Sustainability of water use in agriculture. Southern European farmers participation and social impact.

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Abstract

This paper aims to open a discussion in the scientific point of view and policy making processes on sustainability of water policies. The social and environmental impact on the Agriculture sector in Southern European countries (Greece, Italy, Portugal and Spain) will be investigated to analyse the adoption of measures taken by decision makers on water policies. The community assets of farmers will have an important role on the implementation of different strategies concerning agriculture water management. The paper will focus on the role of farmer's participation as central actors of implementation in water policy. Furthermore, the social and the environmental aspects will be addressed.

Keywords: water policies; water management; farmers participation; social impact.

Introduction

Sustainability is a broad discipline, treated by hundreds of authors and giving insights into many aspects of the human world, such as environment and social sciences. In recent years, the three strategic pillars of sustainability, i.e. economic, social and environmental, have become crucial (Mouysset, 2014). The water policies in European Union are continuously improving to integrate water resources management policies. In fact, managing water resources for irrigation in an efficient, effective and sustainable manner is an essential issue for a public service challenge (Brown, Keath.; Wong, 2009; Grafton et al., 2015; OECD, 2016). The humanity needs to be more sustainable, to establish and protect the environment; considering the impact of actual actions on future generations.

This research work will focus on the evolution of agriculture water policies in Southern European countries (Greece, Italy, Portugal and Spain). In particular, sustainability indicators of water policies will be considered in order to compare the agriculture water management in the aforementioned EU countries.

An extensive literature review will be carried out to assess the sustainability of agriculture water policies so far adopted by Southern European countries.

Moreover, the farmers involvement in water policies will be investigated. In fact, the participation of farmers in a new paradigmatic concept of sustainable agriculture has a positive influence on the importance they give to food production, water use

and environment issues (Michael & Wilson, 1988). Nevertheless, farmers cooperation with policies designed to bring greater levels of agriculture water management and biodiversity protection differs across the EU (Sibert, Toogood, & Knierim, 2006). Farmers are very heterogeneous and differ in their decision-making in relation to their holdings (Gravsholt Brusck, 2002). They differ from

country to country and from one specific context to another; not only cultural or sociological point of view but in the function of economic aspects too. One of the most interesting aspects of this study is how these factors (cultural, sociological and economics) will illuminate the complex relationship and balancing act between Southern EU policy of water use, local environmental governance and the knowledge management of the farmers.

What's before water framework directive

Growing pressure exerted by human activities on the environmental systems has led to widespread sensitivity towards ecological issues in the countries with advanced economy, together with the introduction of regulatory provisions aimed at regulating and limiting depletion of natural assets.

For instance, in 1987 the General Assembly of the United Nations, World Commission on Environment and Development (WCED) published a report titled "Our Common Future". The aim was to propose long-term environmental strategies for achieving sustainable development by the year 2000 and beyond.

On the other hand, Agenda 21 is an action plan of the United Nations regarding sustainable development. This plan has been elaborated in the Earth Summit held in Rio de Janeiro, Brazil, in 1992. Both these documents were multilateral and interdependent in terms of sustainable development concerning the formal political development sphere that can be executed in national, local and global levels. In this context, water management in agriculture has attracted ever growing attention in European countries; they all have different laws, rules and environmental policies concerning the water management (Bontempi, Broekman, Palladino & Setti, 2005).

New environmental policies were needed since human being realized to be the principal cause of environmental transformation because natural resources have been used without any control. Thus, different organizations and institutions were formed to prevent, protect and manage the environment.

Different Scholars have discussed the sustainable theory regarding the future generation in different point of views. For instance, the present generation has a fiduciary responsibility to see that future generations should have the right to use the natural resources and can access on them (Acreman, 1980). Other theories discussed that, the present generation cannot know either the value preferences of future

generations or predict the physical conditions in which they will live, especially far into the future (Braudel, 1992). Edith Weiss Brown on her book; "Principle of Conservation and Options" holds that: "*Each generation should conserve the diversity of the nature and cultural resource to ensure both sustainable human progress and human survival*". In this context, managing the water resource in agriculture for the present generations without enhance the future generations make the process of sustainable more complex. For this reason, the different directives of management of water resource in a global level do not offer a blue print action.

