II. From an economic analysis to a shared review of the WFD's critical issues

II. The economic analysis of irrigation water abstraction in agriculture and the agri-food industry.

II.2. Rural development, management and cost recovery of water resources.

II.3. The cooperation of Land Reclamation Consortia, ANBI and Irrigants d'Europe for a revision of the WFD.

II.4. Some critical aspects to be reconsidered in the WFD.

II. Economic analysis of irrigation water abstraction in agriculture and the agri-food industry.

Water is an indispensable public good that guarantees human life and the existence of biodiversity for many species of flora and fauna. This fundamental observation was the starting point for the in-depth economic analysis conducted by Prof. P.M. La Sala, who states that, with respect to the balance of natural flows of the hydrological cycles of the past, today in order to ensure the quality and availability of water resources, it is necessary to adopt targeted policies that take into account some critical structural factors: the increase in the world population, the industrialization of production and the rise in temperatures that have increased the need for irrigated cultivation practices.

The international critical scenario, in many ways, is also proposed in the European and national reality. Even though Italy is one of the richest countries in water resources, due to its favourable climate and available reserves, it is not able to satisfy the growing demand for drinking water, due to the economic development processes and the increase in the quality of life. For this reason, the Italian water footprint has been divided into two main items: 1) production (corresponding to the total volume of water used for the national production of goods and services) and 2) withdrawal (corresponding to the volume of water used to produce goods and services consumed within the country, even if imported). Agriculture is the economic sector that uses the largest volumes of water (85%), which are used for the production of crops for human consumption, livestock, pasture and breeding farms. The remaining 15% of the total footprint is divided between industrial production (8%) and domestic use (7%). The distribution of the water network (extending over 210,000 km) is fragmented and inefficient, with widespread water losses averaging 40%.

According to Prof. P.M. La Sala, the current climate changes have made irrigation an agricultural practice which is common to all farms, even for those crops with a reduced water supply, such as olive and almond trees. According to the statistics, Italy is the second European country in terms of irrigated area and, over the years, with the reduction in the total number of farms, there is an extension of the irrigated areas. Water sources available in Italy, mainly from the subsoil (groundwater 97%) compared to surface water (surface water 3%), have also been surveyed. The water supply of agricultural enterprises comes for 35% from underground waters which, require a considerable period of time to recover, and for this reason they are undergoing a salinisation effect on the coastal aquifers. According to statistics, there are four main methods of distributing water on the ground, depending on the type of crops: irrigation by submersion, by flow and lateral infiltration, by sprinkling (rain) and micro-irrigation (drip). In Italy, the main irrigation method used is sprinkling, with the serious problem of the wind. Microirrigation is developing, but the systems have a high cost. Most of the water volumes are still distributed with low efficiency irrigation systems (62%). These indications are fundamental for an economic analysis of the agricultural and water resource management policies, which should be revised together with the existing regulations.

The contribution of Prof. P.M. La Sala then focuses on zootechnical productions and, in particular, on the use of water resources in breeding farms in Italy. This is a significant consumption, which is often neglected, as regards both the quantity and quality of water in the zootechnical feed. The water for watering animals in zootechnical farms comes from wells and, in any case, should comply with certain quality parameters. In zootechnical farms, water is also used in the washing of the farms. The water used in Italian zootechnical

Il presente progetto è finanziato con il sostegno della Commissione europea. L'autore è il solo responsabile di questa pubblicazione (comunicazione) e la Commissione declina ogni responsabilità sull'uso che potrà essere fatto delle informazioni in essa contenute.
This project has been funded with support from the European Commission. This publication [communication] reflects the views only of the author, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

establishments has a significant impact, equal to 3%, on the total Italian water withdrawal. The disposal of zootechnical waste, in relation to the increasing use of intensive breeding, has raised a delicate environmental issue due to the percolation of sewage that, if excessive, could infiltrate the groundwater. Hence the need to guarantee the quality of the water by spreading the wastewater, both inside and outside the farms, with an increase in production costs. Excessive nitrate loads in both surface and groundwater contribute to their eutrophication, which leads to the depletion of fish species in rivers, lakes and seas. In order to re-establish a balance between the livestock load and the area of land available for the sewage spread, the amount of nutrients should be significantly reduced by using various actions. The use of water resources in processing industries is equally significant, especially in oil mills, dairy industries and tomato processing industries. For each processing activity, the quantities of water resources required for each individual processing stage are identified together with the necessary measures for the correct disposal of the waste produced.

