses of PES effectiveness and efficiency.

Furthermore, on some occasions, publicly-financed PES makes citizens less responsible, eroding their sense of duty to protect ecosystem services (Neely, 2008). In fact, if this task is attributed to the government, citizens are not stimulated to develop private transactions.

Nevertheless, publicly-financed PES has the opportunity of achieving economies of scales for transaction costs, given the considerable breadth of action that characterizes this type of scheme.

Although less efficient, however, there are some cases in which publicly-financed PES remains the only option: for example, when there is a significant conflict of interest between beneficiaries and providers of an ecosystem service or an increase in transaction costs or incentives for opportunistic user behaviour (Wunder *et al.*, 2008).

Publicly-financed PES is sometimes able to achieve objectives that a user-financed PES is not able to obtain: for example, it seems to be possible to reduce poverty in developing countries through the creation of a publicly-financed PES. In these contexts PES should be mainly aimed at improving local economic conditions, providing opportunities for the integration of income or additional services to the population (training, technical assistance, etc.).

The use of PES to achieve further issues could, however, on the one hand, confirm the importance of institutional support to ensure a certain level of quality of life for the local population but, on the other hand, it may jeopardize the achievement of the primary objectives, i.e. the provision of ecosystem services. The main difference between PES created in developing countries and PES in developed socio-economic systems concerns the presence, in the first case, of the above-mentioned further targets.

8. Concluding remarks

There are still important difficulties to be resolved in order to develop optimal patterns of PES in favor of rural landscape. First of all, the problems in i) estimating the value of an ecosystem service and its price, ii) identifying the best type of contract to ensure optimal deployment from a social perspective, and iii) the need to evaluate the consequences arising from the application of a PES. The evaluation requires the ability to use appropriate indicators and a sufficiently long period of time to observe and determine the impact of PaLBeS on landscape features and complements (Marangon *et al.*, 2007).

Nevertheless, the positive effects that seem to follow from a suitable use of PaLBeS argue in

favor of its extensive use in the future, following a trans-disciplinary approach (Farley and Costanza, 2010), based on considerations regarding not only efficiency but also equity and sustainability.

In any case, the choice of the most suitable measures must be made according to the characteristics of the ecosystem service in question.

Each tool created in favor of landscape conservation could be the best to maintain or increase the supply of ecosystem services provided by the rural landscape according to the context. Moreover the choice of one tool does not preclude the use of the others: in fact, each context and ecosystem service requires an appropriate solution (Troiano and Marangon, 2011).

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RISK MANAGEMENT TOOLS IN AGRICULTURE: SOME REFLECTIONS ON THE OPPORTUNITIES AND LIMITATIONS OF THE EUROPEAN COMMISSION PROPOSAL

JEL classification: Q18, Q14, G22, G28, G32, H50

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Abstract. *Economic risk management tools in agriculture have been the subject of renewed interest and profound evolution, not only for the their increasing diffusion in national policies in support of agriculture but also in relation to the important role that they could have in adapting agriculture to climate change within the measures of the future CAP.*

The contribution that economic tools for risk management can bring in this context is related in particular to their flexibility and adaptability to farm needs. Starting from an analysis of tools currently in use at international level and taking into consideration the Italian experience in risk management at national level (the National Solidarity Fund), this paper aims at highlighting both the potential and limitations of risk management tools in the context of the new CAP and its challenges.

In fact, in order to be effective, these tools need strong integration in a wider framework of policies and actions on climate change adaptation. Moreover, it is crucial that, when designing these tools, consistency with other key agricultural objectives is ensured, most notably food security and environmental sustainability.

Keywords: *climatic risk management, CAP sustainability, agriculture and climate change, insurance schemes*

1. Context

The use of economic risk management tools in agriculture has recently been discussed with renewed interest for their potential, within agricultural policy, for supporting farms in situations of crisis. The role that economic tools for risk management can have in this context is related in particular to their flexibility and adaptability to farm needs under increasing uncertainty and volatility of markets.

The emerging new interest is also due to the important role that these tools could have in adapting agriculture to climate change and the occurrence of extreme events. The key concepts are that agriculture is one of the sectors most exposed and vulnerable to climate change and that the uncertainty of scenarios requires the definition of flexible tools in order to manage risk.

The European Commission's proposal for CAP towards 2020 in the new regulation on rural development policies (European commission, 2011) introduces a kit of measures for risk man-

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agement in agriculture and some countries have started studies and evaluations in order to face up to the most problematic aspects of these tools as well as integration between them and other policies in order to avoid overcompensation. In fact, referring to the structure of the EC proposal, the characteristics of agriculture and to the evolution of risk management in the European countries, some reflections are necessary in order better to understand the potential role of these economic tools in supporting farmers within the new CAP, in order to improve the effectiveness of the policy.

Several studies have been started about the technical aspects and impacts of the proposal on feasibility, cost-effectiveness and also the juridical structure of the policy measure (Adinolfi *et al.*, 2012; Adinolfi, 2011). It is, however, considered crucial to give some consideration also to the general policy approach, as the definition of these tools must be consistent with other key agricultural objectives, in particular the adaptation of agriculture to climate change, most notably for the consequences for food security and environmental sustainability.

2. Managing risks in order to manage uncertainties in agriculture

Mediterranean and Italian agricultural sectors are fragile in particular because of the wide variety of ecosystems, microclimates and environmental conditions, as well as the variety of agricultural production based on the quality and territorial specificity of its products.

According to the generally accepted economic meaning, in business management the planning phase seeks to consider all factors that may influence the expected result. However, there are some external factors with unpredictable behaviour that generate uncertainty and potential risk.

The agricultural sector presents important peculiarities, as production is strictly correlated to environmental and climate factors that, by their very nature, are hardly subject to management control. In short, agriculture has a higher exposure (to climate events) and higher vulnerability (to the consequences of events).

In particular, the production risk associated with adverse weather conditions[1] (generally speaking the "climatic risk"), understood as the risk that the yields or the quality of production are lower than expected owing to the effect of adverse meteorological or environmental events, has always been considered as a matter of priority and perceived as medium/high risk (in terms of likelihood and damage).

The concept of climatic risk may also encompass the behaviour and diffusion of physiopathologies and parasitic attacks, which appear in the long term to be abnormal, as a result of exceptional events.

Agriculture in the Mediterranean basin has a higher degree of exposure and vulnerability to climatic risk compared to other areas for the following reasons:

- it is based on the quality of production rather than on quantity, that is, on production with high added value and with significant economic relevance also in terms of exports. Therefore, equal damages in quantitative terms, correspond to higher economic loss;
- environmental and climatic conditions of Mediterranean countries are extremely heterogene-

[1] The concept of adverse weather conditions is not clearly defined at international level. According to the European Commission's community guidelines for state aid in the agriculture and forestry sector 2007 to 2013, national disasters include earthquakes, avalanches, landslides and floods. The Commission does not recognize the insurgence of plant and animal diseases or exceptional events unless the latter are particularly calamitous (in terms of diffusion) and the Member State justifies the exceptional nature of such an event.

ous. This factor renders production more diverse and rich but also entails higher risks for the territorial specificity of production.

Given these considerations, risk management on farms has always represented an important element and, in certain cases, a decisive factor for the farms' very existence.

In this already complex contest for risk management, climate change (CC) raises fundamental questions regarding the future of agricultural production. In fact, compared with baseline scenarios, climate change increases the level of uncertainty and variability of the environmental conditions under which agriculture operates and thus heavily influences cropping cycles, agricultural practices and farm management.

Recent and ongoing studies[2] highlight the possible effects of CC on the agriculture of the Mediterranean, most notably Italian, taking into consideration the main climatic variables in different zones of the Member States and, in certain cases, simulating the effects of such changes on specific aspects such as yields, water availability and phytosanitary conditions.

Concerning productivity, the common understanding – yet to be verified in more specific situations – is that the increase in temperatures and the decrease in precipitation may cause a reduction in production owing to the impacts on irrigation (less water available), cultivation systems (modification of cropping cycles, riskiness of pathogens, modification of the entomological component) and on animal production. For instance, scenarios on phytosanitary conditions reveal that higher temperatures may favour the development of pathogens also due to the increased thermal and water stress on crops which are thus subject to higher vulnerability, and to the arrival of new pathogens typical of subtropical areas.

Moreover, the impact of the increase in temperatures on animal health and well-being is also being debated: notably, the effect of high temperatures on the nutrition of the breeding stock (reduced appetite and reduced productive and reproductive capabilities as a result of increased stress).

In short, even if agriculture has always adapted naturally to environmental conditions, the ongoing climatic changes put forward specific problems, such as:

- the speed of the changes in relation to the ability of agri-ecosystems to adapt;
- the increasing frequency and the higher magnitude of extreme meteorological events such as drought and floods;
- the uncertainty of climate change scenarios;
- the global production of food: while changes in climate may create new production opportunities, they may generate more important preoccupations regarding the ability of agricultural systems to ensure food security for an increasing world population.

The above considerations complicate the context in which business choices take place. The latter become increasingly more uncertain regarding the type and quantity of production and regarding the execution of practices, i.e. seeding, irrigation, phytosanitary intervention and harvesting (when, how, how much). In other words, farmers are today faced with the choice, on the one hand, to continue operating as usual (entailing a higher risk), or investing in a more complete risk coverage, adapting the farm and its management.

Different types of actions are available, most notably:

- structural: actions for the improvement of business infrastructure and of the territory in order to reduce the exposure and vulnerability to the effects of CC.

[2] Projects financed by CLIMAGRI, Agroscenari Programme, AdaptAlp.

- management level: improvement of farm and territorial management (business planning, innovation and modernization of management, diversification of activities and production), decision-making support and early warning for drought, floods, landslides and pathogenic attacks.
- economic: financial and economic tools to cover risk such as insurance, compensation funds, mutual funds, investment funds, etc.

Concerning in particular the latter category, traditional tools are considered useful, compared, for instance, with structural or infrastructural investments, for their characteristics of flexibility and adaptability at the stage both of definition and of application (contracts with subject and objectives that are modifiable in time and space). In the context of CC, such characteristics are even more important (and indeed useful) given the uncertainty regarding the effects and impacts on production. This is because economic tools are adaptable in terms of objectives and substance as different scenarios may unfold.

Several studies try to explain the role that these tools can have in the context of increasing uncertainty, showing that risk management at local and farm levels represents one of the most important elements and key challenges (OECD, 2009).

The analysis of the international context (Mahul and Stutley, 2010) demonstrates that the diffusion of risk management in agriculture through these economic tools, primarily insurance, is based on the possibility of benefiting from supportive public policies (Bielza *et al.*, 2009; Cafiero *et al.*, 2007). In most cases, public support is in fact targeted to the specific needs of each context: adverse climatic events in the EU and North America, and more recently also in Australia, as well as the objectives of agriculture and development in South America, are all cases in point (the most frequent being agricultural insurance) (Pontrandolfi and Nizza, 2011a).

The transformation of climate is going to modify (is modifying) the behaviour of the main variables that impact risk distribution both in terms of pattern and of measurement, mainly that of production.

Tendentially, an increase in general levels of risk is to be expected, as well as intensification of uncertainties and question marks regarding the behavior of the main reference parameters (first and foremost temperature, precipitation and yields).

3. The current status of risk management systems in Italy

Italy has a strong tradition of risk management in agriculture. This is mainly because of its particular climatic, environmental and production characteristics, which determine strong heterogeneity and complexity of variables as well as higher exposure and vulnerability to risks associated with meteorological and climatic conditions.

Since the 1970s, the insurance market has offered single-risk hail insurance with the partial coverage of the "National solidarity fund for natural calamities in agriculture" established and dedicated to the financial compensation of farmers hit by natural disasters. The fund was reformed in 2004 (legislative decree n. 102/04), with a change in principles and economic tools. The main objective is to promote actions for prevention to cope with damage to production, infrastructure and productive equipment. The types of intervention foreseen are as follows:

a) measures for insurance contracts: aid for payment of insurance premiums (public contribution up to 80 percent of premiums with a damage threshold of above 30 percent). The measure is voluntary and is applicable to both individual and collective forms of organisation (consortia or cooperatives).

b) compensation measures for damage to production, infrastructures and equipment, aimed at helping the economic recovery of farms that have suffered more than 30 percent for damage not covered by insurance.

This approach responds to two different risk management strategies:

- transferring the risk to third parties, traditionally associated with insurance and generally used for risk management with medium probability of the event happening and with a medium degree of damage.
- accepting the risk, generally associated with a low probability of events with a high level of damage.

It is important to highlight that the principle of exclusion, which is not always applied in other countries, is foreseen for both types of tools: it is not possible to give compensatory contributions for insurable risks (included in the National agricultural insurance plan, approved by decree of the Ministry of Agriculture). The 2004 reform and its evolution in 2005-2009 highlight the choice to give more importance to insurance, which today covers around 80 percent of the available contributions.

Furthermore, in recent years, the demand for and offer of insurances has widened and diversified: the introduction of new insurance types (pluri-risk and multiple risk), in addition to traditional ones (single-risk of hail), has certainly contributed to the diffusion of insurance in areas where they were traditionally lacking (Capitanio and Cioffi, 2011). In recent years, there has been a constant increase in pluri-risk policies, which today cover approximately 46 percent of the agricultural insurance market (Razeto, 2011). Pluri-risk insurance linked to adverse meteorological conditions (drought, hail, floods) has had a significant diffusion.

At legislative level, a number of already existing opportunities arise from combining EU and Italian law, even if some of them are not considered implementable or of interest for Italy. Contributions for insurance premiums can also derive from the Common Market Organisation (CMO) for Wine and Fruit, even if to date only the premiums for the Wine CMO have been utilized. Since 2010, for the first time in the history of the Common Agricultural Policy (CAP), some contributions for risk management tools come directly from the CAP Regulation 73/2009. Specifically, Italy has implemented article 68 (d) relating to contributions for insurances.

Currently, in Italy public contributions for insurance and compensation funds are available. An issue discussed is the ability of the system to satisfy the exact needs of the agricultural sector with regard to the occurrence and damage caused by adverse events. In the period 2007-2011 the insured value[3] of production has increased from €4.3 billion/year to €6.1, but the role of compensation funds is still strong and it seems to have increased in recent years (from 2006 to 2013 more than €6 billion of financial aid for compensation[4]) in relation to the adverse events that occurred (severe drought in 2012 and several floods).

For these reasons, the most debated topics are the following:

- at legislative level, the lack of tools complementary or supplementary to insurance and compensation funds in order to manage other levels and types of risk not yet covered (market crisis, diseases, etc.).
- the insured base is still considered to be excessively low (approximately 18 percent of national production) despite significant public contributions[5].

