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PARTICIPATORY WATER MANAGEMENT AND CULTURAL HERITAGE: ITALY COUNTRY REPORT

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SUMMARY - Water savings techniques and experiences are crucial to the development pattern of almost all countries in the Mediterranean area, where both land and water are scarce resources limiting agricultural production and overall development of the region. In Italy, unfavorable climatic conditions and complex physiographic and morphological context have made necessary the centuries of initiatives and investments in land reclamation, flood protection works and irrigation, which required adequate legislation support favoring the cooperative and participatory approaches in land and water management. This report analyzes the evolution of the water policies and legal framework for land and water management in Italy, giving a historical outline of initiatives carried out during the last Century and, then, focusing on the recent regulatory and organizational setup. The experiences and functioning of the main institutions working in water sector are presented and analyzed, also in a comparative and descriptive approach, highlighting differences and level of responsibility. A particular attention is given to the evolution of participatory approach in irrigation sector, territorial distribution, main characteristics and duties of Consortia in Italy.

Key words: Participatory Irrigation Management, irrigated agriculture, legislation in water sector, Irrigation Consortia, Italy.

IRRIGATED FARMING IN ITALY: HISTORICAL NOTES

In the Mediterranean regions of Italy, the agricultural production has been strongly related to the availability of water since the ancient times. In fact, the early works referring to water application to crops were published more than 2000 years ago by Cato (approx. 180 BC), Varro (37 BC) and Virgil (30 BC). Since those periods, Roman aqueducts have been presented in many areas imposing an example of advanced and long-lasting structures delivering water for agriculture and domestic use.

After a general decay in the "dark centuries", an upsurge in irrigation was brought about by the Arab domination in Southern Italy and Sicily by the end of the first millennium. In fact, in these times, water was managed with a considerable skill to irrigate gardens and farms. Arab philosophy considered water as a Godsend to be respected and tended, and, as a consequence, fine works of hydraulic engineering were developed aiming to rationally capture, convey and apply water: a number of fountains graciously embellishing gardens were built where water gushed and sang before irrigating ornamentals. Furthermore, Arab heritage to Italy includes techniques to lift waters, such as "norias" - in use till a few decades ago, the check-basin method of water application - still in use to-day, and a number of terms to designate water appliances.

Since those times, no major progress in irrigation occurred for many centuries. In spite of the progress in hydraulics, which permitted to accurately design conveyance structures (mostly open channels), the rules to apply water to crops remained basically empirical and often contradictory. The numerous terms used to describe water volumes and flow rates (still in use to-day in some areas, in spite of the "metrication" brought by the French revolution and later by the International Standards) added to the confusion. In fact, only in the second half of the nineteenth century the attention was focused on the volumes of water to be applied to the main crops (regardless of the soil and climate conditions), and the various methods of (surface) water application (Alfonso, 1877;

Cuppari, 1870; Lo Re, 1898; Ridolfi, 1862). Since those times is in use a method of subsurface irrigation (the so-called “catuso”) applied mainly in citrus plantations (Alonso, 1877) and still to-day sporadically in use in the Maghreb countries.

The second half on nineteenth century represents also the period in which the first serious initiatives and investments in land reclamation and flood protection works and, then, in irrigation, have made. This has contributed to a significant improvement of the conditions of agriculture and has permitted the fist unions of farmers aiming to reach high productivity levels. Accordingly, for more than 150 years, these efforts have been followed by the progressive modification of the legislation on support to local structures and farmer’s unions working on the improvement of conditions for agricultural production. In fact, the history of irrigation in Italy has proved that the sector of water for irrigation has had since ancient times an institutional set-up based on users’ aggregation.