In this context, Prof. La Sala points out that the analysis of water abstraction is essential to raise public awareness on the effects of an incorrect management of water resources. Agricultural activities take an average of 50% of the water resource. For each product, the water footprint can be calculated, consisting of the volume of fresh water used for its production, measured along the entire supply chain. The footprint is a multidisciplinary indicator that assesses the intake of freshwater (direct and indirect) by source and the volumes of pollutants by the type of pollution. It includes water taken from rivers, lakes and groundwater (both surface and underground water), used in agriculture, industry and households, and rainwater used in agriculture. It is possible to trace the water footprint at a national level divided by sector and product category. This has a strong impact on the water resource of meat production, as well as of vegetable oils, which are characterized by a high quantity of water needed for the transformation process. Compared to the production of fruit and vegetables, animal by-products have a higher impact as the calculation of the water footprint takes into account not only the amount of water used for the growth of livestock, but also the amount used for the production of animal feed and forage.

The economic analysis, according to Prof. P.M. La Sala, is an essential moment which is not very developed yet, it assesses the optimal use of water resources, especially in the context of the increasing demand and scarcity of the existing supply. The determination of the economic value of water, without market mechanisms that regulate the demand and supply of water for irrigation, should provide an indicator of the resource shortage. This indicator should be used for obtaining a more efficient allocation of the usage rights, as well as for setting the right rates, according to the capacity of contribution of the eventual users. This approach is based on the concept of the cost for the best alternative in water use: when choosing between different uses and with different economic impacts, the decision-making process should aim to minimise the lower income generated by the alternative uses of a resource stock that is insufficient to cover all the demand. The availability of the economic analysis allows to evaluate the economic, employment and consumption impact caused by the choices of the destination of the resource stock, which includes the different uses in a situation of scarcity or allocation decision that does not cover all the needs.

The determination of the economic value of a natural resource such as the water, is evident in the study of Prof. P.M. La Sala, which is very complex and rests on indirect, specific and variable criteria. Agriculture for irrigation purposes is the first consumer of water resources in the world, including Italy. In determining the economic value of irrigation water, practical problems are notoriously encountered. These problems are linked to the absence of a competitive market and, in any case, to the impact of State intervention on the costs. It is therefore based on indirect approaches of evaluation, which should consider both quantitative and qualitative terms, since the water resource plays a fundamental role in ensuring the quality of production and, therefore, it is a key element in the strategy of the national economy. The irrigated agriculture, given the nature of the products, generates a significant input on the related industries and, moreover, it generates a set of goods and services that, going beyond the production of food and industrial raw materials, benefit the whole society and the natural environment. These advantages of agriculture, including that which uses irrigated and intensive farming systems, correspond to the multifunctionality of the agricultural system: the environmental benefits, the socio-economic development of rural areas, food security, cultural heritage and other social benefits. In determining the economic value of the resource,

multiple context factors must also be taken into account, which make it very difficult to attribute a single and invariable monetary value. For the water resources, it is important to consider specific factors related to the allocation and management methods, as well as to the access, extraction and disposal system. For irrigated uses, the economic value depends on the weather conditions, on the type of cultivation, on the irrigation techniques used, on the prices of the productions, on the scarcity of the resources and on the guarantee of the supply.

Prof. P.M. La Sala also states that, like all economic goods, water also has an economic value due to its scarce availability with respect to the demand, since different users enter into competition. In many ways, in the system that applies to water, multiple needs must be balanced, both individual and collective, because of the private advantages and public externalities that arise from it. Both the short and long term must also be taken into account, with particular reference to infrastructure investments. In the use of water, in fact, there are components of private property (water as a consumer good and a productive factor), but also public property (hydraulic safety, landscape, support of the economic chain, the prosperity of a territory, qualified employment, etc.). In agriculture, therefore, water services can contain a dimension of both private benefit (for example, the advantage of being connected to a water network for the use of water) and also of public good (since the water infrastructure, once present, is available to anyone who wants to connect without particular additional costs, as is typically the case for network services). Examples of water services whose output contains clear characteristics of public good are also the activities of reclamation, drainage and, more generally, of territorial arrangement that aims to make space available to human activities in the proximity of water bodies. A correct economic evaluation of irrigation must take into account all the benefits deriving from the use of water in agriculture.

In referring to the distinction between "utility value", direct or indirect, of the resource, and the " non-utilization value", linked to the utility generated without the use of the resource, Prof. P.M. La Sala insists that in the evaluation of projects and policies for the management of the water resource of a territory, the "marginal value" must be taken into account. This element is decisive for the choice of the correct indicator regarding the economic evaluation of projects and policies that aim to serve the growing demand of cities, productive sectors such as tourism, or even the environment. For a correct evaluation of the alternative uses of water (for example, irrigation, vs. environment, vs. industrial vs. civil uses) the choice of a common denominator is necessary, which should refer to the natural quality of the untreated resource which flows in the rivers or resides in the lakes and in the natural stratum. Therefore all the necessary costs for the treatment, supply, collection, accumulation, transport of the resource in order to make it available to the final user, must be subtracted from the value of use of the resource.