[3] www.ismea.it

[4] Data from Italian Ministry of Agricultural, Food and Forestry Policies.

[5] Data from: Ministero delle Politiche agricole alimentari e forestali (Ministry of Agriculture, Food and Forestry policies).

- the disparity in geographical distribution with a predominance of premiums in Northern Italy (70-80 percent).

It is worth noticing that in recent years the need has emerged for introduction of new tools enabling wider choice and freedom of action for farmers in difficulty, given the increase in the frequency of adverse events linked to CC.

4. Opportunities emerging from CAP reform: the EC proposal on risk management

Following the European Commission's communication adopted in November 2011 on future directions for CAP towards 2020, a proposal for a Regulation on rural development has been put forward and is currently being negotiated (European Commission, 2013). The proposal, for the first time, introduces in the European Union a comprehensive policy framework of measures and tools for risk management in agriculture. The proposal acknowledges that the agricultural sector is more vulnerable than other sectors to damage to its production potential as a result of natural disasters. Therefore, support to farmers for the recovery of the agricultural assets damaged by natural disasters, as well as support for risk management notably in the is required.

Most notably, the proposal introduces a specific measure for risk management, providing support for:

- crop, animal and plant insurance premiums against financial losses caused by adverse climatic events or by animal/plant diseases (art. 51);
- mutual funds[6] to pay financial compensation to farmers for losses suffered as a result of the outbreak of animal or plant diseases or environmental incidents (art. 52); contributions may include: the administrative costs of setting up the mutual fund, spread over a maximum of three years in a degressive manner; the amounts paid by the mutual fund as financial compensation to farmers; interest on commercial loans taken out by the mutual fund for the purpose of paying the financial compensation. No contribution of public funds is accepted to the initial capital of the fund (paid by farmers).
- an income stabilization tool, in the form of financial contributions to mutual funds to compensate farmers that have suffered a loss of over 30 percent of their income[7] (art. 53). Payments by the mutual fund to farmers shall compensate for not more than 70 percent of the income loss.

Mutual funds have a certain degree of spread in Northern Europe and notably in the livestock sector covering the risk for animal diseases (Netherland, France). In Italy, there is a general interest in mutual funds: some experiments have been attempted in the North of Italy, but they are contingent and intermittent, even though the results are considered positive (Pontrandolfi and Nizza, 2011b).

In the cases analyzed no public contributions to mutual funds are present, therefore imple-

[6] By "mutual funds" the EC means a regime recognized by the Member State, in line with its legal system (Member States define rules for the establishment and management of funds), which allows member farmers to cover themselves and to benefit from compensatory payments in the case of economic losses.

[7] Income reductions must be in excess of 30 percent of the average income of the previous 3 years or of a 3-year average based on the previous 5 years excluding the highest and lowest years in terms of income. Income is referred to as the sum of revenues that the farmer receives from the market, including any form of public support.

mentation in CAP Health Check (Regulation 73/2009) and the CAP reform of a specific measure is quite an important innovation in risk management policy.

In general terms, the existence of mutual funds that do not benefit from public contributions may imply that the agricultural sector has enough confidence in such a tool.

Mutual funds are not considered to be in contrast with insurance but rather as important and potential complementary tools, able to cover types and levels of risk that are non-insurable, for instance animal/plant diseases.

It has also emerged that the stronger competition ensured by the very existence of a fund is generally considered to have a positive effect on insurance premiums (they tend to decrease) and their features (more specific to farm needs). In areas where insurance premiums paid are much higher than compensation received, investment in a mutual fund may be considered more effective and useful.

Essentially, the most evident positive effect is the placing on the market of a new and complementary risk management tool.

Referring to the EC proposal, it is foreseen that a specific regulation must be adopted by Member States to govern the institution and management of the mutual fund, from the juridical and administrative to its economic and financial aspects (authorization by a competent authority, transparency of financial flows, rules for the allocation of responsibility and for compensation, etc.).

The **Income stabilization tool** (IST) in the CAP reform deserves particular attention. Income as a variable is not a component of risk. Income is the final result, while the risk factors are the variables influencing the result. In any case, in the global context, the choice of income stabilization tools represents an emerging and much-debated issue since recent market crises as well as price volatility (INEA, 2010) have underlined the need to find new ways for income stabilization in agriculture to complement traditional income support measures (present in all Member States with different support policies and tools).

The IST is considered for the first time in European policy as an instrument to help farmers in case of an excessive reduction in income, independently of the negative event which occurred (for instance, an adverse climatic event or a market crisis) (Adinolfi *et al.*, 2012).

As regards the objectives of income protection (a kind of safety net), a heated debate is under way at European level (Chatellier, 2011), including the Italian Government and the scientific community.

The most critical aspects are:

- the allocation of the IST to the Second instead of the First Pillar of the CAP. The criticism refers not only to the nature of the tool, but also to the rules for implementation (multi-annual contracts, administration and timing of proceedings, disengagement rules, etc.) and the spatial scale (in Italy regionalized[8]) of rural development measures, which may not be appropriate for managing the necessary support to farmers in case of crisis (immediate actions for recovery after the damage and reimbursement immediately effective);
- the evaluation of the income loss (regional and sectoral indices proposed seem inadequate (JRC, 2009) and its calculation at farm level (links to fiscal systems and availability of historical data);
- the integration with other risk management tools in order to avoid overcompensation;

[8] Italy has proposed amendments to the legislation to create a National programme for risk management measures.

- the difficulty of estimating the financial needs to implement the measure in the Programmes;
- the performance of the new measure, in particular the challenge is to enhance the participation of farmers in relation to their financial conditions (ability of farmers to participate with financial capital to the creation of the fund).

The aspects of the introduction of an IST considered more positive are:

- this would be the first risk management tool adopted in a policy context explicity covering the farmer's income from the risk of adverse market conditions such as volatility of prices, costs for raw materials and inputs (Capitanio *et al.*, 2011);
- the choice of the mutual fund for IST could ensure less issues of adverse selection and moral hazard typical of an insurance tool since it is based on farmers' agreement and association, shared knowledge of risks and participation in management and control;
- major opportunities arising from the allocation to the Second Pillar are the potential synergies between risk management tools and other rural development measures of a more structural and management nature, which could contribute to a reduction of exposure to risk and of the vulnerability of farms (first and foremost agro-climatic-environmental measures, product diversification, irrigation infrastructures, technological and management innovations and formation-information- advisory services);

Concluding this part, it is important also to consider the document "**Green Paper on the insurance of natural and man-made disasters**" produced by the EC in 2013, accompanying the launch of "An EU strategy on adaptation to climate change" (European Commission, 2013). The document discusses several issues concerning the adequacy and availability of appropriate disaster insurance with the objective "*to raise awareness and to assess whether or not action at EU level could be appropriate or warranted to improve the market for disaster insurance in the European union* […] *and help to promote insurance as a tool of disaster management and thus contribute to a shift towards a general culture of disaster risk prevention and mitigation, and bring in further data and information*". A general consideration must be made regarding the explicit choice of insurance as tool to manage the risk of natural disasters in a context of adaptation strategy to CC. There is no doubt that the exposure and the vulnerability to changes create the need for innovative instruments to face the economic damage of natural disasters, more and more frequent ,and at the expense of society as a whole, as a result of increasing risks. The document also expresses the importance of combining the natural disaster insurances with preventive measures; the role of the actions for reduction of exposure and vulnerability, however, seems minor in relation to the enhancement of the insurance tool (which is also proposed as compulsory in some cases), in the launching of public-private partnerships and Governments as reinsurers. Describing the needs for risk prevention actions, the EC considers that citizens and owners could be more protected with insurance ("*insurance is a critical requirement for development as uninsured losses can extend the cycle of poverty and impede economic growth*") and that "*disaster risk management can help to promote undisturbed economic development*". From this point of view, the EC approach and the choice to publish the Green paper as an accompanying document of the adaptation strategy could be considered as a sign of strong orientation of the policy to transfer the risks through economic and financial tools more than as enhancing public prevention actions, while in designing policies a more complete perspective of disaster risks would be necessary, together with a more comprehensive strategy for prevention and safeguard of the population, the territory and most vulnerable human activities, primarily agriculture.

5. Final Considerations

Referring to the European and Italian experiences and the results of the researches already done in this field, several issues need to be further investigated and expanded in order to define the future CAP and to develop the risk management system.

Without considering all the technical aspects and critical points under discussion to ensure the effectiveness and efficiency of the proposed policy measures some considerations about the general policy approach could be useful to the debate.

Several observations can be made on the opportunities offered by economic risk management tools with regard to the objective of protecting European farms from risks and adapting agriculture to climate change. There is no doubt that this type of tool is useful to farms in order to face the increase in risks, in particular considering the uncertainty and complexity of the factors involved in production. In the presence of unforeseeable and extreme events, in terms both of occurrence and magnitude, risk coverage can determine the very survival of the affected farms.

However, it is important to highlight that risk management through economic tools cannot itself represent the only answer, as its limitations as well as its effectiveness largely depend on the conditions in which farms operate at business and territorial level. In other words, without a good risk assessment the economic tools could result ineffective (for instance, insufficient financial coverage of damage or lack of incentives to activate insurances). For instance, if the occurrence of floods increased and the area is not protected from hydrological risks, an economic risk management tool would not cover the damage caused by the extreme event. Similarly, the tools would lose effectiveness if no preventive actions are taken at farm level (anti-hail nets, improvement in irrigation, maintenance of ditches, strengthening and adjustment of infrastructure, etc.) and at management-level (risk planning, farm innovation and modernization, diversification, farm advisory system and early warning system).

It is important, moreover, to integrate the risk management policy in a wider context of environmental sustainability and food security. With regard to environmental sustainability, the main concern is the occurrence of "maladaptation" phenomena (lowering of the farmer's attention towards maintenance and innovation of land, water and soil management, given the presence of an economic tool covering possible damage). The same concern may arise in relation to the food security objective, as these tools safeguard farmers' incomes, not the production level. Of course it is difficult to estimate the impacts of a wide diffusion of risk management tools on production levels, nonetheless it represents an element worthy of consideration when designing policies.

These considerations are even more relevant when operating in a national or international policy context: when choosing to allocate public funds to risk management, the ineffectiveness of these tools would imply inefficiency of public spending.

It is thus of crucial importance that risk management tools are placed within a more general integrated strategy, clearly defining complementary actions and synergies within structural, management and economic actions as well as ensuring consistency with other strategic objectives.

Concluding, critical points to discuss in the definition of the European policy on risk management in agriculture within the CAP reform are:

a) the necessary preliminary analysis on risk conditions (parameters, risk levels and interrelations) and risk assessment which justify the choices made on policies and public aid;
b) the analysis of demand, for risk management tools with policies oriented more to market

supply (insurances); this tendency can create inefficiency and ineffectiveness of the policy and the tools (economic aid even for not-insurable risks, consequent imbalance between contributions to premiums and ability of companies to indemnify damage, insufficient financial coverage of damage);

c) a low level of integration among the available risk management strategies (reduction of exposure and vulnerability, transferring and acceptance). In general the object of policies is only or mainly trasferral of risk. A multilevel (farm and territorial, management and structural), integrated approach seem more appropriate to ensure the effectiveness of the the long term policies.

Taking into account these considerations, it is important to define policies, objectives and tools starting from risk assessment and demand for risk management tools and then specify the more appropriate tools to support farmers, in synergy with other structural and management measures.

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AN ANALYSIS OF THE POTENTIAL EFFECTS OF THE MODIFICATION OF THE PROSECCO PROTECTED DESIGNATION OF ORIGIN: A CHOICE EXPERIMENT

JEL classification: C81, C87, C01

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Abstract. *The wine market is facing new challenges that require a high degree of competitiveness. To support the agricultural sector the European Commission has issued regulations (Regulation 510/2006 followed by Regulation 1151/2012) regarding the protected designations of origin (PDO) and protected geographical indications (PGI). These measures are part of the common agricultural policy (CAP) and affect, among others, the wine sector. The objectives of Regulations 510/2006 and 1151/2012 are to promote rural economies, enhance internal markets and increase consumer choice and information. We applied a choice experiment to understand whether the new PDO Regulation has a positive effect on the Prosecco wine market. Five attributes were considered: using grapes from local biotypes, protection of the traditional landscape, traceability, place of production and finally, price. Our results indicate that the production area appears to be an important attribute in guiding consumers' purchasing decisions. The research also showed that consumers seem to attribute great importance to other characteristics of Prosecco, in particular, the use of grapes from local biotypes. The latter has more influence than the area of origin on the propensity to buy Prosecco for 64% of the sample.*

Keywords: *choice experiment; wine marketing, latent class, Prosecco*

1. Introduction

The wine market is facing new challenges that require a high degree of competitiveness. To support the agricultural sector the European Commission has issued regulations (Regulations 510/2006 and 1151/2012[1]) regarding protected designations of origin (PDO[2]) and protected geographical indications (PGI[3]). These measures are part of the common agricultural policy

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[1] Regulation 1151/2012, while introducing some new norms regarding agricultural products, did not alter the provisions first introduced by Regulation 510/2006 as regards wines.

[2] "'Designation of origin' [PDO] means the name of a region, a specific place or, in exceptional cases, a country, used to describe an agricultural product or a foodstuff: originating in that region, specific place or country; the quality or characteristics of which are essentially or exclusively due to a particular geographical environment with its inherent natural and human factors; and the production, processing and preparation of which take place in the defined geographical area." (source: Regulation 510/2006).

[3] "'Geographical indication' [PGI] means the name of a region, a specific place or, in exceptional cases, a country, used to describe an agricultural product or a foodstuff: originating in that region, specific place or country; and which possesses a specific quality, reputation or other characteristics attributable to that geographical origin; and the production and/or processing and/or preparation of which take place in the defined geographical area." (source: Regulation 510/2006).

(CAP) and affect, among others, the wine sector. The objectives of Regulations 510/2006 and 1151/2012 are to promote rural economies, enhance internal markets and increase consumer choice and information while the expected results are: "Increased diversity of agricultural production; Increased income for farmers; Fair competition between producers of products with geographical indications or designations of origin; Increased recognition and credibility of registered names on the part of consumers; Consumers able to make better choices due to clear information on product origin" (European Commission, 2008, p. 23).

The present research aims to evaluate the impact of this policy with regard to the latter objective, namely the provision of quality signals to consumers about the products labelled as PDO. The understanding of consumers' perception of PDO labels will also enable guidelines to be formulated for possible marketing strategies to enhance the signalling value of PDO labels.