One of the most important is the Water Framework Directive (2000/60/EC; European Commission, 2000), which established a framework for European Community action in the field of water policy. It was adopted on October 2000 and published in the Official Journal of the European Community on December 2000. It is known as the Water Framework Directive (WFD), who provide for all European countries a solid legislative instrument basis for long- term integrated for the protection and management of water resources. In terms of protection the Dublin Accord on Water and Sustainable Development laid an obligation to sustainable water resource management and protect the environment. Human health, welfare, industrial development, food security, sustainable agriculture and the ecosystem are integral part of the European economy and society. Those are all at risk, unless water and land resources are managed more effectively and tried to have a decision-making process in the present decade and implementation of the more sustainable decisions for the future generations (FAO, 2016).

The Dublin Accord also promoted that water should be treated "as economic good" rather than be treated as a free good, originated in the (ICWE, 1992)[1]. Economic valuation provides instruments such as water pricing, property rights and the opportunity that people are willing to pay (FAO, 2006).

Nowadays, water use in agriculture in the considered Southern European countries is around 70% of the total water use. The main linkages between sustainable management of water in agriculture and policies regarding adaptation strategies is the participation of farmers. Their presence improves an economic efficiency on decision making in agriculture making more effectiveness the use of water resource. Governments have their principal role on investing and informing the farmers about all the new practices for a more sustainable agriculture and more sustainable water use. To consider is the motivation of farmers on participation of the meetings and their voluntary to follow such policies that governments or ONG-es propose.

[1] (ICWE) International Conference on Water and the Environment. The Dublin Statement on Water and Sustainable Development. Adopted January 31, 1992 in Dublin, Ireland, on 26-31 January 1992. In this conference were established four important principles regarding water resource: Principle No 1: Fresh water is a finite and vulnerable resource, essential to sustain life, development and the environment; Principle No. 2: Water development and management should be based on a participatory approach, involving users, planners and policy- makers at all levels; Principle No. 3: Women play a central part in the provision, management and safeguarding of water; Principle No. 4: Water has an economic value in all its competing uses and should be recognized as an economic good.

The main concerns here remain the different attitudes and aims of farmers, the different educational level, age and how they are influenced by the groups to which he or she belongs.

We will discuss about the individual interest on applying the new knowledge on water management and activities on performing the behaviour as their own (Deci and Ryan 2008b).

Finally, in terms of policies the governments need to improve economic efficiency and environment effectiveness of policies with pressure from urbanisation, industrialisation and climate change. These policies will provide guidance to decision makers in agriculture with more competition for water resources, water supply, its status and management in agriculture.

The implementation of Article 9 of the WFD (which requires Member States to take account of the principle of recovery of the costs of water services, including environmental and resource costs) is important for strengthening water efficiency. In Portugal for example the consumption of water started to be payed and for this the farmers and the stakeholders started to be more efficient on use of it. Indeed, it has been acknowledged that water pricing and non- pricing measures have a high potential to provide an incentive for more efficient water use and thus help to achieve the environmental objectives under the Water Framework Directive (EEA, 2017).

The Directive aims to establish a legal framework for the water protection and management of water quality in the basis of individual river basin districts. It is intended to have a strategic and fundamental role in management of water policy and ensure the sustainability of water use in the long-term. It sets ambitious objectives for the preservation and restoration of the status of bodies of surface and ground water to achieve good status of the water systems.

The Italian water regulatory framework on drinking water quality and quantity it was transposed in 2006, with the legislative decree no. 152. The first anticipating the WFD was refers to (Law no. 183 of 1989) and was called “Norms for the organizational and functional rearrangement of soil protection”. The purpose of this law was to enhance the water rehabilitation, protection of lands, use and management of resources for a rational, economic and social development, and for the protection of the related environment (art. 1).

The River Basin Management Plans (RBMP) different for all EU countries include: a summary of the significant pressures and impacts of human activities on the waters; the water monitoring network and the results of the monitoring, which show the ecological, chemical and quantitative status of the waters; a list of the environmental objectives set for the waters; a summary of the economic analysis of water uses; a

summary of the programs of measures to be adopted; implementation of all the above will lead to the achievement of the main objective of the Directive, namely to achieve a "good" state of water. As far as the irrigation is concerned, the proposed actions are suggested as supplementary measures in the River Basin Management Plans and are specified for each River Basin District. This information is provided by the Rural Development Programme (RDP)[2] for Italy (2014-2020) which is the second factor and the general policy instrument for irrigation in Italy. All countries have their own legislative roles and differ instruments for implementation of policies on water management. Farmers impact and their presence on decision-making in irrigation management will be discussed and argumentized.