In many national irrigation systems, in fact, the costs of capturing and distributing the resource are of a private nature which is fully paid by the farmers. It should also be noted that irrigation does not only bring direct benefits from the use of the resource for production purposes, but it also provides numerous indirect environmental, economic and social benefits. Studies on the evaluation of the indirect value deriving from the use of the resource in agriculture, have shown a high economic value attributed by the community to the agricultural landscape. This element deserves particular attention in a national context, where rural tourism and the surrounding landscape are elements of strength of the specifically targeted offer. On the other hand, an indirect value linked to the use of the resource in irrigation is also recognizable by the action of contrasting erosive processes, intrinsically linked to the processes of desertification.

II.2. Rural development, management and cost recovery of water resources.

Professor P.M. La Sala, observes that both national and Community policies have long been concerned with the protection and management of water bodies, with regard to health and the main areas of impact of water use. Directive 2000/60/EC (Water Framework Directive - WFD) is a cornerstone in the European Union, which has introduced a major innovation by adopting an integrated approach to water management based on the principle of river basin management and aims at achieving a good ecological status of all water bodies. From a sectoral approach, there has been a move towards systematic management that aims to provide an overall view of the ecological system of water bodies. Water is no longer an element or a

resource, since it is recognised as the ecological dimension that water bodies have within the biosphere, territories and human society.

The water intervention aims to protect and safeguard water for a long-term environmental, economic and social sustainability. It is worth mentioning the structural criticalities that need to be addressed, as well as the appropriate water management measures that need to be adopted in order to make them efficient and sustainable, with regard to water storage, water efficiency and alternative water supply. To this end, it is required: an increased use of economic instruments for better allocation of resources and internationalisation of external costs; better integration of water-related issues into sectoral policies to ensure further dissemination of natural water retention measures, measures to improve the efficiency of buildings and equipment, water reuse and instruments to reduce losses in water supply infrastructure; a more efficient water governance and effective collaboration between institutions, as well as a full integration of qualitative, quantitative and hydromorphological considerations into water management; better knowledge and tools for water managers, for effective decision making and reduction of administrative burden.

The protection of water resources is also supported by the environmental sustainability objectives of the new Common Agricultural Policy (CAP), with its two pillars of intervention. The new programming includes, among the tools for evaluating the efficiency of the administrations responsible for implementing the programmes, also the ex-ante conditionalities. These are certain minimum regulatory, administrative and organisational conditions that the Member State must meet in order to ensure efficiency and effectiveness in achieving the objectives of the rural development policy. Among the ex ante conditionalities linked to the strategic priorities of the European Agricultural Fund for Rural Development (EAFRD), there are the water-related conditionalities, which require the Member State to: (i) have a water pricing policy that provides adequate incentives for users to use the water resources efficiently; (ii) make an adequate contribution to the recovery of the costs of water services in the different water use sectors.

The increase in the efficiency of the irrigation sector can also be achieved through the financing of infrastructure measures which aim to modernise and adapt existing structures, and therefore also the finance irrigation investments. In accordance with the objective of integrating the requirements of the WFD into the rural development policy, the Rural Development Regulation No 1305/13 (Articles 45 and 46) states that irrigation investments may be planned only and exclusively in areas for which the Commission has previously been notified of a river basin district management plan, as required by the regulation. The planning tool should include both the entire area on which the investment is focused, as well as any areas whose environment may be affected by the investment, and should indicate the program of measures to be launched in the district. The planned investment should also include the installation of meters to measure water consumption related to the supported investment. In addition, the Rural Development Regulation specifies investments that involve the improvement of an existing irrigation system or an element of irrigation infrastructure, on the basis of an ex ante evaluation, which must include the achievement of a potential water saving of between 5% and 25%.

Improving the efficiency of irrigated uses of the resources is a primary objective of the rural development programming. However, Professor P.M. La Sala points out that, despite the emphasis placed on the efficiency of water use, the complexity of irrigation accounting has been underestimated and it presents a certain degree of integration between actual and non actual uses. The difference is defined by the ratio between the amount of water actually consumed by the plant and the total distributed or used, as the latter is increasing. The phenomenon depends on many factors (irrigation systems, organization, transport and storage systems) and in recent years it has been highly critical, emphasizing the losses of the system. In reality, the concept of loss is complex and contradictory: the water lost during irrigation serves to generate the "return flows" in the original reservoir, as well as to supply other parts of the ecosystem, such as wildlife. Consequently, it is not definitively lost and should not be attributed to agriculture in the calculation, but more correctly to the environment.