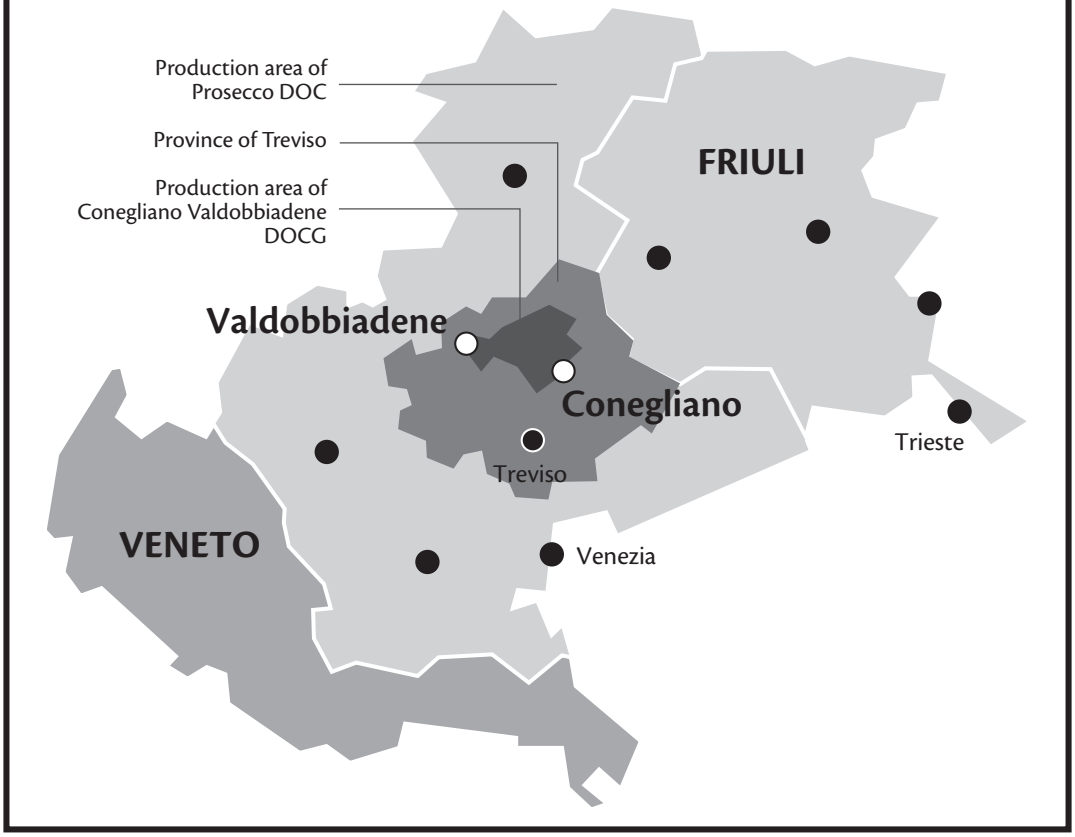
We consider Prosecco wine, one of most famous sparkling white wines of north-eastern Italy, as a case study.

The chosen case study is motivated by two factors. First, Prosecco wine is quite well known on the market and second, it was recently affected by the Ministerial Decree of 17 July 2009 that has significantly altered the production specifications of Prosecco wine.

The Ministerial Decree has had three effects on the production/labelling of Prosecco wine. First, the boundaries of the production area have been changed; the original Protected Designation of Origin (PDO or DOC) became Protected and Guaranteed Designation of Origin (PGDO or DOCG). Second, the DOC area has been extended and now includes nine provinces of the Veneto and Friuli-Venezia Giulia Regions (Figure 1). Third, only the wines from grapes produced in DOC and DOCG areas can be labelled as "Prosecco". As a result, the areas for the production of Prosecco (labelled as DOC or DOCG) tripled from about 3,932 ha to 12,600 ha.

These norms should improve consumer perception of the quality of Prosecco thus eliminating unfair competition and helping to reduce asymmetry in information. As a consequence, it is presumed that the market power of the Prosecco producers will rise due to the greater protection given to their product by the labelling policy. However, the reform carries a controversial threat, due to the expansion of the production area and the subsequent potential increase in supply: this aspect could undermine the gain in market power due to a price fall as a consequence of the increased production. This could particularly affect small wineries and vineyards on the hills that have higher production costs than growers on the plains. It could therefore happen that in the medium and/or long-term, growers and vineyards in historic production areas currently DOCG will face a loss of competitiveness. This will happen especially if consumers do not understand the significance of the DOCG and DOC labelling, and especially the differences between the wines produced in these areas.

Fig. 1 - Areas of production of Prosecco: DOC and DOCG



We analysed the effect of PDO labels in influencing the propensity to buy Prosecco wine by means of a choice experiment that considers five characteristics (attributes) of the product: designation of origin, traceability, use of local vine biotypes, preservation of the traditional landscape and price. The application of a latent class model allowed the market segmentation to be analysed, providing the bases for discussion of marketing strategies that satisfy the preferences of the different consumer targets.

The rest of the paper is organised as follows: section two summarises the results of past research in this field. The methodology applied is presented in section three, followed by a description of the results obtained from our analysis. The last section discusses the results of the econometric analysis and presents our conclusions.

2. Background

Wine is defined in the literature as an experience good, namely a good whose quality is unveiled only during its consumption (Lockshin *et al.*, 2006).

As pointed out by Sáenz-Navajas *et al.* (2013), wine is a complex good and the perception of

its quality depends on both intrinsic and extrinsic characteristics. Both characteristics provide a set of information to consumers, and while the first category (intrinsic factors) is derived from tasting the product, the second (extrinsic factors) is more related to its commercial description, namely advertising and packaging (Sáenz-Navajas *et al.*, 2013).

Protected Designation of Origin can be classified among extrinsic factors, given that it provides a signal to consumers on the product label.

Several studies have analysed the effect of both intrinsic and extrinsic factors, applying different methodologies. These methodologies can be classified in monetary (e.g. hedonic pricing, choice experiments) and non-monetary techniques (e.g. multi-criteria analysis, conjoint analysis, preference rating), where the latter have the advantage of providing information on the premium price given by consumers to a specific characteristic of a product. Among monetary techniques, hedonic pricing (Bartik, 1987; Court, 1941) and choice experiments (Hensher *et al.*, 2005) have been the most widely applied to the wine market. The first was applied, among others, by Combris *et al.* (2000); Schamel (2003); Schamel & Anderson (2003) while the second by Cicia *et al.* (2013); Lockshin *et al.* (2006).

According to the literature, several factors are crucial in influencing purchasing decisions and the most important are taste (Mitchell & Greatorex, 1988; Thompson & Vourvachis, 1995), price (Jenster & Jenster, 1993; Djumboung *et al.*, 2013; Koewn & Casey, 1995; Perrouty *et al.*, 2006), region of origin (Batt, 2000; Perrouty *et al.*, 2004; Skuras & Vakrou, 2002; Tustin & Lockshin, 2001; Thiene *et al.*, 2013; Veale & Quester, 2009), grape variety (Combris *et al.*, 2000; Goodman *et al.*, 2005), branding (Vlachvei *et al.*, 2012), packaging (De Mello & Pires Gonçalves, 2008; Mueller Loose & Szolnoki, 2012; Piqueras-Fiszman & Spence, 2012), previous experience (Casini *et al.*, 2009) and traceability (Cicia & Colantuoni, 2010).

While several authors have analysed the effect of country of origin labelling (Alfnes, 2004; Alfnes & Rickertsen, 2003; Bolliger & Réviron, 2008; Carpio & Isengildina-Massa, 2009; Chung *et al.*, 2009; Loureiro & Umberger, 2007; Tempesta & Vecchiato, 2013; Umberger *et al.*, 2002), the analysis of the premium price for PDO (DOC and DOCG) Italian wines has not yet been investigated. Looking at the results obtained from the analysis of the effect of country of origin labelling for foods, it seems that the indication of the place of origin on product labels is often one of the characteristics most appreciated and rewarded by consumers (Mauracher *et al.*, 2013; Tempesta & Vecchiato, 2013). Our study will try to understand whether this is also the case for the PDO labelling introduced on the wine market by the CAP with particular attention to the DOC and DOCG designations.

3. Material and methods

3.1. The Choice Experiment Methodology

The Choice Experiment (CE) methodology (Louviere & Woodworth, 1983; McFadden, 1974) is a popular technique in marketing, transportation and environmental studies. CE can be framed in the economic valuation techniques, along with the Contingent Valuation Method (CVM), among stated preference methods. Both techniques are based on a survey that mimics consumer choices, asking respondents to declare their willingness to pay (WTP) for a proposed good or service. While in the CVM respondents are asked to declare their WTP for a single hypothetical scenario, CE requires respondents to choose their preferred good for each of the proposed bundles. In each bundle (choice set) the respondent is presented with different con-

figurations of the same good differentiated by some of its key characteristics (attributes). The interested reader can find an in-depth presentation of the CE methodology in Hensher *et al.* (2005) and Hoyos (2010).

CE data can be analysed with different models depending on the purpose of the study and on the assumptions made about the data collected. While multinomial Logit (MNL) (McFadden, 1974), multinomial Probit (MNP) and nested Logit (NL) models can be applied when preferences are assumed homogeneous among respondents, random parameters Logit (RPL) and latent class models (LCM) are usually applied when studying heterogeneous preferences among respondents and therefore a segmented market. LCM models (Swait, 1994) analyse heterogeneity finding different clusters (classes) of respondents whose preferences are homogenous in every class but different between classes. On the contrary, RPL models (Train, 2003) treat heterogeneity in a continuous fashion and require the analyst to make assumptions on the distribution of the parameters assumed to be interpreted in a heterogeneous way by respondents.

In this research data were analysed first with a MNL model and then with a LCM model in order to investigate the segmentation of the Prosecco wine market. MNL model estimates should be considered only as "explorative" results. In fact MNL models assume that error terms are independent and identically distributed (iid) and that the Independence of Irrelevant Alternatives (IIA) (Arrow, 1951) is satisfied. The latter assumption is rarely satisfied and therefore other models like LCM or RPL models should be applied in order to overcome the IIA assumption that characterises MNL models.

3.2. Experimental design

The definition of the choice sets that will be presented to respondents in a CE is reached by a process called experimental design. Once the key attributes and the level of the good under investigation have been defined, the full factorial of their combinations is reduced to a limited set of combinations that can be presented to respondents. Attributes must be relevant and related to the investigation and are usually selected by organising technical focus groups with experts in the field of the good under investigation. Keeney & Raiffa (1976) report that the selected attributes must have the following properties: be exhaustive, in the sense that they must contain all the main aspects of the problem; meaningful and understandable, decomposable, non-redundant.

The selection of the key attributes for our research was reached with two rounds of focus groups with experts of the Prosecco Consortium of Conegliano-Valdobbiadene. The chosen bundle of attributes was then tested with three rounds of focus groups involving potential respondents to check whether they were clear and understandable. This process led to a final set of five attributes: use of local biotypes, protection of the traditional landscape, traceability of the wine, place of production and price.

Tab. 1 - Attributes and levels used in the choice experiment	
Attributes	**Levels**
Use of local biotypes	- Main use of grapes from local biotypes - Partial use of grapes from local biotypes - No use of grapes from local biotypes
Protection of traditional landscape	- Protection of traditional landscape - No protection of traditional landscape
Traceability	- With Traceability - Without Traceability
Place of production*	- Prosecco wine produced in D.O.C.G. area - Prosecco wine produced in D.O.C. area - Prosecco wine obtained in any other part of Italy
Price (€/bottle)	- 3 € - 5 € - 10 €
* The D.O.C.G. area consists of the historical and most typical area of Prosecco production. It includes the district of the hilly municipalities located between Conegliano and Valdobbiadene. In this case, the wine is subject to very strict controls to ensure the compliance of the product specifications. The D.O.C. area is much larger and includes the provinces of Treviso, Belluno, Venice, Padua, Vicenza, Pordenone, Udine, Gorizia and Trieste. In this case too, the wine is subject to strict controls for compliance with product specifications that are less restrictive than those of D.O.C.G.	

3.2.1. Attributes description

Growers select the vines that provide the best grapes related to the territory where they are grown. The local biotypes are, in fact, better adapted to the environmental and climatic conditions of the area and provide better quality products. Prosecco can be obtained through the use of more or less grapes from these vines.

The vineyard is a factor that strongly characterizes rural landscapes. Vineyard landscapes often preserve the characteristics they had in the past and are a testimonial of great importance in farming culture. In recent times, however, to reduce production costs, major transformations of vineyard landscapes have led to a loss of their cultural value. In order to promote the protection of historical landscapes, a possible solution could be certification attesting that grapes were obtained from vineyards that have preserved the traditional landscape.

According to EC Regulation 178/2002 that came into force in 2005, traceability is the ability to trace and follow food, feed or ingredients through all stages of production, processing and distribution. In the case of wine, it consists of recording all oenological stages and movements of the primary product (grape). Through traceability, the consumer can accurately identify the location of grape production and therefore have more information on the area and the quality of the environment where the wine was produced.

Designation of Origin is the term used to describe a typical product from a specific production area. Until 1992 each country had its own rules and its own symbol. In July of that year, the European Community established a uniform system of development and protection of food products within the European Union. This results from adopting two regulations: the Protected Designation of Origin (PDO) and the Protected Geographical Indication (PGI) on the one hand, and the Traditional Speciality Guaranteed (TSG) on the other. Regarding wine, the designation of origin refers to a product whose quality or characteristics are due exclusively or essentially to the geographical environment, including natural and human factors.

The price is always an important attribute that should be considered to give credibility to the hypothetical market created in the choice experiment. It should ensure that respondents make

decisions about their budget constraints and enables the researcher to derive the marginal willingness to pay for the different attributes and levels. In the context of our CE it was defined as the price of a bottle of Prosecco with a capacity of 0.75 l and was expressed in euros. The levels of the price attributes were chosen following the results of a previous research (Tempesta *et al.,* 2010). Note, however, that the vector price is consistent with the WTP for Prosecco wine estimated by Thiene *et al.* (2013).