Importance of irrigation in agriculture

Making the concept of sustainable development operational for farmers' and common policies rises important challenges in terms of measurements. In this section we collect data from different sources to carry out the distribution of area irrigated in our countries of study.

We analyse the percentage of irrigated area land and observed how is changed during the time. The fundamental pilasters of sustainable: economic, environmental and social, implies the objectives of increasing economic efficiency and material wealth must take into social and environmental objectives. Sustainability is the most ambitious objective of the European Union and is related to safeguarding the Earth's potential to sustain life and bio-diversity. For many years, the European Commission and the Member States have had difficulty making the concept of sustainability operational. Frameworks are important, theorical or conceptual to structure work on indicators about sustainability. European Commission have adopted different types of frameworks structuring indicators based on the Brundland Report's definition of sustainable development. Another type of framework adopted is developing a pyramid of indicators based on the themes and sub-themes of the European Union sustainable strategy.

Measuring sustainable indicators and extracting data with different sources, related and constructed them in the best way, who these indicators can be interpreted in a global level, and used appropriately is the most difficult work to do.

Sustainability is more than a generic concept and is often criticized for the difficulty of putting it into practice. It has no definite parameters that can be determined scientifically. Many of the indicators are extremely specific and many measure criteria

[2] The Agriculture and Rural Development Programme (2014-20120) is funded through European Agricultural Fund for Rural Development (EAFRD). This programme helps the rural areas of the EU to meet the wide range of economic, environmental and social challenges of the 21st century. Frequently called "the second pillar" of the Common Agricultural Policy (CAP), it complements the system of direct payments to farmers and measures to manage agricultural markets (the so-called "first pillar).

that go beyond the scope of European area. Even though in assessing sustainability at the European level it is important to know the political context in which specific indicators and tools for example legislation, are applied. Therefore, a cyclic and gradual procedure has been developed that can logically accompany this work from the point of departure to the desired point of arrival with significant results.

Very often the decision makers on public policies would like to measure the environmental situation and instrument policies in a given country (or region). Irrigation in agriculture have important influence on economic point of view. The economic incentives is a prime factor for farmers in relation to adopt policy measures. Results shows that economic interests have importance when farmers think about participation in measures enhancing environment and biodiversity (Deffuant, 2001).

In terms of necessity, water is essential in agriculture. The production is inextricably linked to the need for fresh water and livestock depends on water to drink. Plants absorb water in their biomass and release it in the atmosphere by transpiration, a process that affects positively on microclimatic conditions. Vegetable-covered soils have a greater infiltration capacity and higher humidity rates, which allows to reduce run-off. On abandoned land, particularly in the case of desertification, the capacity to retain water is considerably lower or even totally non-existent when the soil is waterproofed.

Agriculture production and irrigation system depends on the climate change and natural conditions. Changing weather conditions cause imbalances between rainfall and crop needs during the vegetative period and have a significant impact on yields and on the quality of agricultural products. Increasing frequency and gravity of extreme weather conditions will increase the vulnerability of the agricultural (Copa – Cogeca, 2016).

Irrigation systems managed from farmers are fundamental tools for ensure the maintenance of production and the use of water resource. The absence of irrigation would risk leading to abandonment land and serious economic problems, without talking about the possible relocation of agricultural production. It is essential to resort to more effective irrigation techniques and a practice that allow a low consumption of water, with the aim of safeguarding agricultural production in certain areas of our study. Most surfaces irrigated area are concentrated in the Mediterranean area (France, Greece, Italy, Portugal and Spain) which account 9.15 million hectares, corresponding to 84% of total area irrigated equipped with irrigation systems. In Italy, 50% of the agricultural lands irrigated produce more than 60% of the value total products agricultural come from 21% of the land's agricultural crops. In Spain 14% of the agricultural lands irrigated produce more than 60% of the total value of the agricultural products.

The table below show data collected from FAO and OECD database for year 2010. The results are different regarding to the hectares and the proportion of total agriculture area for each. In the semi-arid areas, the problem related to water resources and the engagement of farmers on choosing the crops for their production have a very strength association.