The recovery of the cost of water is a key principle established in the Water Framework Directive which, as Professor P.M. La Sala remarks, is the guide for economic evaluations concerning water services and is

considered an important financial instrument, although not exclusive, for the reforms of water pricing. The Art. 9 of the WFD, in fact, identifies appropriate water pricing policies that encourage a rational use of water resources, as well as an adequate contribution to the recovery of the costs of water services to be paid by the various sectors of employment, including agriculture. In a very concise view, the degree of the costs coverage is calculated as the difference between the amount paid directly by the final beneficiaries and the set of all the costs incurred to provide the service. The portion which is not directly covered by the beneficiaries is assumed to be financed through the public contribution or charged to the general taxation of the public administrations at different levels (state, regions, provinces, autonomous provinces and municipalities). In practice, the process of covering the cost is more complex, due to the complexity of the expenditure structure (investment, operational, resource and environmental costs), the number of beneficiaries, the multiplicity of bodies involved in the supply of the service, the variety of possible forms of public subsidy (local, regional, state).

The first application in drawing up the river basin plans under the above-mentioned European directive was not satisfactory. The application of the principle was hampered by technical, institutional and even conceptual obstacles. The available information is insufficient in providing a measure of all the cost components required by the legislation. The level of cost recovery remains unsatisfactory throughout Europe and in Italy the available data are still inadequate and fragmentary, both with regard to irrigation accounting and the related recovery of costs for the use of the resource. The comparative survey among some EU Member States shows that there is a wide variety of actions on taxation and pricing of the water resources for irrigation in Europe. The principle of effectiveness states that cost recovery should be pursued when economic assessment and subsequent pricing appear to be effective tools for facilitating public decisions and for virtuously changing the behaviour of economic actors.

The principle of cost recovery through the application of incentive tariffs (Art. 9 WFD), as is the case for all directives, has wide implementation margins, leaving the Member States the possibility of declining the most appropriate procedures while respecting the specificity of the administrative structure and territorial competences. The adequate adjective means that the recovery must be significant with respect to the objectives, with prevalence of the contributions that users of the various economic sectors must pay to those who directly provide the water service, over taxes or other forms of taxation. The use of incentive rates may be exempted either on the basis of the disproportionality of the economic amounts in relation to environmental objectives or on the basis of documented ineffectiveness of the pricing policies in pursuing the objectives of the good ecological status of the water bodies.

The analysis of Prof. P.M. La Sala, identifies the various types and systems of financing the costs related to the supply and management of water uses and services, including operating and management costs (direct and indirect), maintenance costs and capital costs (depreciation and financial charges). With regard to management and maintenance costs, the Consortia for land reclamation, irrigation and improvement, which are the main bodies operating on the national territory, are traditionally bound to cover these costs through the contributions paid by the consortium members, which are generally divided according to beneficiary criteria. The consortia, in fact, can draw their income from the commercial exploitation of some available resources and, in particular, from the hydroelectric production by exploiting the resources located along the network. The other part of the financial costs, relating to the cost of fixed capital relating to irrigation investments (depreciation and interest on invested capital), is largely covered by public finance, and therefore by collective taxation, due to the presence of multiple dimensions of public property which characterize the irrigation practice. These public investments, made over several decades, are largely depreciated. Ordinary maintenance is already included in the operating costs of the consortia.

Public finance therefore contributes to the modernisation of supply and distribution networks, also in terms of efficiency of distribution, pressure, etc., to the completion of irrigation schemes and the interconnection of storage basins, to control and measurement systems and to the pursuit of greater efficiency at a company level through the adoption of more water-saving irrigation techniques and methods. The CIPE has identified the financing criteria for the main types of work specified in the national irrigation plan and the completion programme.

Resource costs, or scarcity costs, correspond to the opportunity cost of the resource as such, i.e. the possibility that a given use of a given amount of water permanently removes this resource from an alternative use. The related cost can be shared among the different sectors of water use, through allocation mechanisms that take into account: the availability of water over time, current and future needs, the reproducibility of the resource and its quality, destination constraints and economic-social and environmental effects that can be produced by the different uses and non-uses impact on the economy, effects on the induced, environmental impact, social benefits). The internationalisation of this cost, which can be approximated with the concession fees for the derivation within the operating costs of the service, would ensure its coverage as well as the other items of the financial cost.