Image 1 - Choice cards: an example

Purchase situation 2	Bottle A	Bottle B	Bottle C	No bottle
Use of local Biotypes	No use of grapes from local biotypes	Main use of grapes from local biotypes	Partial use of grapes from local biotypes	
Traditional landscape protection	 Absent	 Present	 Present	
Traceability	 Absent	 Present	 Present	
Place of production	DOCG	DOC	Other	
Price	3 €	5 €	10 €	

3.2.2. Experimental design: technical characteristics

In order to obtain different profiles to submit to respondents, choice sets were constructed following the steps proposed by Louviere *et al.* (2000). We opted for an unlabelled choice experiment. The full factorial design of our experiment was reduced with an orthogonal fractional factorial design resulting in 18 choice options (profiles), grouped into six choice sets, containing three alternatives each plus the no-choice option. The latter was added to each choice set as recommended in the application of choice experiments to marketing products: according to Bateman *et al.* (2002) the exclusion of the no-choice option from the experimental design might result in unreliable welfare measures. The 6 choice sets were termed "purchase situation" and the choice options "Bottle A, Bottle B, Bottle C, No Bottle" (Image 1).

3.3. The questionnaire

The choice experiment was presented to respondents by means of a questionnaire that was structured as follows.

The first part contained information on wine consumption habits while the second focused on Prosecco. The latter section was designed to elicit the knowledge about Prosecco, consumption patterns, purchasing habits, knowledge about the difference between DOC and DOCG labels meaning and implications. The third part consisted of the CE introduced by the presentation of the hypothetical scenario. The six purchase situations created in the experimental design were then presented one by one to each respondent. A choice for each purchase situation was required from each respondent, asking him to imagine being at the wine shelves to make a purchase. The next part asked some questions to verify the consistency of the choices made in the CE. The fourth part of the questionnaire asked socio-economic questions to understand the consumer's profile.

3.4. Data collection

Data were collected in 2012 through face-to-face interviews in three locations: Conegliano, in the north-east of Treviso province, Selvazzano and Albignasego, both municipalities in Padua province. We used a sampling strategy described by Davis (2004) as an intercept survey. A group of interviewers was specifically trained to conduct the interviews in central squares, in front of grocery stores, local street markets, and bakeries. To ensure randomness of respondents and avoid self-selection, interviewers were told to stop one person in every five. Shopping centres as point of data collection allowed us to have quite a heterogeneous sample. A total of 440 questionnaires were collected.

4. Results and discussion

4.1. Sample characteristics and consumption habits

Socio-demographic characteristics are reported in Table 2. Looking at gender, our sample is composed mainly of males (59.5%). 27.7% of respondents are under 30, 39.8% are between 30 and 49 years of age, 19.8% are between 50 and 59, and the remaining 12.7% are older than 59 years. Regarding levels of education, a high school diploma is the most common (53%) followed in order of importance by university graduates (26.6%), high school (18.2%) and primary school (2.3%). Most people live in urban areas (40.7%). With regard to employment, only 3.2% of respondents are in the agricultural sector, a quarter of the sample work in industry and crafts, 47.8% provide services (shops, administration, utilities ...).

All respondents declared that they had consumed Prosecco wine at least once during the year preceding the interview (Table 3), and 72% had bought it in the same period. This reflects the real trend, given that 73% of the production of Prosecco in 2011 was for domestic use (Distretto del Conegliano Valdobbiadene, 2012).

The usual place where consumption takes place is at home for 61.1% of the sample, in restaurants for 55.2%, while 43.2% consume it at festivals, fairs and exhibitions. Only 13% drank Prosecco with friends and 4.5% at unspecified locations.

The purchase of Prosecco is almost equally distributed between wine companies and wine cellars (31% and 30%). Supermarkets and grocery stores are in third position followed by wine shops.

Tab. 2 - Socio-demographic characteristics		
Age Class	**N**	**%**
Less than 30 years	122	27.7
30 to 49 years	175	39.8
50 to 59 years	87	19.8
60 years or over	56	12.7
Education level	**N**	**%**
Primary school	10	2.3
Secondary school	80	18.2
High school diploma	233	53.0
University degree, Master, PhD	117	26.6
Place of Residence	**N**	**%**
Agricultural area	179	40.7
Urban area	261	51.3
Employment sector	**N**	**%**
Agriculture	14	3.2
Industry and handicrafts	111	25.2
Tertiary sector	210	47.8
Not active	105	23.8

Tab. 3 - Prosecco Consumption			
Consumption and purchase		**N**	**%**
Have you drunk Prosecco in the last year?	Yes	432	98.1
	No	8	1.9
Have you purchased Prosecco in the last year?	Yes	317	72.0
	No	123	28.0
On what occasions did you drink Prosecco?			
Occasion	**N**	**%**	
At home	269	61.1	
At a restaurant	243	55.2	
At a bar	171	38.9	
At festival, fair, exhibition ...	190	43.2	
With friends	189	13.0	
Other	20	4.5	
* Possibility of making multiple choices			
Where did you buy Prosecco?			
	N	**%**	
Wine company	130	31.7	
Cellar	124	30.2	
Wine shop	47	11.4	
Supermarket and generic grocery store	95	23.1	
Other	14	3.4	

Tab. 3 ctd.

Importance given to factors when purchasing		
Position	**Factors**	**Mean**
1	Type of wine	4.1
2	Place of production	3.8
3	That the wine reports the Designation of Origin on its label	3.6
4	Curiosity to discover new wines	3.3
5	Knowledge of the production company	3.2
6	Price	3.2
7	Recommendation from friends	3.0
8	Knowledge / Brand Reputation	3.0
9	Type of cap	2.7
10	Packaging (label / elegant bottle)	2.5

4.2. Results

Data were analysed first with an MNL model and then with an LCM model. All variables were effect-coded, apart from price which was considered as a continuous numerical variable.

Both models share the same utility function that, in its first formulation, is linear for all variables considered.

The results obtained from the MNL model using a linear function of the attribute price led to controversial results. Contrary to our expectations, the coefficient of the price variable was positive. This implies that the higher the price the higher the probability of purchasing a given wine *ceteris paribus*. Although this result, indicates that, to some extent, the price attribute is taken as proxy for quality by respondents, it cannot be justified in economic terms. In other words, while it is plausible that purchasing decisions are guided by price as a signal of quality up to a threshold maximum price, it is not acceptable that the relationship between the price level and purchasing probability is linear and positive if the budget constraint of an agent is to be considered rationally.

To overcome this problem a model with a quadratic price utility function was estimated and its results are reported in Table 4. These are satisfactory - all variables are significant (p-value < 0.05). A first result is the relative importance of the attribute levels considered in terms of utility. The most influential attribute levels are, in order of decreasing importance: traceability, the prevalent use of local biotypes, conservation of traditional landscape, the DOCG area of production, the partial use of local biotypes, and finally the DOC area of production. Note that in this case it is not possible plausibly to estimate the premium price since the marginal utility of money is a function of the price level (inverse U-shaped parabola in our utility function specification). At best it is possible to calculate the price (we refer to it as $P_{threshold}$) that discriminates two different parts of the utility function by using the following formula:

(1)
$$\begin{cases} U = \beta_p p + \beta_{p^2} p^2 + \sum \beta X \\ \dfrac{\partial U}{\partial p} = \beta_p + 2\beta_{p^2} p \end{cases}$$

where X are all attributes considered apart from price. The indirect utility function U becomes parabolic when $\beta_p > 0$ and $\beta_{p2} < 0$.

Then $P_{threshold}$ can be derived finding the maximum of $\frac{\partial U}{\partial p}$, namely the value of p where $\frac{\partial U}{\partial p} = 0$. Therefore:

(2) $$P_{threshold} = -\frac{\beta p}{2\beta_{p^2}}$$

Where: b_1 = coefficient of price in the utility function; b_2 = coefficient of price squared in the utility function.

$P_{threshold}$ is the value of P that maximises the indirect utility function with respect to price. When the price is lower than $P_{threshold}$, the consumer considers the price as a signal of wine quality. Only if the price is higher than $P_{threshold}$ the consumer behaves in a way consistent with neoclassical consumer theory.

The application of LCM models implies a first analytical step where the number of classes that best fit the data is found by an iterative process of estimation, varying the number of classes exogenously. Following this process, several models were estimated. The statistical parameters/criteria taken into consideration in order to determine the optimal number of classes are: (a) the log likelihood; (b) information criteria (Bayesian - BIC, Akaike - AIC and *Hannan-Quinn - HQIC*); (c) the McFadden pseudo R-squared. Following these indexes/criteria (see Table 5) the model with three classes was chosen, where the first class represents 45% of the sample, the second 36% and the third 19%.

For the first class (45% of the sample) the coefficients of the price attribute and those of the DOC production area are not significant ($p > 0.05$). For this group, the most important characteristics are: the prevalent use of grapes from local biotypes, preservation of the historic landscape, and the DOCG labelling. These consumers seem to show a preference for the preservation of the cultural identity of the wine and its production area. Interestingly, for this class, the price is not statistically significant and does not seem to affect the consumers' choices.

For those belonging to the second class (36% of the sample), all parameters result as being significant except the constant that identifies the no-choice option. All coefficients have a low value and are positive (apart from the squared specification of price). Traceability is the most important attribute, followed by price, the importance given to the DOCG production area and finally by preservation of the historical landscape. Contrary to the first class of respondents, the members of class 2 perceive the price as an indicator of quality, and for this class the $P_{threshold}$ is 7.5 €/bottle[4]. This class consists of consumers rather undecided on the characteristics of the Prosecco they could buy.

Finally, consumers of the third class (19% of the sample) seem to be more interested in the quality of the grape, traceability of the product, and belonging to the DOCG and DOC areas. Landscape preservation and partial use of grapes from local biotypes are the least important characteristics. These respondents seem to be mostly interested in the quality of the wine and its origin, rather than in other aspects of the product.

[4] Where the capacity of a bottle is 0.75 l.

Tab. 4 - MNL and LCM Results (p-value in brackets)				
Parameters	**MNL**	**LCM**		
		Class 1: 45% of sample*	**Class 2: 36 % of sample***	**Class 3: 19% of sample***
Constant	2.080 (0.000)	1.351 (0.007)	-0.210 (0.283)	8.172 (0.000)
Prevalent use of local biotypes	0.638 (0.000)	1.276 (0.000)	0.178 (0.000)	1.481 (0.000)
Partial use of local biotypes	0.285 (0.000)	0.438 (0.016)	0.180 (0.009)	0.552 (0.013)
Place of production DOCG	0.433 (0.000)	0.719 (0.000)	0.344 (0.000)	1.062 (0.000)
Place of production DOC	0.250 (0.000)	0.113 (0.308)	0.184 (0.000)	0.863 (0.000)
Protection of traditional landscape	0.582 (0.000)	0.858 (0.000)	0.234 (0.002)	0.615 (0.009)
Traceability	0.653 (0.000)	0.572 (0.000)	0.482 (0.000)	1.102 (0.000)
Price	0.183 (0.021)	0.160 (0.443)	0.481 (0.000)	0.281 (0.364)
Price2	-0.014 (0.013)	-0.019 (0.223)	-0.032 (0.000)	-0.014 (0.517)
Log likelihood function	-2504.431		-2252.740	
McFadden pseudo R square	0.079		0.383	
* 440 respondents				

Tab. 5 - Comparison of selection criteria LCM2 vs. LCM3		
Criteria	**Two classes**	**Three classes**
Log likelihood function	-2319.113	-2252.740
AIC Criteria	1.775	1.732
BIC Criteria	1.817	1.797
HQIC Criteria	1.790	1.755
McFadden pseudo R square	0.364	0.383

5. Conclusions

The objective of our analysis was to study consumer preferences for Prosecco wine and their ability to distinguish the differences introduced by the CAP policy concerning PDO labelling. Five attributes were considered: using grapes from local biotypes, protection of the traditional landscape, traceability, place of production and price. These attributes have been studied taking into account their different levels. Using latent class as methodology has enabled us to emphasize the existence of heterogeneity between preferences.

The latent class model yielded information of great interest for defining marketing strategies for the producers of DOCG Consortium Conegliano-Valdobbiadene. Our results show that consumer preferences are quite heterogeneous. Nevertheless, we note that for consumers, the production area appears to be an important attribute. The coefficients of this variable are significant for all three classes. In contrast, the DOC area appears not to have a statistically significant influence on the inclination to buy Prosecco wine in the class with the largest number of respondents (45% of the sample). An important result is that the coefficient for Prosecco of the DOCG production area is always higher than that of the DOC. This result implies that DOCG wine growers are expected to benefit from a significant competitive advantage over those of the

DOC area. In this respect our research supports the effectiveness of the Regulation 510/2006, given that consumers seem to be able to distinguish the differentiation of PDO labels and to interpret them correctly as a signal of quality.

The research also demonstrated that consumers seem to attribute great importance to other characteristics of Prosecco. Particularly in the first and second classes (64% of the sample), the prevalent use of grapes from local biotypes has more influence on the propensity to buy Prosecco than the DOCG labelling. The existence of a strong link between the wine and the production area seems to be quite important for consumers. The fact that wine is perceived as typical does not derive only from the PDO labelling, which indicates the area of production and the respect of a regulation. The selection of vine biotypes that winemakers have performed over time and the historical process of vines to adapt to the territory are very important. This seems to be testified in our analytical model by the fact that the preservation of traditional landscapes has a positive influence on the propensity to purchase.

According to our results, consumers place great importance on the relationship between territory and typicality of the productions, even if the concept of typicality that emerges is fairly heterogeneous. Typicality is not only the result of the guarantee of place of production, but a combination of respect for the historical identity of that place and its traditional vineyards. The presence of a designation of origin in itself does not appear to be sufficient to increase the tendency to buy. Consumers seem to require a historical and welded link between the wine and the territory. This is an element that should ensure, even in the future, a competitive advantage in the original areas of wine production such as the DOCG Conegliano and Valdobbiadene area.

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OPPORTUNITIES AND LIMITS OF THE CFP ON THE UPPER ADRIATIC COAST: APPLICATIONS AND OPERATIONAL PROPOSALS IN SUPPORT OF THE FISHING SECTOR

JEL classification: Q22, Q18

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Abstract. *One of the main aims of the Common Fisheries Policy (CFP) is the adoption of conservation measures to prevent the overexploitation of fish stocks and the resolution of potential conflicts between fishing and other activities. It is necessary to find solutions capable of pursuing compatibility between use and conservation of the marine environment, with a specific focus on the human activities taking place in the different areas of the coastal strip.*

This paper analyses the fisheries and aquaculture industry of Veneto region, which is part of the broader Mediterranean context, and it suggests an operations management model for the North Adriatic coast, in the light of the constraints imposed and the opportunities offered by the new CFP.