AGRICULTURE AND IRRIGATED FARMING IN ITALY: ACTUAL SITUATION

Nowadays, approximately 41 per cent of the Italian territory is used for arable agriculture and permanent crops, and 15 per cent as permanent grassland; about 21.3 per cent is covered in forest (Table 1). The process of urbanization is progressively absorbing land in Italy; urban areas, mainly for residential use and for industrial infrastructure, are increasing and are estimated at about 2.8 million hectares or 9% of national territory (Table 1), while other unproductive areas account for 10.4% of territory. On the other hand, the agricultural land area is continuously decreasing: since 1970 the agricultural area utilized diminished by 2.8 million hectares (-16%) according to data from the most recent survey of farm structures. This is a phenomenon which affects all developed and industrialized countries. Land is, thus, becoming an ever-more precious resource, especially in countries which, like Italy, have a high population density and where national territory is subject to considerable variation in altitude.

Table 1. Land use in Italy and EU countries (%) (Source: INEA, 1995, ISTAT, 2002)

	Italy	Other EU Mediterranean countries (*)	Other EU (**)	Total EU
Arable land (1)	29.6	27.9	30.5	29.6
Permanent crops (2)	11.0	9.2	1.1	4.9
Vegetable gardens	0.3	-	0.2	0.2
Permanent meadows and pastures	15.0	11.6	25.1	19.7
Woodland	21.3	33.5	22.1	25.5
Inland waterways	2.4	1.2	1.7	1.7
Unproductive areas and other land (3)	20.4	16.6	19.3	18.4
TOTAL AREA (000 ha)	30,132	72,872	133,816	236,820

(*) Greece, Spain, Portugal.
(**) France, Germany including ex GDR, Benelux, Denmark, Ireland, Great Britain.
(1) Including temporary forage crops and set aside.
(2) Tree and other permanent crops.
(3) Civic and industrial settlements, infrastructure, rocks and barren land; abandoned and uncultivated land, ornamental parks and gardens, farm land under buildings and road are included under other headings.

Agricultural population accounts around 3.5 millions and it has decreased in the last 20 years for about 2.4 millions (more than 40%). According to ISTAT (2002), active agricultural population is about 1.55 millions and represents only 6.1% of the total active working population (25.3 millions). The differences among regions are particularly pronounced between the industrialized, affluent north and the less developed south, the Mezzogiorno. Statistics continue to show a wide gap in the socio-economic conditions of the two parts, despite massive and long-standing efforts to achieve a better balance.

Similarly, the variety of the physical and pedological features and climatic conditions diversify the Italian irrigation and ascribes it to at least two climatic complexes:

- the sub-humid zone of the north and the “Po Valley” extending towards the inland valleys of the center of the Peninsula;
- the sub-arid zone of the south with increasing aridity, especially in the South-eastern part and two main islands of the Mediterranean sea, Sicily and Sardinia.

The northern sub-humid zones have substantial annual precipitation rate in the range of 1000-1200 mm, while the Southern Italy is characterized with scarce hydrological potential and low annual precipitation rate in the range of 500-600 mm. Nevertheless, irrigated agriculture plays an important role over the whole territory mainly due to the facts that precipitations are unevenly distributed over the year and the irrigated land can produce an average net income for about 2.5 times greater than rainfed agriculture (4,500 Euro/ha against 1,800 Euro/ha), as estimated by ANBI (1992).

In Italy, more than thirty billion cubic meters of water (or almost 60% of total water withdrawal) is allocated to agriculture to cover potentially irrigable surface area of about 3.882 million hectares. Out of these, more than 2.5 million hectares are served by networks managed and maintained by the land reclamation and irrigation Consortia. More than 1.3 million hectares that do not fall under the competence of the Consortia are irrigated through waters from wells, springs, small reservoirs and small water systems managed by the farmers.

Slightly less than two thirds of the irrigated area is in the Northern Regions, involving 34.9% of farms with UAA (Utilized Agricultural Area) and with an average area per farm of 6.5 hectares. In the Center, only about 17.9% of farms are irrigated, whereas in the South the practice is carried out on 25% of farms with a total area of 758 thousand hectares, equivalent on average to 2.2 hectares per farm (Table 2). About 62.3% of irrigated land in located in the North, 9.1% is in the Central part of the country while 28.65% is situated in the South.