The environmental costs correspond to any negative externalities generated on other parties and not necessarily related to water as such (the external cost of a dam may include the landscape impact of the construction). These costs, according to the current legislation, must be internalised, by financing the necessary measures for rehabilitation. In this sense, they represent the economic value of environmental damage related to the degradation of aquatic ecosystems and the impoverishment caused by a particular use of water. However, part of the residual environmental costs will not be internalised as they are considered socially and economically acceptable. For the quantification of negative externalities and their recovery through economic instruments of various kinds, it is also necessary to identify and quantify the environmental benefits associated with irrigation (positive externalities). The cost recovery instruments relate to the two main options of state and final user taxation, which are often presented as alternatives to each other. According to Prof. P.M. La Sala, the excellent economic principle does not provide for the coverage of the full costs, but it rather requires that each user be attributed the marginal cost (which in the case of activities with high fixed costs could be limited or negligible, in any case much lower than the full cost) and, moreover, considers that the different ways of covering costs (prices, taxes, tariffs, contributions, taxes) in reality are placed along a continuum in which there are different nuances. With respect to the two extremes (attribution of the full cost to the single individual and to the community through the general taxation), many intermediate solutions can be traced. The amount paid by the users can reach the coverage, but within wider communities, admitting flows of cross-subsidisation between different users according to the territorial position, or between the different services offered to the same community.

An appropriate criterion for the cost allocation, according to Prof. P.M. La Sala: 1) should attribute to each user the marginal cost; 2) the desirability of the infrastructure should be established on the basis of a social analysis of costs and benefits for fixed costs and, therefore, the related costs allocated according to the optimal taxation; 3) the first best assumes that they are allocated to different individuals in proportion to the benefit that each derives from the existence of the infrastructure; 4) as a second best, if the public budget encounters restrictions, the fixed cost can be recovered through the direct attribution to users.

II.3. The cooperation of Land Reclamation Consortia, ANBI and Irrigants d'Europe for a revision of the WFD.

Italy is a country that has considerable renewable resources (surface waters) and also spring and underground waters, with abundant rainfall. The establishment of the Consorzi di bonifica, as Prof. P.M. La Sala points out, has responded to the needs of reclamation, of hydrogeological and sanitary defence and subsequently to those of the water service. In some rural contexts, the water service supplies a number of users (civil, industrial: hydroelectric and agricultural). ANBI is the national association that belongs to the reclamation consortia and represents the first national operator in terms of territorial coverage, users, services and volumes distributed. ANBI, together with its Portuguese, Spanish and French counterparts, joins Irrigants d'Europe, which promotes the revision of the WFD and a specific study on the principle of water cost recovery.

The contribution systems applied by the Consortia for reclamation and irrigation in general correspond to two major chapters of budgetary expenditure: the reclamation and water service. Through the classification plan, the consortia share out, on the basis of the benefits of the reclamation, the operating and maintenance costs of the actions and works for the settlement, drainage and hydrogeological protection of the administered areas. All the residents of the administered areas for whom the benefit of

the reclamation is demonstrated, are subject to the payment of the annual fees distributed per hectare. The financing is carried out on a tax basis, with special purpose taxes, of a public-positive nature, justified by the economic nature of the public good of the reclamation service. The operating and maintenance costs of the water networks for the collective water service are very diversified among the supply bodies that operate in the territory. They are recovered through systems of direct contribution by the users of the service, to whom the service is actually provided. The demand for irrigation, unlike other sectors (civil and industrial) varies during the year and between the years, both by virtue of weather trends and the choices of crop distribution which are often conditioned by the market prices.

In addition to the pre-eminent collective service of the ANBI consortium networks, there are numerous other municipal, provincial and regional networks that are managed by public and private bodies. These networks, although marginal in terms of volume, have a collective nature. The other part of the irrigation service in Italy is operated in self-supply directly inside the company or outside and can take place both from surface and underground sources. The costs transferred to users for the use of the water resources relate only to the environmental and resource costs, since the financial and operating costs are all of a private nature and are paid by the users.

In Italy, access to water resources is regulated by a system of concession of use, which is the responsibility of the Regions, which impose the payment of a fee for the use of the resource. The Italian Government plans to implement a volumetric pricing system for all users (both collective and self-supplying) with the aim of recovering the environmental costs and resources ex DM environment n. 39/2015. The "command and control" approach is generally predominant since the access and discharge points are subject to a regional licence and, in any case, environmental costs have been avoided thanks to a system of control of water withdrawals and discharges. The approach is not adequate in regards to non-punctual pollution, as in the case of agricultural fertilizers.