Keywords: *Common Fisheries Policy, coastal management, management of fisheries, aquaculture.*

1. Introduction

The holistic concept recently issued by the FAO (Reykjavik Declaration, 2002) and shared by the European Union has led to the adoption of an ecosystemic approach[1] in fisheries management, and to a new Common Fisheries Policy (CFP) based on the relation between fish capture activities, environmental conservation, protection of biodiversity, and sustainable development of the fishing industry[2]. At the present time, actions and practices in this industry must be integrated with other European maritime policy principles: the Marine Strategy Framework Directive (MSFD-2008/56/EC), ratified by Italy in 2010 (Legislative Decree n. 190 of 2010), which requires coordination between States; the full implementation of the

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[1] Ecosystemic approach, i.e. "a method that considers the human community to be an integral part of ecosystems and of the mechanisms that govern them and not as an element that upsets the natural balance". Its principles can be summarised into a few main points: a) *communities that inhabit an area are responsible for the biodiversity that surrounds them*; b) *sustainability rests on three pillars: environmental, economic and socio-cultural*; c) *in order to manage an environment it is necessary to combine scientific and traditional knowledge*; d) *management activities must be implemented through the adaptive management system*.

[2] "Sustainable exploitation" means exploitation of an aquatic resource in such a way that future further exploitation is not compromised and does not have negative repercussions on marine ecosystems.

Council Regulation (EC) no. 1967/2006 concerning the exploitation of fishery resources; and the integrated coastal management established at the Barcelona Convention (2008).

The evidence shows that for over 30 years fishery resources have been exploited beyond their maximum sustainable yield (MSY) (Boudiguel *et al.*, 2009). Moreover, some other consequences of human activities, such as pollution, climate change and alterations or even destruction of natural environments known as essential to the biological cycle of some species (i.e. nursery areas), have altered the equilibrium of fish stocks, causing a reduction in their number and the collapse of some species.

To assure that over the coming years fishing and farming the sea will still be considered as a factor of development for coastal communities, which can provide a respectable way to earn a living, it is recognised that a more appropriate management of resources must be applied immediately.

One of the main objectives on which the Common Fisheries Policy (CFP) is based is the adoption of conservation measures to prevent the overexploitation of fish stocks and to facilitate the resolution of potential conflicts between fishing and other activities. Hence, it is necessary to find solutions capable of pursuing compatibility between use and conservation of the marine environment, with a specific focus on the human activities taking place in different areas of the coastal strip.

This paper, after analysing the fisheries and aquaculture industry of Veneto region, which is part of the broader Mediterranean context, suggests an operations management model to be applied to the Upper Adriatic coast, in the light of the constraints imposed and the opportunities offered by the new CFP.

2. Fishery resources of the coast of Veneto

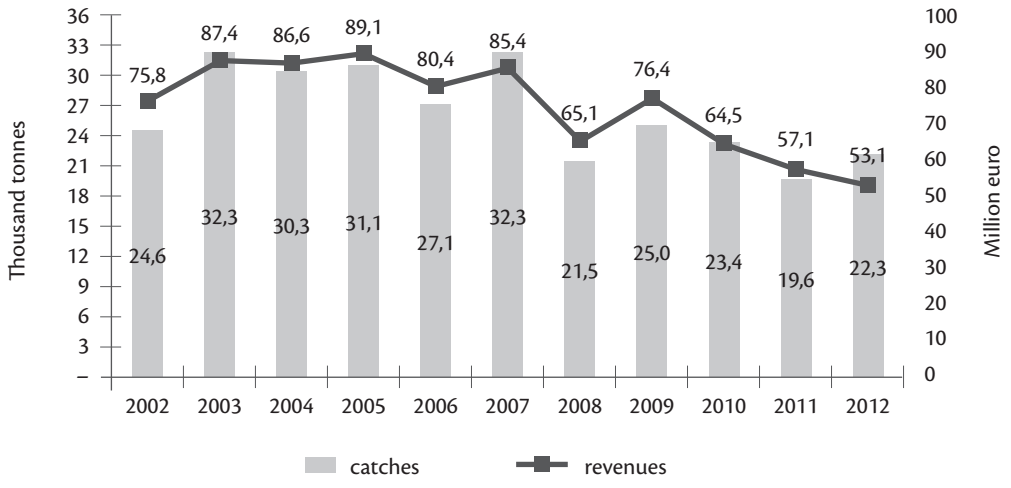
Undoubtedly, it is evident that Mediterranean fishery resources are being overexploited and the decline in fishing yields, which began in the mid-1980s, is leading to extremely serious consequences in terms both of biodiversity and of fish stocks (Boudiguel *et al.*, 2009).

By 2004, the catches per unit of effort had already halved, and only a few species, such as the sole (*Solea* sp. pl.), has remained relatively large in number, by virtue of the fact that a significant share of reproductive adults can find shelter in specific areas where trawling is difficult to carry out (i.e. in the so-called "dirty seabeds").

The same happened to small pelagic fish (known as "oily fish"), whose number has shown worrying signs of decline. For example, the stock of Adriatic sardines (*Sardina pilchardus*), fell from an estimated biomass of around one million tonnes in the 1980s, and an average biomass of 600,000 tonnes between 1987 and 1999, to an average of just 200,000 tonnes from 2000 to 2010. Similarly, the stock of anchovies (*Engraulis encrasicolus*) has decreased and in 1987, it even collapsed (Mannini and Relini, 2012; Cataudella *et al.*, 2011).

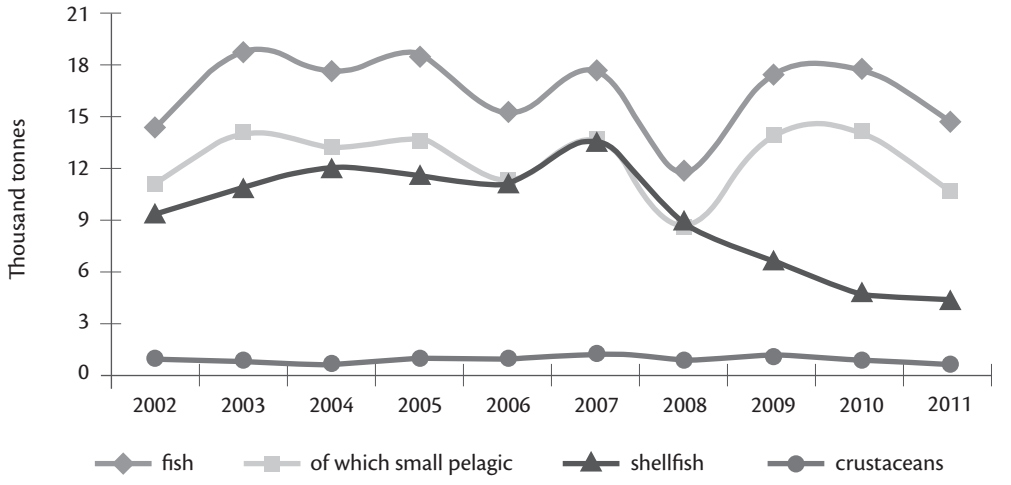
Over the last thirty years, a dramatic reduction in catches has been observed for both pelagic and demersal species in the Upper Adriatic, a "closed" and shallow sea which has a maximum depth of 35 metres. In addition, a substantial decline in the number of vessels, operators and hours of activity has been registered. In 2012, the output produced by the lagoon and marine fishing fleet of the Veneto region was approximately 22,3 thousand tonnes (Fig. 1). In this area, the more significant species for fisheries are anchovies and sardines, with a total catch of over 10,500 tonnes in 2011 (Fig. 2). The region produces a significant amount of shellfish, including large quantities of clams, cuttlefish and eledones.

Fig. 1 - Trends in catches and revenues in Veneto region



Source: IREPA

Fig. 2 - Trends in catches by groups of species in Veneto region



Source: IREPA

2.1. Structural features of the sector and most recent trends

In Table 1 are shown data regarding changes in the fishing effort and trends in the fleet of Veneto.

Tab. 1 - Trends in the technical features of the fleet of the Veneto region					
	No. of vessels	**GT**	**GRT**	**Engine power (kW)**	**Fishing days**
2002	1,076	-	10,349	100,343	112,103
2004	956	-	10,229	96,918	113,865
2006	818	13,037	9,436	88,337	95,860
2008	770	12,176	-	83,061	74,266
2010	715	12,146	-	80,662	77,692
2012	703	11,714	-	80,787	69,285

Source: Socio-Economic Fishing and Aquaculture Observatory on data produced by Irepa and Fleet Register of EU Fisheries Commission.

Veneto region's marine fishing fleet has recorded a declining trend over the last few years: the IREPA data show a decrease in the number of vessels. In 2012, the parameters relating to the fishing system became stable, hence the negative changes mainly concern small-scale fishing.

Tab. 2 - Technical features of the fishing systems in Veneto region				
	Number of units		**Engine power (kW)**	
	2002	**2012**	**2002**	**2012**
Trawling and Floating trawl	335	253	61134	53072
Hydraulic dredges	167	163	18277	17914
Passive	574	287	20932	9801
Total	**1076**	**703**	**100343**	**80787**

Source: Irepa for 2002, EU Fleet Register for 2012.

The economic reasons for the fall-off in fishing activities are mainly due to the operating costs, to the reduced sales caused by price increases, and also to the decrease in the net margin of contribution per kilogramme of product caught and/or sold, together with the diminished competitiveness resulting from the opening of larger markets.

As a result of some exceptions in application of the law which have remained valid for decades, within the coastal area of Veneto the most widely employed fishing systems are trawling and hydraulic dredging (Table 2). The growth of the fishing fleet (its increase in gross tonnage and in engine power of the vessels which has taken place since the end of World War Two) and technological progress have led to the licensing of over 300 fishing vessels to operate along the coast. This means that they could operate within the critical 3 nautical miles considered as a priority, since they are a nursery area for a large part of the fishery resources of the Adriatic Sea: in this area some of the fishing equipment and systems which exert a huge impact on the marine ecosystem are present.

The progressive depletion of fish stocks has caused a critical situation in economic terms for fishing enterprises, as the poor catches can no longer cover the operating costs. This happened not only to the species which are the main target of trawling, but also in the case of sedentary populations of bivalve molluscs caught by means of hydraulic dredging. Since 1996, these molluscs which live along the coast are subject to the management of the Clam Management Consortiums (Consorzi Gestione Vongole or Co.Ge.Vo.). In biological production terms, this kind of management is considered as a first-level aquaculture activity (Reay, 1988), whereas in economic and legal terms it cannot be regarded as an open access system but as a Rights-Based Management (RBM),

which is a system based on fishing rights (Finco and Padella, 2009). This management allows the harvesting of pre-established quantities which are set according to strictly defined catch shares. In the Veneto region, the commercial fishing of bivalve molluscs is carried out by fishing enterprises belonging to the Co.Ge.Vo. of Venice and Chioggia. The Ministerial Decree of 11th February 2003 established that these enterprises are entrusted with managing and regulating the harvesting of Adriatic clams (*Chamelea gallina*), razor-clams (*Ensis minor* and *Solen marginatus*), cockles (*Acanthocardia* sp. pl.) and smooth clams (*Callista chione*)[3] in the two regional maritime areas.

The increasing interest shown by public opinion and by institutional bodies in the use of more sustainable fishing systems, which consider environmental protection as well as economic profitability and its related social aspects, is creating an essential need to develop and adopt a new way of operating and producing.

Likewise, marine aquaculture techniques (sea culture), which are complementary and/or synergically related to fishing activities, should go through a process of innovation and diversification of production.

Nowadays, the practices employed to exploit the waters along the coast of the Veneto region are almost exclusively represented by mussel farming, as in other production areas of the Adriatic Sea.

Traditionally practiced in the lagoon environment, mussel farming has been extended to the marine environment since the beginning of the 1990s, with the spread of *long-line* systems. The overall number of *long-line* mussel farms situated on the coast of Veneto is around twenty, covering a total of approximately 2,000 hectares. Only two systems (Cavallino and Treporti) are located off the coast north of Venice, while nine of them lie opposite Pellestrina Lido (Venice) and about ten are spread over Porto Caleri and Sacca degli Scardovari (Province of Rovigo).

On a regional basis, approximately one hundred vessels, defined as 5th category, are employed in aquaculture facilities: 82 in the maritime area of Chioggia and 19 in the maritime area of Venice.

The production of this area is depressed, and it might gain relief by extending existing sea culture activities and by beginning a process of developing the mollusc farming industry and creating new production chains by diversifying the marine species farmed.

2.2. The regulatory context in Veneto Region

The Veneto Region has proven to be particularly aware and active in applying the new Common Fisheries Policy and, together with the competent ministry (MiPAAF), has planned the management of fishing within three nautical miles, promoting management plans and innovative actions for protecting and enhancing specific areas of value, as part of a strategy for managing the coast (Integrated Plan – Veneto Region, 2006)[4].

[3] Fishing of *C. gallina* is practised along the coast at depths between 3 and 10 metres and is the activity that involves the largest number of workers. The fishing of razor-clams is operated over limited periods of the year at a depth of about 3 metres, smooth clams instead are harvested in the open sea, at a distance of 8-10 miles from the coast, generally at depths of around 20 metres.

[4] Among the main PROJECTS IMPLEMENTED as part of the strategies of Integrated plan for management of the coast, the following may be listed here: the setting-up of an "Experimental field at sea", in the area near the mouth of the Sile river, for a series of research activities in preparation for the introduction and dissemination of underwater barriers in the sea, various multi-year projects for experimental management of the biological protection zone of the Tegnùe (Chioggia, Porto Falconera-Caorle), and opposite the Venice Lido and the Po Delta (Rovigo) for measures to safeguard and enhance protected marine areas for repopulation, study, experimental, information and monitoring activities in the environmental area, with the aim of informing and educating people about the marine environment and the Tegnùe.

PRIORITY PROJECTS for protection, promotion and development of the Veneto region's coastal zone and for the creation of marine biological protection zones (Regional Law no. 15 of 12th July 2007) include the environmental protection of the region's marine area, the protection and enhancement of biological and geomorphological resources in the fish repopulation zones, the publication and dissemination of knowledge about the ecosystem and marine ecology, the development of scientific study and research programmes, the fostering of socio-economic development that is compatible with aspects of naturalistic significance, and the accomplishment of management experiments.

In fact, some of the measures considered as crucial to conservation and to the development of the regional policy are those concerning the ecosystems constituted by the Tegnùe. Responding to the requests made by the Region and the local communities, some years ago the Ministry of Agricultural, Food and Forestry Policies listed a number of biological protection areas (ZTB) off the coast of the municipalities of Chioggia and Caorle (the former with the Ministerial Decrees of 05th August 2002 and 16th March 2004, and the latter with the Ministerial Decree of 16th December 2004).