Table 2. Farms and irrigated area in Italy (Source: INEA, 1995; ISTAT, 2002)

DISTRICTS	FARMS		AREA IRRIGATED		
	no.	% all farms UAA	[ha]	[% of total UAA]	aver. per farm [ha]
North	254,483	34.9	1,650,935	32.2	6.5
Centre	73,718	17.9	239,769	8.9	3.3
South	337,915	25.2	758,354	11.0	2.2
ITALY	666,116	26.8	2,649,058	18.0	4.0

Recent data on irrigated agriculture, published by ISTAT in 2002, indicated that the sprinkler irrigation methods are dominant covering about 41.3% of total irrigated land (Fig. 1). Surface irrigation methods are also largely applied (furrow 33.5%, flooding - basin 8.6%) and they are particularly spread in North-western Italy where they are used at about 775,000 ha (or at 79% of all irrigated land). Drip irrigation methods are applied at 11.5% of irrigated land (mainly in Southern Italy), while micro-irrigation and other methods are used at about 5.1% of irrigated land.

The data related to the sources of water for irrigation, presented in Figure 2, have revealed that the greatest part of water for agricultural use is withdrawn from surface water courses (48.5%) and groundwater (41.5%), while only 10% of water comes from other sources. These data emphasizes a significant increase of water obtained by water harvesting practices (5.6%) which represents one of the results of the recent Italian water policy. In fact, the last law on water resources (so-called "Merli law" from 1994) grants to the farmers out of charge the harvesting of rainy waters into reservoirs and tanks on the fields. Finally, it is important to underline that the amount of treated wastewater use in agriculture is still very low and it represents only 0.2% of the total water supply for agricultural purposes.

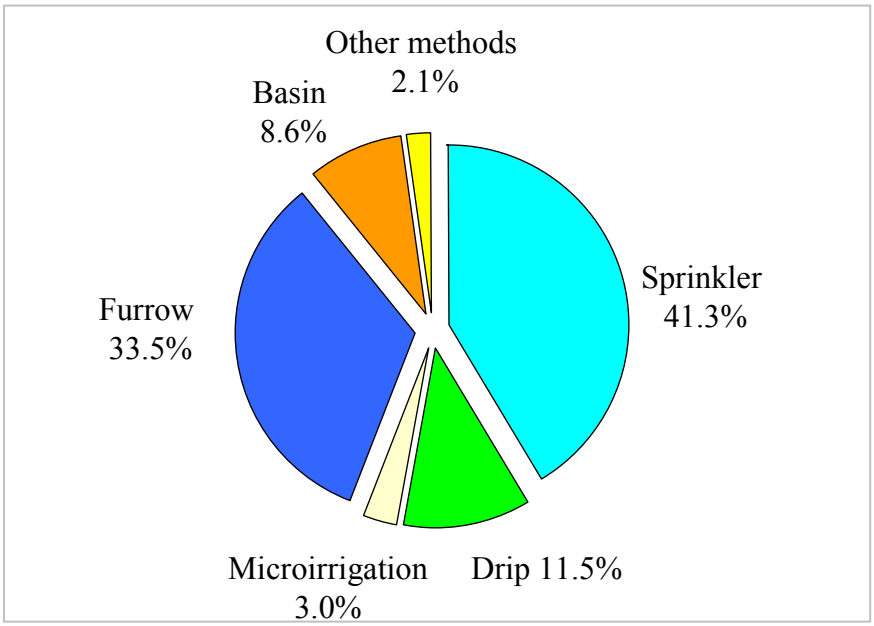

Fig. 1. Irrigation methods in Italy (Source: ISTAT, 2002)