Since irrigation has deep interactions with natural and productive ecosystems, it is emphasized by Prof. P.M. La Sala that it can be a general externality, i.e. positive or negative variations on the level of well-being of other subjects without a monetary compensation. Irrigation can have consequences for the hydrology, the ecological conditions and the quality of the water resources of the territory, which intervene in the different phases of irrigation, even if the changes do not always determine externalities, when there are no positive or negative effects on the well-being. The main types of externalities produced by irrigation can also be divided into environmental and social. Among the social externalities, the quality of food production should be mentioned above all. The guarantee of irrigation has made it possible to develop a modern, high-quality agri-food chain. An economically sustainable system, which also takes into account the costs of irrigation, must therefore be maintained on the territory

Prof. P.M. La Sala explains, the definition of the value of externalities, depends essentially on the interaction with the involved economic subjects and on the consequent variation of usefulness. With specific reference to irrigation, the value of externalities depends on all the possible usefulness/disutility generated by the use of irrigation water. These variations can be traced back both to direct and the indirect use, and to possible passive values. In addition to the values linked to the use, individuals can attribute a value to the resource regardless of its actual immediate use. These are passive values (or values of non-use) and can be traced back to the option value, the bequest value and the existence or intrinsic value.

The main methods of assessing externalities related to the use of irrigation water can be schematically divided into two categories: indirect and direct. The indirect approach is based on the possibility of estimating the value of an externality by observing the behaviour of economic agents on the market of real goods, that is, of investigating the equivalence between the lost utility and the sum of money needed to restore it. This is done by analysing the function of expenditure of the individuals or the production costs of the enterprises. The indirect approach normally has shorter costs and times than the direct approach. Moreover, estimation methods can be distinguished from estimations and revealed preferences. The evaluation methods are called primary methods, since they allow the externality from time to time to be assessed in an appropriate and, as far as possible, precise manner, even if they may have high times and costs and are often inconsistent with the purposes of the evaluation itself. The so-called benefit transfer

approach, on the other hand, is a widespread practice of assessing externalities based on the use of evaluations that have already been carried out on similar situations. Its advantages, compared to primary evaluations, essentially consist in the cost and the short time. This is a second best, when it is not possible or reasonable to use a primary procedure.

According to Prof. P.M. La Sala, the principle of recovering the cost of water is still difficult to apply in the irrigation sector, despite its central role in the application of Directive 60/2000/EC and despite the studies and research that have been carried out for more than a decade. The discussion lacks the availability of a coherent and shared knowledge framework. The contribution of Prof. P.M. La Sala confirms, together with other European studies, that the problem of cost recovery is not only a matter of political will or environmental assessment, but it also requires the definition of clear evaluation objects, shared methods, of the subjects involved and the training of the appropriate know-how among the subjects in charge of the evaluation and implementation of the measures. In this sense, the Land Reclamation Consortia, ANBI and Irrigants d'Europe can, at different levels, offer a significant contribution, in terms of analysis, proposal for revision and direct assumption of responsibility in the implementation of the measures provided for by the WFD.

In the national context, according to Prof. P.M. La Sala, the main criticalities concern the scarce availability of information, the lack of connection between the cost monitoring and accounting framework, as well as the institutional structure of reference. In Italy, despite the presence of the Consorzi di bonifica, which are mainly responsible for the costs of water supply in the agricultural sector, it has not yet been possible to assess accurately the recovery of costs that requires a review of the current accounting system, while the role of the other parties involved is to be better defined. Compared to other European countries, the national legislation for managing access to water resources through the concession system and the consequent application of a fee (tripled in the presence of drinking water) is more advanced regarding the recovery of the environmental and resource cost component which wass introduced by a Community legislation in 2000/60/EC.

In the conclusions of Prof. P.M. La Sala, there are two challenges that our country must face with regard to the creation and implementation of a primarily water-based accounting system, which can be followed by an economic accounting system. While the directive has introduced economic analysis as an innovative tool for the management and protection of water resources, the management of the resource also in the protection plans still suffers from the dictatorship of engineering planning. A greater multidisciplinarity of technical expertise is needed, especially of a socio-economic nature, within administrations at all levels. In this sense, Italy does not appear to be different from other European countries.

II.4. Some critical aspects to be reconsidered in the WFD.

The economic analysis carried out by Prof. P.M. La Sala highlighted a number of critical elements and, at the same time, offered important food for thought for proposals to improve the current discipline. The collected information, through the Consorzi di Bonifica, ANBI and Irrigants d'Europe, can be shared with stakeholders from the world of agriculture and water management. In this sense, the approval of the WFD regulatory revision measures could be solicited together. For the purposes of exhibition convenience, the items in Irrigants d'Europe's Position Paper of 25 April 2018 will be included both according to order and content. These points are relaunched and are intended to be further developed through the organised activities of information, dissemination and comparison that will take place in Italy with all stakeholders at a regional and national level.