Amongst the first and more structured interventions already implemented, a few actions aimed at conserving the outcrops of stable organic or inorganic substrata (the Tegnùe) are included. This can be obtained not only by placing limits on fishing and on the transit of vessels, but also by facilitating the access to sub aquatic and study activities and the repopulation of the marine flora and fauna.

Other significant actions carried out at the regional level include some measures to reduce the impact on the fishing economy both of the large-scale engineering works aimed at restoring the coast of Veneto (for instance beach replenishment and dredging to restore beaches) and of the sites connected to Major civil engineering Works (MO.S.E., MOdulo Sperimentale Elettromeccanico or Experimental Electromechanical Module, and "complementary works" such as the construction of dams, reefs and submerged embankments) which have changed the nature of the substrata and the offshore hydrodynamics in areas traditionally given over to fishing. In fact, sea currents are the main carrier of nutrients: they transport plankton and disperse eggs and larvae, and to change them can lead to catastrophic consequences for fishing.

The enforcement in June 2010 of the Council Regulation (EC) no. 1967/2006, whose importance, validity and necessity is widely recognised in terms of general recovery of Mediterranean resources, risks worsening the critical situation of fishing enterprises, given the technical measures that need to be adopted in terms of equipment, minimum net sizes and ways of conducting fishing activities.

Therefore, during this phase of transition, it becomes important:

- **to protect the areas known as populated by breeding adults** of the various demersal stocks from the aggressively disruptive action of dragging tools and equipment (rapid gear, dragnets, trawl-nets, etc.). In particular, it is necessary to intervene with protection systems for the reproducers of commercially exploited stocks so that they can find safe havens;
- **to create protected fishing areas along the coastal strip**, using artificial barriers or structures, in order to contribute to the repopulation and recovery of depleted stocks;
- to implement strategies aimed **at protecting a number of fish stocks**, by devising the means to implement a unified management plan;
- **to redefine the terms for the implementation of the technical suspension of fishing**, with attention to the means and ways of recommencing fishing activities;
- to supplement the implementation of the Council Regulation (EC) no. 1967/2006 with some **support measures for the operators who need to upgrade their fishing equipment** in order to comply with the new regulations, guiding them towards capture systems fairer to the resources and the environment;
- to encourage **aquaculture (mariculture = sea culture) practices**.

3. Operational proposals for managing the coast of Veneto

According to the wishes of the European Union and to what has been decided, and in part already implemented at regional level, it might be particularly useful to test a management system in a broad stretch off the coast of Veneto which should cover the role of a pilot experiment. This model could then be applied – with suitable modifications and appropriate changes – to other stretches of the coast with similar characteristics (i.e. neighbouring maritime areas). In the past, in order to make fishing effort proportional to available resources, a series of measures were introduced to reduce the time that fishing vessels could spend at sea (i.e. limits on number of days, fishing hours, technical suspensions). At present, it would be potentially more effective to apply the concession of the Territorial Use Rights in Fisheries (TURF) to an entire area,; this consists in granting full and exclusive rights to exploit a resource within a specific area through self- or co-managed systems, as happened with the case already mentioned of the Clam Management Consortiums of the Adriatic.

By involving the stakeholders in a participatory and shared process, it would be possible to proceed with the environmental, biological, economic and social recovery of a sufficiently broad and representative area of the coast of Veneto, with approximately 20% of the coastal area to be raised to the status of pilot experiment.

For this purpose, contextual conditions suggest as a suitable location the stretch of sea within the three miles north of Venice, off the Cavallino-Treporti and Jesolo coast - an extension of approximately ten nautical miles.

It should be pointed out that the recent plans for development on land (Piani di Assetto Territoriale) involving the municipalities of the Eastern coast of Veneto (Cavallino-Treporti, Jesolo, Eraclea and Caorle) consider the recreational activities of the tourism industry as part of a sustainable and lasting development which should reconcile growth requirements with the need to preserve environmental, socio-cultural, agricultural-productive and natural balance.

The tourism industry, which represents one of the most important parts of the economy of this area, finds its main source in the natural features of the coast and its sea. During the history of the seaside tourism of Veneto and of the Upper Adriatic coast, the municipality of Cavallino Treporti promoted its products and services in relation to outdoor tourism. This involves the development of the areas and the facilities strictly connected to seaside tourism; the growth of forms of tourism such as hiking, holiday farms and sport holidays, with particular attention to the activities related to the aquatic environment; the redevelopment and consolidation of accommodation facilities, including the provision of culturally advanced services; the enhancement of port facilities and the regulation of land and water routes. These are all aspects coherent with what this project sets out to propose.

The purpose of the project is to proceed, within a short time, to the revitalisation of a marine environment which has been degraded by years of uncontrolled and inappropriate use, with the safeguarding and protection of the specific “Tegnùa” habitats, which are naturally present in the area and which have been the subject of recent studies and protection measures aimed to re-establish the fish populations and to increase their biodiversity and number.

Therefore, these measures might be geared towards the sustainability and enhancement of the marine and Tegnùa habitats in the area off the Venetian coast, with close attention to their biological protection, to increasing their biodiversity, to a sustainable use of resources by both professional and recreational fishermen, integrated with existing local and environmental features.

The option of establishing no-take reserves in suitable areas, where fish reproduce or young

specimens are present (nursery areas), and of defining biological rest areas in the environments of greatest natural value would enable species to stay and grow, developing more numerous populations less subject to be affected by unregulated human activities and by trawling. Moreover, it would be possible to make provision for underwater access, in order to make possible educational guided itineraries and visits, wildlife photography and studies of marine biology and of natural interest.

Non-nursery areas could be managed by dividing them into areas for professional fishing conducted in an environmentally sustainable manner, traditionally known as "small-scale fishing", with equipment such as fixed trammel-nets or gillnets, boulters, traps and baskets, and areas for recreational fishing. The sizes of nets and meshes, and their number could be subject to discussion and evaluation. Additionally, areas not included in no-take reserves could form part of a rationed and selective activity of catching/harvesting of molluscs and crustaceans with a high commercial value (warty venuses, horsemussels, lobsters, spider crabs, etc.), contributing to the regulation of the widespread practice of professional underwater fishing.

3.1. Protection of seabeds and actions aimed to deter illegal bottom trawling

The actions aimed to protect the seabed, to replenish depleted stocks, to repopulate species and for defence against illegal trawling, which are partly already provided by some regional programmes, can be implemented through the creation of "artificial barriers" and additional measures. Therefore, the protection of seabeds and the mechanical action to deter illegal bottom trawling are of the utmost necessity. The creation of obstacle-bodies of different shapes and kinds, suitably scattered over the seabed, in such a way as to intercept and damage trawl nets can work efficiently. The result of this mechanical action is biological, since, over time, a shift from young to adult classes is obtained, and this is what entails an increase in the biomass available for fishing. In fact, the damage currently done by trawling is that of intercepting the undersized part of the fish population.

All the "barriers", both natural or artificial and specific or general, have an obstructive action on trawling. However, whereas the actions of repopulation, energy recycling, and sea culture are encouraged by specific structures and forms designed for such purposes, the anti-trawling measures provide for other appropriate types of action, according to the goals one wishes to achieve.

Clearly, if only artificial structures are desired to impede trawl fishing, the essential prerequisite to take into consideration is that of submerging bodies, following a random strategy and design, and with a suitable density, which are able by virtue of their mass or of their structure and shape to obstruct illegal trawling by damaging the nets (for example with bodies with iron spikes). In this case, it is necessary to cover large areas (of at least several hundred or thousand hectares). Moreover, suitable obstacles can be submerged even in notable depths of the North Adriatic.

With these barriers, density must be taken into account, namely the number of anti-trawling obstacles per unit of surface area, so that any attempt to find trawlable paths in the protected area is truly thwarted by the obstacles.

Nevertheless, in order to achieve the two goals, i.e. protection and coverage of a wide area, the obstacles can be laid separately in individual units, each one able to entangle, retain and/or damage the trawling equipment.

The most important biological effect of these barriers is not that of achieving a biological settlement on or in the obstacle itself, but to allow young specimens of demersal species inhabiting the protected area to grow. Thus, it would be possible to obtain a larger biomass available for fishing, consisting of adults that may have reached their reproduction size at least.

As fish and vagile lifeforms make seasonal migrations from the coast towards the open sea and viceversa, the advantage of a protected area of this kind is significant, also with regard to the trawling which takes place in the strip bordering the protected area.

On the other hand, the advantages of small-scale fishing with fixed equipment are that it can be carried on in the protected area, since the equipment it uses is not damaged or dispersed by illegal trawling. Furthermore, it can capture adult fish and other marine organisms with greater yields per unit of effort, even though the anchoring device may potentially be damaged if it is accidentally entangled in an obstacle on the seabed.

In addition to the obstacles, it is possible to place different bodies on the sea-bed with the purpose of giving shelter and encouraging repopulation, since it is not advisable to create a barrier exclusively for anti-trawling purposes.

An example of an anti-trawling barrier consists in the use of bodies weighing up to five to six tonnes which can counteract the lifting force of motor trawler winches. The bodies employed are cubes of solid concrete, reinforced with iron rostrums. They are laid out individually in a completely random pattern (to prevent them being easily located with echo-sounding), piled up in pyramids and joined together in clusters in order to increase their total weight. The blocks are positioned along the route of fishing excursions, as to intercept the nets as they pass.

3.2. Protection of the seabed and repopulation actions

Inside the protected areas it is possible to place a number of pyramid-shaped structures formed by overlaying suitable hollow structures made of cement (such as cubes, cylinders, etc.) and larger than a metre, on horizontal levels, following axes parallel to the sea floor and/or in an alternating pattern.

Artificial barriers can be made with modular concrete forms and natural rocks to create an extensive protected area, mainly for anti-trawling purposes but, at the same time, aimed to lure, shelter, protect and repopulate specimens, and where possible, to harvest mussels and oysters which settle on the artificial substrata.

In order to encourage the larvae of sessile organisms to settle on them, the blocks have rough surfaces, while their side walls have cavities of different volumes and diameters so as to provide diversified refuges and habitats for the various marine organisms, as tested in the structures already positioned.

The layout of the blocks provided with metal hooks has been designed in such a way as to render the area impenetrable to illegal trawl-fishing.

3.3. Mariculture (aquaculture in the sea)

According to CFP (COM, 2013), mariculture could not only be expanded and work with actions for productive and economic sustainability, but it might also help the process of repopulation and encourage the reproduction of many species.

In fact, mariculture, would give greater impetus to the already established mussel farming and would supplement new production chains with other species to be farmed in the sea (fish, molluscs, crustaceans, seaweed, etc.). Existing facilities can be expanded and improved further in terms of environmental compatibility (for instance by providing for the recycling of plastic materials or the use of biodegradable materials). Alternatively, new well-advanced structures can be built according to the technical and biological requirements of animal species which require breeding grounds with different characteristics from those required by mussels (such as greater depth, more stable temperatures, greater salinity and less stress caused by wave motion).

The mussel-farming facilities placed along the coastal strip already attract a very large number of species, since they find better environmental and trophic conditions inside the farming facilities.

3.4. Professional fishing

Thanks to the quota allocation system (TAC and ITQ), enterprises can gain a degree of relative stability. However, this must be associated with a system which fosters environmental sustainability through a fair distribution of access to available resources, and a culture of legality. Fishing rights must be granted to those operators contributing to the primary aims of the CFP. As a consequence, access to fishery resources will need to be based on a series of transparent criteria which include:

Selectivity: different fishing methods produce various amounts of bycatch, which is often thrown back into the sea. Operators employing fishing methods which reduce bycatch to a minimum should have priority access to available resources.

Environmental impact: the impact on the environment of fishing equipment and systems varies greatly, for instance, in terms of pollution or damage to the seabed. Operators employing less destructive fishing methods must be granted priority access.

Energy consumption: some fishing vessels and systems require enormous quantities of energy compared to the quantity of fish they catch, particularly in the case of trawlers. Operators employing energy-efficient fishing methods must be provided with incentives.

Employment and working conditions: it will be necessary to grant priority access to fishing methods which offer greater employment, on condition that these are also fair to the environment. Working conditions must comply with all current international legislation of the sector, in particular with the "Convention on work in the fishing sector, 2002" issued by the International Labour Organisation (ILO).

Quality of product: the fishing equipment influences the quality of catches. Operators employing systems capable of offering the best quality of fish must be granted priority access. For instance, cuttlefish captured by trawl nets is scraped externally and contains sand due to the extended dragging on the seabed and the raising of sediment, while that caught with gillnets or traps (baskets) is undamaged (without abrasions) and does not contain sand.

Compliance with laws: When granting fishing rights the degree of compliance with the regulations of CFP achieved by fishermen and Member States over the years must be taken into consideration.

Access to fishing activities should be allowed to enterprises which are small-scale, environmentally compatible and socially equitable, and which provide local communities with substantial economic and cultural benefits. Furthermore, considering their importance for the environment and fishing purposes access to a number of fishing areas, (reproduction and nursery areas), should be reserved exclusively to small-scale fishing. The definition of small-scale fishing and of reserved areas should be established on a case-by-case basis, while the granting of fishing access rights should be agreed with local communities. Moreover, small-scale fishermen will have to receive the necessary support to comply with environmental and social criteria.

Where industrial fishing and small-scale enterprises compete for the same resources, priority should be given to small-scale fishing operators, as stated by the FAO Code of Conduct for Responsible Fisheries (article 6.18).

3.5. Shortening the production chain

Operators in the industry might shorten the production chain by opening restaurants and direct sales outlets managed by the fishermen themselves (based on the so-called farmer's market

model). This method has recently been undertaken by a number of local cooperatives (for example the experience of AdriaMar). In addition to selling products, it is possible to experiment in the processing of fresh fish, which requires low outlays, but adds value to the product and constitutes a way of enhancing the fish resource and the professionalism of fishermen.

Alternatively, operators attempt to make arrangements with the Large-scale Retail Sector (supermarkets and hypermarkets) in order to reduce the intervention of wholesalers and intermediaries. These supplier agreements would probably be possible only for easily available fish products and only with handling and marketing/sales operations run on a fully joint basis. Finally, the quality of fish products on offer is extremely important in sustaining local producers and enabling the increase of the final retail price. In an extremely fragmented production sector, such as fishing, it is essential to concentrate the supply in order to obtain both a higher retail price and higher revenues.