Southern European countries	Irrigated area ('000 ha), 2010	Irrigated area as a proportion of total agriculture area
Greece	1.314	37.6
Italy	2.710	22.8
Portugal	791	21.0
Spain	3.453	17.6

Table 1. Irrigated area as a proportion of total agriculture area for Greece, Italy, Portugal and Spain, Year[3].

In one hand, we realised that irrigated area per ha in 2010 is high for Spain, Italy following Greece and in the end Portugal. On the other hand, the irrigated area of total agriculture area is distributed not in the same way as the irrigated area as a proportion of total agriculture area for the year 2010.

Nevertheless, despite the possibilities considered a priori as combinations of the previous table, it is notable that there is not a perfect association with the total of irrigated area land with the correspondent ha in 2010.

Abstractions from surface and groundwater are the most frequently in Southern European countries. For instance, abstraction from surface waters accounts for over 80% of irrigations in Greece (Caraveli, 2015). Abstraction from surface waters are also the main source for irrigation in Spain (68%, Sumpsi, 1999). However, in Italy mainly abstraction from surface water is 72%, generally in the south of country and groundwater is in north area with 28%. In Portugal abstraction is mainly from groundwater sources (FAO, 2016).

[3] Sources: (FAO, 2010) and (OECD, 2010).

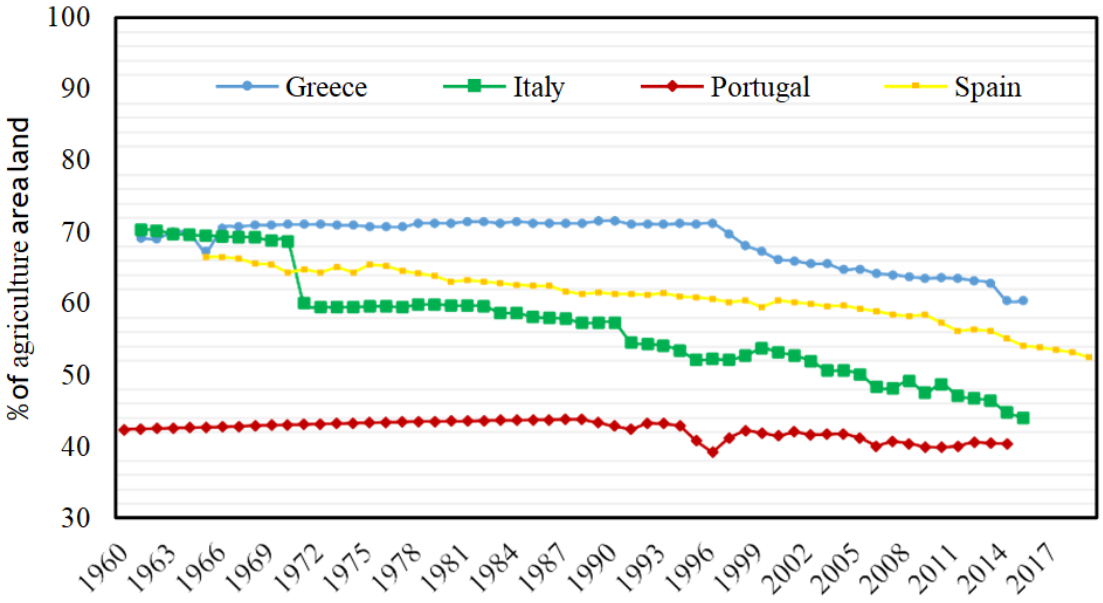

Fig. 1 Percentage of agriculture area land over the total area land for considered Southern European countries (Greece, Italy, Portugal and Spain) from 1960 to 2017.

The chart shows the percentage of agriculture area land over the total area land for the Southern European countries (Greece, Italy, Portugal and Spain) from 1960 to 2017. We have some missing data, unfortunately not available from the Main data Base of World Bank.

In the EU-28, the total utilized agriculture area amounts nearly 179 million ha in 2016. Greece has the largest agriculture land area covering more than 70% of the total area land, followed by Spain with more than 68% in beginning of the 1960, the Italy has more 70% of total area land in 1960 but has decreased in 1970 of more than 10%, and in the end Portugal with 43% of total agriculture area land. To precise is that the percentage is calculated in base of surface total area land for each country taken in consideration.

Now I'll show the percentage of agricultural area land irrigated. It gives an indication of the pressure of agriculture on water resources. While the irrigable area, which is the area equipped for irrigation, does not show much variation from year to year, the irrigated area can in fact vary significantly due to meteorological conditions or the choice of crops and agricultural production (farmers decisions).