Firstly, it is well-known that European and national policies and regulations as a whole have helped to modernise the irrigated agriculture. This has significantly contributed to the economic development and food security of European society as a whole, as well as of the Italian society. Also, thanks also to the investments made with the CAP, the agricultural sector has been able to achieve sustainable and environmentally friendly growth, and has become among the most advanced and innovative sectors. Irrigated agriculture has a great potential for the production of public goods, relying on excellent technological and innovative capabilities to support the common objectives of promoting the quality and sustainability of agricultural production. It has also contributed to food security, adaptation to climate

change, the promotion of the bio-economy and the circular economy. The European rural society as a whole, and the Italian rural society in particular, rely heavily on the availability of water resources and are committed to keeping them in a good condition, so as to continue to contribute to the production of food, biomass, the protection of the environment and other social assets (so-called positive externalities).

Regarding the process of revising the WFD (art. 19), also from the Italian perspective, action should be taken on the following points in order improve the current rules:

1. Article 4 - Access to resources

In the past years, reducing water consumption has been the main tool for maintaining the dilution capacity of water bodies at the required level, but other measures must also be applied to support the quality of water. For example, reductions in pollutant loads, restrictions on their use and advanced tertiary treatment should be considered to remove them from urban and industrial wastewater. This would reduce the need for dilution in natural and artificial water bodies, allowing the mobilisation of water resources needed for productive uses, without compromising the socio-economic sustainability of irrigated agriculture.

2. Art. 4 - Single principle, total

The application of the "*one-out, all-out*" principle has obvious criticalities, as it discourages improvements and it does not reward the efforts made and the results obtained, even if partial. The factors of uncertainty and variability have also not been taken into account. Therefore, it would be preferable to apply more flexible criteria in the evaluation of water quality, instead of the "*one-out, all-out*" principle. It is hoped that the necessary step-by-step approach will be adopted. There should also be a recognition and reward of the gradual improvements in the quality assessment of the water bodies, by taking into account the economic aspects and setting realistic objectives, based on natural conditions, different water uses and the effects of climate change.

3. Article 5 - Economic analysis

In the implementation of Article 5, the economic analysis was directed only in regards to the application of the water rate system, in accordance with Article 9. The criteria of the economic and social analysis should be extended in order to avoid unbalanced and, in any case, partial cost/benefit assessments. The overall and actual impact on rural society, the agri-food sector and general food security must be assessed. All positive, economic, social and environmental externalities resulting from the irrigated use of water should be considered.

Therefore, Annex III needs to be revised and fairer criteria should be developed and implemented. In addition, the revision of Annex III falls under the provisions of Article 20.

4. Art. 9 - The price of water and 'the polluter-pays' principle

Irrigated agriculture has made considerable efforts and investments to meet the EU environmental standards of water protection. Farmers are not in a position to bear additional and higher environmental and water resource costs for irrigation.

On the one hand, it is not possible to further exploit water or monetise the ecosystem service of supplying fresh water for agricultural purposes. On the other hand, it should be kept in mind that irrigated agriculture generates many positive externalities that have not yet been detected. For example, agricultural water networks provide ecosystem services similar to those provided by natural water bodies, but their costs are largely sustained by farmers.

The application of the polluter-pays principle of the directive is unsatisfactory in practice because it is costly, time-consuming and highly bureaucratic. Increased water costs would also damage the implementation of modern agricultural irrigation as a sustainable and climate resilient form of agriculture. Moreover, it should also be considered that in the southern European Member States farmers' organisations, in Italy the Land Reclamation Consortia, have always been responsible for the construction and maintenance of agricultural infrastructure. Irrigation infrastructure is currently used for a variety of

purposes, such as drainage and flood reduction for urban areas. These activities are carried out mainly at the expense of farmers (construction, maintenance and management costs).

5. Article 14 - Stakeholder involvement.

A greater and direct involvement of stakeholders at different levels is necessary, as foreseen by the WFD. Public participation contributes significantly and effectively to the management of water resources. To achieve the objectives set out in the WFD, stakeholders need to work in synergy and on an equal basis with the European institutions.

More effective and inclusive participatory approaches are needed through all the Member States in order to facilitate the participation of stakeholders in irrigated agriculture, including the Land Reclamation Consortia in Italy. To this end, it is necessary to first remove the obstacles to the technical understanding of the subject and implement the comparison with all *stakeholders*.

6. Emerging contaminants and uncontrolled non-agricultural sources of pollution

Since the WFD came into force, farmers have had to implement action plans on a mandatory basis, effectively reducing the negative impact of agriculture on water quality. However, other surface and groundwater pollution factors such as leakage, breakage, malfunction and undersizing of industrial and urban wastewater treatment systems have not been considered so far. In addition, untreated rainwater from densely populated areas has increasing concentrations of harmful substances. Emerging pollutants, including medicinal residues and microplastics, have highly harmful effects on the society due to their negative impact on the food chain and the quality of irrigation water.