3.6. Fishing tourism

The activity of traditional fishing and local fish production could also be further promoted by working together with tourism products and services offered by the region. Fishing tourism is a recreational activity which takes place on vessels used for small-scale fishing and is aimed at spreading awareness of the sea culture and of the body of knowledge linked to seagoing jobs and marine traditions. It constitutes an opportunity to supplement the income of specifically licensed fishermen who may take a certain number of passengers on board as guests. However, the thorny question is the limitation on the number of passengers, which is considered as too restrictive with respect to the high operating costs and the fact that the activity can be carried only for a few months a year (and only in good weather). For these reasons it is not considered as a valid resource. In any case, the coast of Jesolo and Cavallino-Treporti, thanks to their good position and their high potential for growth of tourism (with a highly diversified demand, ranging from campers to residents), could be further developed by establishing connections between the various players, so as to create a skilled supply of suitably trained human resources to promote integrated tourism packages (for example each accommodation establishment of a certain size could "adopt" a crew of fishermen and their boat, promoting the activity of fishing tourism as part of the activities and services of campsites or holiday villages).

According to the CFP, moreover, the diversification of the activities with tourism/accommodation enterprises, such as fishing tourism, fosters the creation of a connection between products and the local area, adding economic and image value to the local catches.

3.7. Training

The above-mentioned processes of supplementing and reorganising the fishing activity, which are already underway or which will be implemented in the future, certainly require support both in terms of training and of business/management advice. From this point of view, training is extremely important, not only the more traditional kind connected with the industry (safety on board, food safety, fish conservation, etc.) but also, and above all, the already highlighted reskilling and reorganisation of fishermen's activities. Training is important in order to start up projects related to aquaculture, which in many respects is an activity comparable to agriculture. The same can be said for projects and initiatives aiming at combining fishing with tourism products and services, thus linking operators with an industry other than their original one.

3.8. Recreational fishing

By responding to requirements and expectation of recreational fishermen, this approach constitutes an innovation in this fishing sector. The FIPSAS, which is a federation that represents a sizeable, expert part of the world of amateur fishing as well as various underwater activities, recently (2011) put forward a proposal for environmental recovery and for the creation of a marine reserve on the coast of Veneto.

The proposal suggests the implementation of plots of marine waters which are to be managed and regulated by affiliated fishermen. In these facilities, which are based on a low-impact, sustainably-managed approach, some structures aiming to attract sea life (deepwater, sedentary and pelagic) would be installed and they would make available surface for benthic species to settle on.

This constitutes a new way of looking at the management of the coast and of existing fishing, aquaculture (mariculture) and nautical activities.

Another important goal of these measures is, with appropriate regulation, to make some of these facilities available to affiliated divers for educational purposes. In addition, divers' associations could carry out checks and regular maintenance on such facilities, as part of their club activities.

4. Conclusions

The future CFP must acknowledge the fact that the social and economic problems faced by the fishing industry and the collapse in fish stocks are not two opposing issues requiring separate solutions. Actually, the solution of one of them is a response to the other. Investment in resource recovery and energy efficiency, together with the spread of environmentally sustainable fishing practices will make it possible to support employment levels in the fishing industry over the long term. Nevertheless, in order to recover and conserve resources, and to regain profitability, the fishing capacity and effort of the fleet must be reduced in line with scientific limits on mortality. At the same time, the new CFP must promote local, low-impact, high-quality fishing, high-efficiency in the processing of products and the sale of environmentally sustainable and socially equitable products.

With the recovery of fish stocks, catches per unit of fishing effort will increase and, if the EU moves from non-selective and high-fuel-use fishing practices to alternative and more sustainable systems, the power of the fleet will move from machinery to employment, bringing about, from the firm's point of view, a shift in investment from engine power to employment.

The new CFP should exclude self-management of monitoring activities and could lead to the establishment of areas of co-management, entailing greater commitment at the local level on the part of the competent authorities.

Finally, it should support all those measures which tie EU aid to the obligations that come from the system of fishing controls and to the strict application of the CFP.

Climate change constitutes a worrying threat to the marine environment, in particular as a result of the strong pressure imposed on marine ecosystems by human activities. Fishing causes the greatest damage when it removes too much biomass from the ecosystem, in terms of both target and incidental species, and when it destroy habitats that are vital for the survival and reproduction of marine species. The pollution produced by humans, the eutrophication, the debris and the introduction of alien species cause further pressure on the marine environment.

If we recognise that the only way to increase the capacity of the marine environment to adapt

to climate change is to reinforce its capacity to resist large-scale climate changes, then it is not necessary to point out the need to reduce other causes of stress.

As far as availability and quality of data is concerned, it is essential that data reporting concentrate on catches and not on quantities landed. In the end, only what is taken from the sea is important, not what is landed.

Fishermen must be encouraged to provide better data for evaluation of stocks and for further research. This could be achieved through preferential access to resources for those who respect the above-mentioned criteria.

Transparency is one of the main elements for encouraging the involvement of the various parties concerned and for guaranteeing sustainable policies. In fact, recent research suggests that translating scientific advice into actual policy measures, through a transparent and participatory process, constitutes the central point for achieving sustainable fishing.

Illegal fishing, either with forbidden equipment, at prohibited times or in prohibited areas, is still an aspect with a strong negative impact.

Poaching, which remains a deeply rooted activity in fisheries, harms the environment, biodiversity and fishery resources. Similarly, recreational fishing is a source of environmental damage due to the lack of new legislation. Indeed, the impact caused by recreational fishing has changed dramatically due to new navigation technologies, which identify prey and fishing, making existing legislation obsolete.

Government spending will need to be diverted away from direct or indirect subsidies for the industry, towards goods and services for the good of society, such as support for independent scientific research on fish stocks and on the environmental impact of fishing, and the stepping up of checks on the application of CFP regulations.

Funding for fishing activities should be gradually removed, as should agreements with third-party Countries which do not guarantee that the costs will be fully recuperated. Equally, tax exemptions on fuel and the de-minimis aid on operating costs should be abolished.

In a sandy and silty environment such as the one along coast of Veneto, the existence of a seabed of "hard" substrata already has positive consequences in terms of environmental diversity, by encouraging biodiversity. Such features introduce an element of discontinuity in relation to the rest of the seabed and will attract marine species.

In order to respond effectively to the demands that have emerged on several sides (i.e. the world of recreational fishing, sea lovers and divers and nautical and nature tourism) several packages have been identified for an integrated series of sustainable activities, geared towards repopulation, protection, fishing and underwater activities. On the basis of an integrated approach to defence, conservation and use, the creation and installations of suitable modular, and scattered structures, surrounded if required by smaller-scale structures, is planned in these areas.

Hence, specially equipped surfaces will be laid out to work in conjunction with already-existing surfaces, whether natural or artificial. The successive stages of the intervention will allow the structures to perform an active role as FADs (Fish Aggregating Devices).

Moreover, so as not to perform exclusively the role of FADs, the various structures must be able to create functional, self-sufficient trophic environments, which need to be adequate in terms of number/surface and area/volume.

The many studies conducted in recent years by marine science experts, including studies conducted along the North Adriatic coastal strip, have widely demonstrated the positive effect of structures placed on the seabed. The goals achieved by trials and verified by technical experts and entrepreneurs in the industry, both in the short and in the medium-to-long term, have

increasingly involved commercial and recreational fish catches, creating areas for extensive and/or semi-extensive aquaculture and for diving tourism, monitoring natural and fishing mortality rates, protecting ecologically significant habitats, restoring damaged habitats and conserving biodiversity.

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ECONOMIC, ENERGY AND ENVIRONMENTAL ISSUES OF AGROENERGY CHAINS. AN OVERVIEW OF THE EU AGRICULTURAL POLICY AND THE CONCEPT OF "MULTIFUNCTIONALITY"

JEL classification: Q13; Q16; Q18; Q27; 013; 044

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Abstract. *It is now widely acknowledged that almost all human activity is seriously dependent on energy produced from fossil fuels. Energy consumption is one of the most reliable indicators of the development and quality of life of a country and the need to satisfy the demand for energy over a certain time period is the basis of energy planning.*

The increasing demand for energy and the expected shortage in the long term solicit new strategies to fill the widening demand-supply gap. The European Commission intends to implement these strategies in a context where both environmental and social goals are considered. It is recognized that a sustainable strategy must be addressed to achieve, first of all, the following goals: guarantee the security of the energy market; minimize the environmental impact; avoid the social consequences of energy shortage; improve the quality of life in rural areas and encourage diversification of the rural economy. In recent years the RES based on agricultural production has rendered agriculture multifunctional in the context of the EU Agricultural Policy.

In this view, awareness of the multifunctional character of agriculture can act as a useful means for identifying the importance of social, environmental and economic functions, and define the best balance between them. Bioenergy production, as a function of multifunctional agriculture, can be used so as to reduce to the minimum the impact on the environment; it can also, in rural or in developing areas, enhance employment and contribute to improving this balance.

Keywords: *bionergy, RES, land competition, multifunctional agriculture, rural development, sustainability*

1. Introduction

Taking into consideration the new challenges of the CAP, in particular, since the Fischler reform, at Community level there has been a renewed interest in all those transformation processes (combustion, pyrolysis, etc..) for obtaining energy, directly or indirectly, through the use of agricultural products or derived from agricultural processing as raw materials. The use of products and by-products of agricultural processing (rapeseed and sunflower, material from forests and pruning, straw and manure) offer many opportunities to reduce fuel costs of farms and

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increase their energy self-sufficiency. Renewable energy sources, therefore, become a resource to be used as raw material in a process of industrial transformation to produce renewable energy. This reduces the overproduction problem and influences the recovery and marginal productivity of lands.

2. Biomass as a renewable energy source for multifunctional farms

Renewable energy sources or Res may be defined as any type of resource that can be regenerated at a rate that is at least equal to the speed with which humanity can consume that resource (Kaminski J., Leduc G., 2010). According to the International Energy Agency (IEA), this category includes: wind power, solar energy, geothermal energy, biomass energy, hydropower, and the energy of the waves and tides. The considerations that can be made in support of their use, and that are often mentioned in EU energy policies, are related to the fact that renewable energies permit reduction in emissions of carbon dioxide (CO_2) as required by various international treaties (i.e. the Kyoto Protocol). In addition, new conversion technologies are being developed that promise renewable energy at a competitive price in the near future. Many of these energy resources will come from local resources and will ensure greater security of supply (Cassman K.G., Liska A.J., 2007). Renewable energy can also provide a source of extra income for the farmer, but should not be considered as the main production of a farm. Renewable energy has a positive social impact, thanks to its ability to create new jobs and re-evaluate, from an economic point of view, entire agricultural regions. In this context, it also becomes a real tool of multifunctionality of farms (Van der Ploeg J.D., Roep D., 2003). In particular, the excess power generated can be sold to the authority for national energy supply, to obtain an additional income. In this way, biomass allows significant savings in energy costs in agriculture (the so-called "*no food*", agriculture a term which indicates that part of agriculture is not intended for food production and processing) (Lanfranchi M., 2003).

3. Biomass production within the EU and the Common Agricultural Policy

Biomass is often considered as the sum of all waste products and residues from harvesting or processing agricultural and forestry crops (prunings, straw, forest cuts), the residues of food production and the timber industry, energy crops (herbaceous and woody), landfill gas and residues from waste treatment, plant and animal waste (manure) and the organic part of municipal waste (Tudisca S., Di Trapani A. M., Sgroi F., Testa R., Squatrito R., 2013).

The chemical composition of plant biomass varies among species. Yet, in general terms, plants are made of approximately 25% lignin and 75% carbohydrates or sugars. The carbohydrate fraction consists of many sugar molecules linked together in long chains or polymers. Two categories are distinguished: cellulose and hemi-cellulose. The lignin fraction consists of non-sugar type molecules that act as a glue, holding together the cellulose fibers. The biomass used to produce energy, can, as explained, be generated from residual sources or from dedicated crops (so-called "energy crops"). For this reason, biomass is considered the renewable energy with the highest potential to ensure a sustainable energy supply in the future. Biomass, in fact, gives the highest performance at the lowest cost (excluding hydropower), moreover, most of the technologies and infrastructures developed for fossil fuels can be converted for its use (Lanfranchi M.,

2002). Furthermore, the products that can be obtained from biomass (mainly solid, liquid and gaseous fuels) have a wide range of uses. For this reason, for several years the European Union is committed to orient its policies towards sustainability through, for example, the development of technology and a "sustainable supply chain" (Schimmenti E., Borsellino V., Galati A., 2012). The main objective of policy "*towards sustainability*" of the CAP 2014 - 2020 is, in fact, to make bioenergy competitive and allow its development on the basis of its high potential and opportunities. Today, biomass energy (Tab. 1) produces about 19.7% of renewable energy at the Community level.

Tab. 1 - Share of renewable energy in gross electricity consumption in EU countries

Renewable Energy	%	TWh
Solar power	6,9	46,3
Geothermal power	0,9	5,9
Ocean energies	0,1	0,5
Hydraulic power	46	311
Wind power	26,4	179,2
Biomass	19,7	133
Total	100	675,9

Source: EurObserv'ER, 2012

The following table (Tab. 2) shows that Germany is the largest producer of biomass in the EU, followed by France and Sweden. Italy is the ninth.

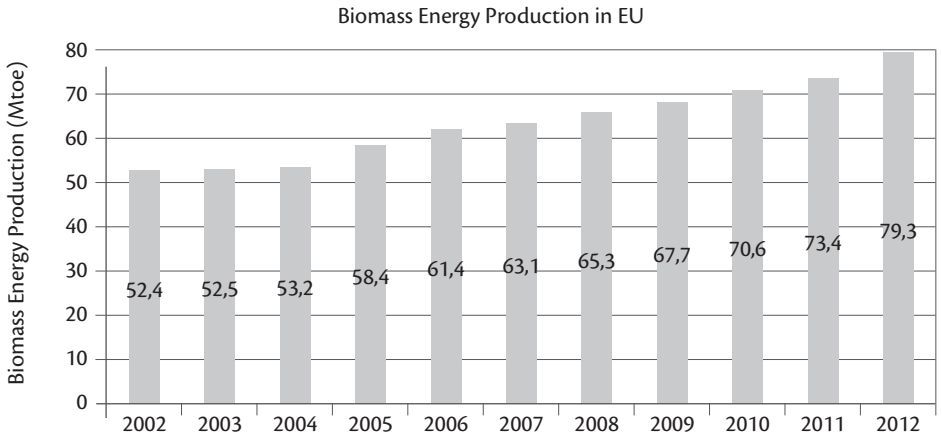
Tab. 2 - Primary energy production from solid biomass in the European Union in 2010 (in Mtoe)

	Country	Mtoe		Country	Mtoe
1	Germany	12,23	15	UK	1,442
2	France	10,481	16	Netherlands	1,033
3	Sweden	9,202	17	Lithuania	1,002
4	Finland	7,68	18	Estonia	0,924
5	Poland	5,865	19	Belgium	0,858
6	Spain	4,751	20	Greece	0,812
7	Austria	4,529	21	Bulgaria	0,788
8	Romania	3,583	22	Slovakia	0,74
9	Italy	3,019	23	Slovenia	0,572
10	Portugal	2,582	24	Irland	0,197
11	Czech Republic	2,094	25	Luxembourg	0,04
12	Latvia	1,739	26	Cyprus	0,01
13	Denmark	1,657	27	Malta	0
14	Hungary	1,489		**Total**	**79,319**

Source: Eurostat 2012

In the last decade, the use and exploitation of energy from biomass has increased exponentially in the EU, (Fig. 1). Biomass can potentially make a significant contribution to meeting the demand for heat and electricity of the population in 2020.