For instance, in 2013 the total irrigated area in Eu was 10.3 million hectares, accounting for 5.9% of total Utilised Agricultural Area (UAA). Southern European countries taken

in exam (Greece, Italy, Portugal and Spain) shows the highest amounts of irrigated land.

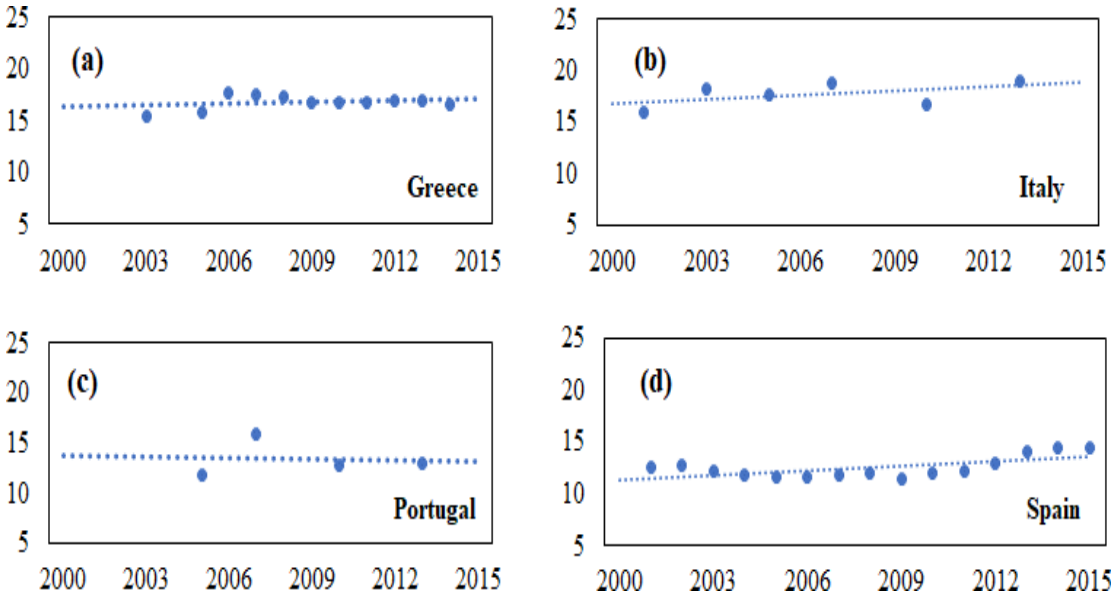

Fig. 2. Agriculture % of total irrigated land area for Southern European countries (Greece, Italy, Portugal and Spain) during the period from 2000 to 2015[4].

The chart about Agriculture trend of total irrigation land for the countries that I considered in this research shows how the percentage is not changing significantly during the time period 2001-2015. Still the problem remains the scarcity of water for irrigation in EU countries the percentage remains mostly the same. The heights percentage of irrigated land is around 19,08294 surfaces reached in Italy 2013 and the lowest is in Portugal 11,88171 2006. It is to mention that the total surface of land is not homogeneous for this area of study. Our benchmarking system in this chart is referred to countries, indicating how during the time the percentage is changed. Regarding the farmers participation and the management of most irrigation systems involves shared responsibility between government agencies and farmers. One of the potential outcomes of this research is that of finding level of farmers management participation as an essential part of achieving optimal management of water resource in agriculture.

Social activity and farmers participation

Irrigation can transform society, quality of water, land and landscapes. The effects are not only social, but they are influenced by agricultural production. The main

[4] Source: World Bank Database. Extracted on June 2017.

effect is the quantity and the quality of production. Water is an essential production factor in agriculture both for plant production and for animal production. Climatic change has a significant impact on agriculture in terms of water quantity and quality. This phenomenon will be exacerbated by the growth of water demand in food production, resulting from an increase in population and people's real income in terms of GDP. European agriculture must already cope with the consequences of extreme phenomena such as floods, storms and drought, which risk to become more frequent as the climate change and could imply problems a dramatic of lack of water. In Southern European countries farmers manage over 50% of surface water and pay an essential role in ensuring a sustainable management of water resources. They have already adapted their own water management practice and will have to continue to adopt them more effectively.