The rapid increase in the amount of pollutants and their concentration in treated urban wastewater and untreated effluent has reached an alarming level, particularly when these streams reach natural watercourses and aquifers. Therefore, more attention needs to be paid both to non-agricultural sources of pollution and to the wide range of products causing detectable concentrations of emerging pollutants that waste water treatment plants are currently unable to remove.

These new classes of pollutants cannot be managed by farmers and water managers, not even by wastewater treatment plants. It is therefore necessary to avoid these harmful substances, which are almost impossible to remove from the water cycle, or, depending on the case, limit their use in industrial production or take appropriate action against improper use.

7. Water conservation and reuse

Especially in water-poor regions of the EU, water saving is vital not only for irrigated agriculture but also for human consumption. Even if the original flow conditions are restored in the rivers, severe water scarcity can occur during the mid-summer months and in years of severe drought. Strategies can and must be adopted to deal with such situations.

On the one hand, water storage and reuse are effective strategies for reducing abstraction from groundwater and water surfaces and for further improving their efficient use. The development of water deposits, from small on-farm deposits to large reservoirs, is therefore the most important means of addressing water security. Water managers and farmers need fiscal and financial incentives to make this happen (subsidies, fiscal incentives, skills). A reduction of the bureaucratic load for the implementation of interventions (licensing, planning) is necessary to address hydrological changes. Due to the very low return on investment index (ROI) that characterizes investments in the agricultural water sector, the adoption of such resilient strategies must be encouraged.

On the other hand, a different and competing efficiency strategy concerns water reuse. There is a high potential for water reuse for agricultural irrigation, but this water needs to be treated through the application of "fit for purpose" criteria. Bottlenecks must be overcome. For example, both consumer misperception and perceived legal liability are still slowing down the further use of these waters.

For these reasons, long-term plans and support actions are required to overcome the various difficulties that currently hinder the storage and reuse of water. In particular, the bureaucratic burdens and barriers,

consumer perception and legal responsibilities that, in various ways, are still slowing down the further re-use of these waters should be highlighted. The WFD should strengthen the dynamics of simplification of European legislation and procedures, and consequently of national and regional ones, by giving an active role to stakeholder organisations in the storage and re-use of water resources for irrigation purposes.

8. Heavily modified and artificial water bodies

In accordance with Article 4(3), a very large number of water bodies were assessed for designation as an artificial water body or as a heavily modified water body until 2008/9 as in the CIS Guidance Document No 4. The CIS guidelines provide guidance for identifying measures leading to Good Environmental Status (GES), restoration measures, in particular hydromorphological changes. These measures may range from reducing the environmental impact to completely removing the physical alteration. In many cases, however, "physical alterations" have been in place for centuries, protecting life and resources from flooding or drought. In particular, water supply and flood protection interventions of such bodies of water would be significantly affected by the restoration of the measures that are necessary to achieve good ecological status. The "wider environment", including rural society, would be equally injured. Moreover, it should be noted that many water infrastructures are now fully integrated into the environmental, economic and social system on which they have been relying for some time.

Appropriate criteria are therefore needed to identify technically feasible and cost-effective environmental options for achieving a good ecological status of artificial water bodies or heavily modified water bodies, with specific uses of water supply or flood protection as a top priority. In any case, water infrastructure stakeholder organisations should be directly involved in the definition and application of these criteria.

9. Underestimation of climate change

The primary production sector is the economic sector most affected by climate change. Indeed, water resources are affected by the quantity, variability, timing, shape and intensity of rainfall. More than ever, climate change impacts negatively on Europe's freshwater ecosystems, their biodiversity and ecological status, introducing serious risks to the achievement of the WFD objectives.

Due to rising air temperatures and changes in rainfall distribution and intensity, crops water demand is increasing in much of Europe. At the same time, soil water and groundwater storage are under stress. Despite all the efforts undertaken by irrigation agriculture, such as the implementation of timely irrigation programmes, the modernization of irrigation infrastructure and the optimization of water use, climate change is still a factor that significantly affects the biodiversity and ecological status of water bodies. This translates into a widespread trend towards the degradation of water quality. In this context, the negative impact of irrigated agriculture on water quality is in many cases overestimated and needs to be objectified. If the focus is only on agriculture, in fact, there is a risk of neglecting other significant pressure factors that are developing.

We therefore call for a review of the objectives and standards that limit the satisfaction of agricultural needs in order to achieve environmental objectives. Greater flexibility is needed in assessing the application of restrictive measures and taking into account the current and future effects of climate change on plant production patterns must be taken into account.

Prof. Pier Michele La Sala – Università di Foggia