Fig. 1 - Solid biomass primary energy production in the EU since 2000 (in Mtoe)



Source: Eurostat 2012

However, according to the latest Eurostat surveys, Europe imports from third countries most of its raw materials for the production of energy, electricity and fuels from renewable sources.

In Europe, biomass derives principally from solid compounds, biofuels and biogas, as shown in Table 3.

Tab. 3 - Energy production from biomass in the EU (in Mtep)

Solid Biomass	72,8
Municipal Solid Waste (50% Biomass)	7,7
Biogas	8,3
Biofuel	12,1

Source: EurObserv'ER, 2012

To compensate for the shortcomings of biomass production, and to support the use of renewable energy, Europe is putting in place a series of measures through support schemes, standards and administrative rules (i.e. the allocation of revenue from ETS and the "NER 300" to promote innovative technologies).

In this context, the European Commission has suggested a sort of "farming guide" to try to produce biomass more efficiently (for example, the Communication of EC "*Renewable Energy: a major player in the European energy market*", June 2012, and also the Report of the Committee on Industry, Research and Energy "*Current challenges and opportunities for renewable energy in the European internal energy market*", April 2013). The efforts that the EU is undertaking will be necessary, given the prominent role that financial support schemes play in the development

of renewable energy. EU policies are therefore essential to reform the support schemes and to ensure that they are planned in a cost-efficient and market-oriented manner (Vieri S., 2012). To ensure convergence and Europeanization of energy, further steps are needed, in addition to the development of common approaches to support renewable energy through increased cross-border cooperation. The current legal framework provides common approaches based on specific renewable energy projects, technologies, and joint support schemes such as the Swedish-Norwegian regime, achievable within national markets. In this way, consumers are able to benefit from the renewable energy capacity produced in a neighboring country. The Commission therefore intends to promote the increase of renewable energy production (especially biomass), the control of production costs, market integration and policies to foster Europeanization. This approach will help to maintain stability between the Community and national policies and will ensure that any market intervention will be able to correct market failures without increasing the current distortions.

4. The economic potential of bioenergy and its role in sustainable development

Bioenergy is becoming an important opportunity in climate change mitigation policies. The increased utilization of bioenergy for production of heat and power has achieved increased political support in European countries. The EU Directive 2009/28, for example, aims at increasing the share of renewable energiy in the EU, in order to achieve the 2020 renewable energy goals.

Bioenergy, as demonstrated, is generally considered as contributing to many priorities, including sustainability, reduction of greenhouse gas emissions, regional development, social structure and agriculture, security of supply (Reijnders, 2006).

The current debate on the sustainability of energy crops is focused on some controversial points: competition with food and fodder crops for fertile lands (Cassman and Liska, 2007); with other human activities for water resources (Service, 2009) and their effects on the direct and indirect land use change (Fargione *et al.*, 2008).

Biomass appears to be an attractive raw material for three main reasons. First, it is a renewable resource that could be sustainably developed in the future. Second, it appears to have characteristics decidedly positive for the environment with no net releases of carbon dioxide and very low sulphur content. Third, it appears to have significant economic potential especially if fossil fuel prices increase in the future. Apart from that, biomass has the unique advantage amongst all RES, to be able to provide solid, liquid and gaseous fuels that can be stored, transported and utilized far away from the point of origin, and due to the negligible amounts of sulphur and nitrogen contained in biomass the energy that is being utilized does not contribute to environmental pollution.

It is well known that the modern use of biomass is distinguished from the traditional use of biomass energy by its conversion into high-quality energy carriers, such as electricity and biomass liquid fuels for transportation.

In the longer term, the pressure on available biomass resources will increase. Ambitions and expectations for biomass use for energy are high in many countries, for the EU and also on a global basis, given a variety of policy objectives and long term energy scenarios. A reliable supply and demand for bioenergy is vital to develop stable market activities. Given the expectations of a high bioenergy demand on a global scale, the pressure on available biomass resources will increase. Without the development of biomass resources (e.g. through energy crops and better

use of agro-forestry residues) and a well-functioning biomass market to assure a reliable and lasting supply, those ambitions may not be met. The development of truly international markets for bioenergy may become an essential driver for developing bioenergy potentials, which are currently underutilised in many regions of the world. This is true both for residues and for dedicated biomass production (through energy crops or multifunctional systems).

At the same time, many developing countries have a large technical potential for agricultural and forest residues and dedicated biomass production. Given the lower costs for land and labour in many developing countries, biomass production costs are much lower, and thus offer an opportunity to export bioenergy. The possibilities of exporting biomass-derived commodities to the world's energy markets can provide a stable and reliable demand for rural communities in many (developing) countries, thus creating an important incentive and market access that is much needed in many areas of the world. For many rural communities in developing countries such a situation would offer good opportunities for socio-economic development.

For these reasons, biomass has the potential to become one of the major global primary energy sources during the next century, and modernized bioenergy systems may well be important contributors to future sustainable energy systems and to sustainable development in developed countries as well as in developing countries (Lund and Munster, 2005).

5. The possible contribution of biomass to the future global energy supply

As already mentioned, many studies have been undertaken to assess the possible contribution of biomass to the future global energy supply. The conclusions from these studies differ significantly. Indeed, most studies focus either on the supply or on the demand side, showing that the biomass energy potential depends on both competition between biomass resource uses and competition between alternative energy technologies and primary energy sources. Nevertheless, the main conclusion of these studies is that crucial factors determining biomass energy potential (availability) are: the future demand for food, determined by population growth; the type of food production systems that can be adopted world-wide; the productivity of forest and energy crops; the (increased) use of bio-materials; the availability of degraded land, and, finally, the competition for land use.

There is, in fact, potential competition for land and water between bioenergy and food crops. Another question is whether biomass for energy use can be produced in a sustainable manner, given the current conventional agricultural production practices. Other than the land and water competition. On the other hand, there are also, sustainable alternatives, for example organic agriculture, to avoid the negative environmental effects of conventional agriculture.

It is necessary to note that all of these issues must be taken into account in the production and use of biomass for energy purposes.

6. Implications for the land system

Land use changes are a result of the interaction of a variety of drivers. Historically, the demand for more agricultural production has been partly compensated by technological advances, and improvement in technology will determine whether yields will continue to improve in the future.

It is also important to note, in this respect, the potential competition for land between

energy and food crops, based on assessments of land availability and on the interaction of increased demand for land with food production and the corresponding effects on land rents and food prices.

The growth of crops for bioenergy has been highlighted as a potential competitor for land with food crops. It is significant, though, that the area occupied by bioenergy and its by-products in 2004 was only 14 Mha compared with 1.500 Mha of crops (i.e. about 1% of the total cropped area) and 4.500 Mha of pastures worldwide (IEA, 2006). While the reasons for growing crops for bioenergy are complex, the use of land for them is likely to increase in the future (FAO, 2009).

Some models also point out the importance of regional differences in land availability. This information should be complemented with estimates of losses in arable land due to soil degradation and water scarcity due, also, to climate change that will on aggregate negatively affect agriculture and the suitability of land for farming in non-temperate climate zones.

Another important issue for competition for land is the potential clearing of new land for biomass crops. Further issues of concern are potential competition for the biomass itself between its use for energy generation and other uses, such as biomaterials or food.

Using biomass for energy is likely to have both positive and negative competitive effects on food production and therefore on land, with national and regional policies beginning to reflect differing components of these inter-linkages. With global oil stocks becoming increasingly threatened, fossil fuel prices will inevitably continue to rise and alternative sources of energy will be needed, not least to maintain agricultural yields. Bioenergy is likely to fill a significant part of this emerging energy gap for agriculture, which in turn will require more integrated energy, agriculture and land-use policies to avoid negative impacts from competition for land.

7. Awareness of the potential of bioenergy as an economic driver for rural development

It has been demonstrated how sustainable biomass production can contribute to the sustainable management of natural resources and, ultimately, to sustainable development. Biomass energy is interesting from an energy security perspective. Resources are often locally available and conversion into secondary energy carriers is feasible without high capital investment (Van den Broek, 2000). Moreover, biomass energy can have a positive effect on degraded land by adding organic matter to the soil. Furthermore, it can play an important role in reducing greenhouse gas emissions, since when produced and utilized in a sustainable way, the use of biomass for energy offsets fossil fuel greenhouse gas emissions. Since energy plantations may also create new employment opportunities in rural areas in developing countries, it also contributes to the social aspect of sustainability (Junginger *et al.*, 2001). Importing countries, on the other hand, may be able to meet their GHG emission reduction targets cost-effectively and diversify their fuel-mix. This creates important future opportunities for developing countries and regions, given the expected increased role of bioenergy within the world's energy supply. Such developments could give access to an open world energy market. Consequently, this poses the fundamental question of how these potential major producers and exporters of bioenergy can benefit from the growing global demand for bioenergy in a sustainable way, i.e., that bioenergy exports can contribute to rural development, benefit local communities and be an integral part of overall development schemes, including the existing agricultural and forestry sectors. These questions represent the

basis of the relationship between international bioenergy trade and socio-economic development and how sustainable bioenergy production could be achieved.

In particular, the social implications arising from local bioenergy investment can be distinguished in two classes: those relating to an increase in "living standard" and those that contribute to increased social cohesion and stability. In economic terms the "living standard" refers to household consumption levels, or levels of monetary income. However, other factors contribute to a person's living standard but which have no immediate economic value. These include such factors as employment opportunities, the surrounding environment and healthcare which should equally be taken into consideration. Moreover, the introduction of a net employment and income-generating source, such as bioenergy production, could help to remove adverse social and cohesion trends (e.g., high levels of unemployment, rural depopulation, etc.).

From this point of view, and in order to evaluate socio-economic impacts in the development of rural regions, it must be noted that, while many trade flows take place between neighbouring regions or countries, a large part of trade flows is spreading over increasingly long distances. This is happening in spite of the greater volume and lower calorific value of most biomass raw material. These trade flows may offer several benefits for both exporting and importing countries. For example, exporting countries may gain an interesting source of additional income and an increase in employment.

Rural areas in some countries, in fact, are suffering from significant levels of outward migration, which militates against population stability. Consequently, given the propensity for bioenergy to be located in rural areas, the deployment of bioenergy plants may have positive effects upon rural labour markets firstly, by introducing direct employment and secondly, by supporting related industries and employment in these. Large-scale production of modern biofuels, partly for the export market, could provide a major opportunity for many rural regions to generate major economic activity, income and employment (Domac *et al.*, 2005).

In economic terms, bioenergy can contribute to many important elements of national or regional development, that can carry direct and indirect economic effects on GDP and trade balance and in energy supply. A frequently mentioned obstacle to the expansion and acceptance of bioenergy into world energy markets is that the markets do not acknowledge the real costs and risks connected with the usage of fossil and nuclear fuels (Van den Broek, 2000).

Studies of socio-economic impact are commonly used to evaluate the local, regional and/or national implications of implementing particular development decisions (Hoogwijk, 2004). The extremely complex nature of bioenergy, the many different technologies involved and a number of different, associated aspects (socioeconomics, greenhouse gas mitigation potential, environment, etc.) make this whole topic a complex subject.

A major complication lies in the fact that these latter elements are not always tractable to quantitative analysis and, therefore, have been excluded from the majority of impact assessments in the past, even though at the local level they may be very significant.

It is interesting, however, to underline that the varied nature of biomass and the many possible routes for converting the biomass resource to useful energy make this topic a complex subject. When we talk about sources of biomass we need to consider forestry, agriculture, industrial residues, short rotation coppice plantations, communal waste, urban biomass, etc. This involves a combination of different economic sectors and human activities and consequently is often not well understood.

The growing dependence of the European Union on imported oil has influenced several legislative initiatives (Directives) intended to facilitate the development of biofuel markets in

Europe also to overcome increasing external dependence. The renewable energy industry is one of Europe's fastest growing sectors as member states encourage the deployment of renewable as an alternative, indigenous energy source with low environmental impact. In terms of employment, in Europe, policy-makers recognise that there are economic benefits from renewable energy (such as bioenergy), especially in terms of employment and the development of a strong export industry.

8. Conclusions

The study presented analyses the range of the global potential of biomass for energy in the long term. It is stressed that this study is exploratory, its aim was to investigate the potential contribute of bioenergy (in this case: biomass) in future scenarios of energy supply and the role of the energy policies of the EU to achieve this purpose.

It has been shown that, in most countries, socio-economic benefits of bioenergy use have been analyzed and identified as very important driving forces in increasing the share of bioenergy in the total energy supply.

Creation of regional employment and economic gains are probably the two most important issues addressed when considering biomass use for energy production. In this view, bioenergy has provided millions of households with incomes, livelihood activities and employment. The essence of sustainability of bioenergy projects from a social aspect is how they are perceived by society, and how different societies benefit from this activity in different ways. Other issues such as mitigating carbon emissions, ensuring wider environmental protection and providing security of energy supply are an added bonus for local communities where the primary driving force is much more likely to be related to employment or job creation. Overall, these benefits will result in increased social cohesion and create greater social stability.

In this view, a good understanding of and strong backing for bioenergy in EU policies are essential to encourage policies supporting the introduction and wider use of bioenergy and would also help to bring down costs further as a result of increased adoption rates and economies of scale. Similarly, a lack of awareness may result in resistance to bioenergy projects, even if they are economically viable and technologically robust.

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