For centuries, farmers have controlled the water cycle at the local level, through irrigation or drainage. This cycle is a constituent element of the climate system and it can be positively influenced using appropriate agricultural practices. The search for solutions, that allow increasing production by using less water, is a crucial priority for our future. If European agriculture must continue to offer economic, environmental and social benefits, it is essential to have access to sufficient water supplies.

Farmers are becoming bigger in number and more specialized on the decision-making process and on the adoption of new policies. Data from EU updated in 2013 focus on farmers age and on the characteristics of their farms. In 2013, a total of 10.8 million farms operated in the Eu-28, as opposed to the 12 million farms in 2010 (- 11.5%). In 2013, most farmers in Italy were older than 55 and only 6% were younger than 35. A significant figure to analyze is the percentage of people continuing work after the age of 65. This participation on the agricultural sector had a significant influence on the adoption of new policies and on communication with other farmers at the local and regional level. The influence of neighboring farmers is important on starting negotiations. In one hand, neighboring farmers experience of successful negotiations with environmental administrators has a specific importance; in case they are older, their experience can be very positive and serve as a model for one's action. On the other hand, the influence of neighboring can be negative in case farmers use always the same methodology and the antique behaviors in relationship with the water resource, land and food production.

Luz in 1994 found out the existence of the negative effect that the bad relations and interaction between farmers and non- agricultural villagersand had on farmers' attitude. A major role in this context is payed by local public actors, whose opinions and actions serve as a common reference system (Oppermann, 1997).

Finally, assisted social interactions have a positive intermediary effect on the relationship between farmers' and local agents. Literature considers the public role as an adviser in informing, promoting, recommending and associating famers through agricultural programmes a very positive one. Professional working groups organized by governments take in consideration local conditions and the knowledge of farmers under observation. Cultural aspects of farmers, and their own self-perception on the effect that they have on the production of food. Natural conditions and the most important issue we are considering the use of water resource in agriculture, have a crucial importance on the environment's conservation. Thanks to a negative public image, very often farmers feel accused of not respecting nature or even destroying it. Self-awareness in farmers will remain the most important factor on ongoing processes for a good and sustainable water management in agriculture.

Conclusions

Finding the optimal level of farmer management participation is an essential part of achieving optimal system performance. In our case of study farmers have been encouraged to play more active management role. In our work we considered a large number of farmers who participate in different programmes for a good management of water resource and Agri- Environmental issues.

Greater farmers involvement in irrigation management have both economic and social benefits. Economically there is evidence that farmers perform certain functions better than outside agencies can, and that both farmers and agencies perform their management tasks better when they feel a mutual responsibility for a common objective. Social benefits include the organizational skills that farmers learn, and which may be useful in other activities, and a sense of self-respect and self-reliance. Though farmer participation requires a deliberate effort on the part of international and government agencies, as well as farmers, the benefits can be substantial. It is essential to get a clear recognition of the fact that the agricultural sector has a unique role to play in the debate water. How we already mentioned, the farmers are not considered consumer of water, but they play an active role in the search of solutions for better management, good communication and good results expected. Their collaboration and share ideas and knowledge will guaranty a future cooperation and positive results on conservation measures (Fish, 2013).

It is essential that the CAP helps farmers to collect the challenge of climate change to offer the maximum benefits to society as a whole. It can be achieved this goal by allowing farmers to achieve one better water efficiency and slow the heating of the planet, while continuing to meet food demand European and global level. Programs like Agri-environmental schemes (AES) allow farmers to adapt the effects of climate change

through more effective management of water resources. The research concerning the question of vulnerability of water resources to climate change and supporting the development of adaptation strategies for agriculture. Numerous achievements have been made in recent years progress with a view to filling the gaps in knowledge, for example through the creation of a European observatory on drought. Efforts to exchange have been intensified innovative solutions between European farmers, but it remains a lot to do. Solutions will need to be proposed to farmers practical and economic. Farmers are willing to take their share of responsibility for sustainable water management in agriculture, but they will need appropriate support so that the agricultural sector can fully implement its role in meeting the challenge of change climate for the benefit of the whole society.

Therefore, it reduces the risks that can arise unexpectedly and damage crops. Agricultural policy should support European agriculture adapting to climate change by encouraging flexible crop irrigation. In this regard, it is necessary to consider the multifunctional role of agriculture in establishing a balance between economic, social and environmental variables in different European regions and countries.

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