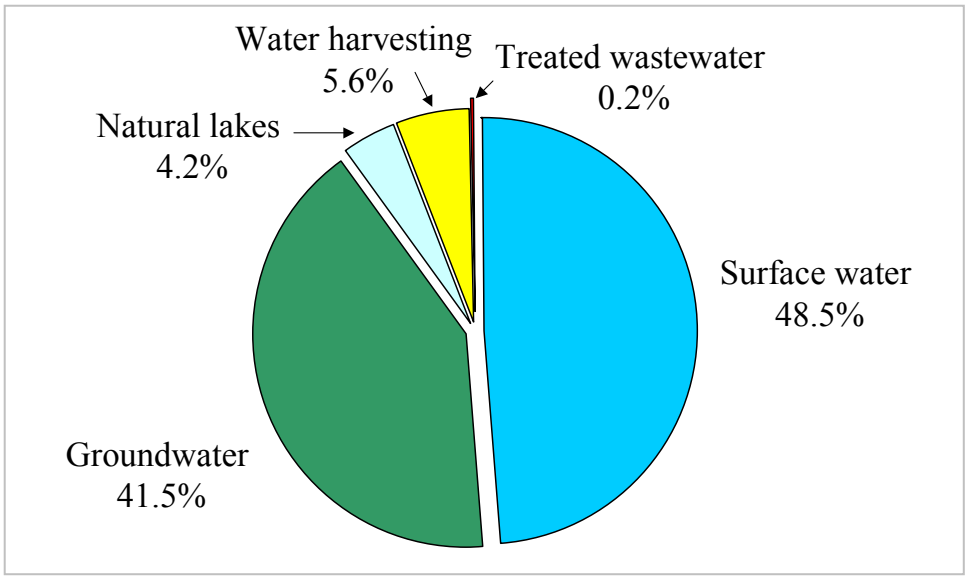

Fig. 2. Sources of water for agricultural use in Italy (Source: ISTAT, 2002)

NATIONAL WATER POLICIES AND LEGISLATION ACTS: A HISTORICAL OUTLINE

The framework of responsibilities in the management of land and water resources has a long history and it has been strengthen through a series of laws and other legislation acts, as synthesized in Figure 3. The law of 1865 on the prevention of disasters from flooding and inundation has provided the fundaments for a voluntary organization of farmers into private associations (Consortia) of common interest in the diversion and use of water, or in the reclamation of land. This law stated that waters are public good while the water works are of private interest, and, consequently, their execution and maintenance had to be assured by the concerned owners of the land. This law has contributed substantially in a proliferation of private irrigation Consortia by the end of 19th and at the beginning of 20th Century. At the same time, by the promulgation of numerous laws, the State has

recognized the general concern of the water sector resulting in the financial participation in the execution of hydraulic works. In fact, throughout the years, the successive laws have gradually attenuated the private nature of both water and hydraulic works, as well as the corresponding Consortia.
After the World War I, the most important law related to land and water management is R.D. 13-2-1933 N° 215, which introduced a set of regulations for comprehensive land reclamation directed to make private and public actions unitary despite their major distinctions. The scope was to change the land tenure system and to focus the initiatives towards the optimum economic and social results to both, producers and consumers. This decree has given the bases to Italian legislation in water sector and it represents the bases of many successive legislation acts.
The R.D. 215/33 recognized the public interest for land reclamation and soil and water conservation indicating a whole set of activities which produce relevant hygienic, demographic and social benefits. Furthermore, this decree included irrigation between the public reclamation works and introduced two new types of consortia:

a) private Consortia of public concerns - *Land Improvement Consortia* – for the achievement of specific objectives in agreements with global interest (farmers contribute financially in the execution of the works at their land);
b) legal public Consortia – *Reclamation Consortia* – for the achievement of the common large-scale objectives of the law.

Successively, by the end of the same year, the Italian State had issued R.D. N° 1775 on the "Norms for the water use and electric plants" which declared public all waters from water courses, other water bodies, springs and aquifers that are or become of general interest. This decree provided normative on the concessions for water use as a public good, defined Consortia for the use of public water and presented special dispositions on groundwaters. The integration of this normative has been made only in 1993 by the D.L. 275/93.

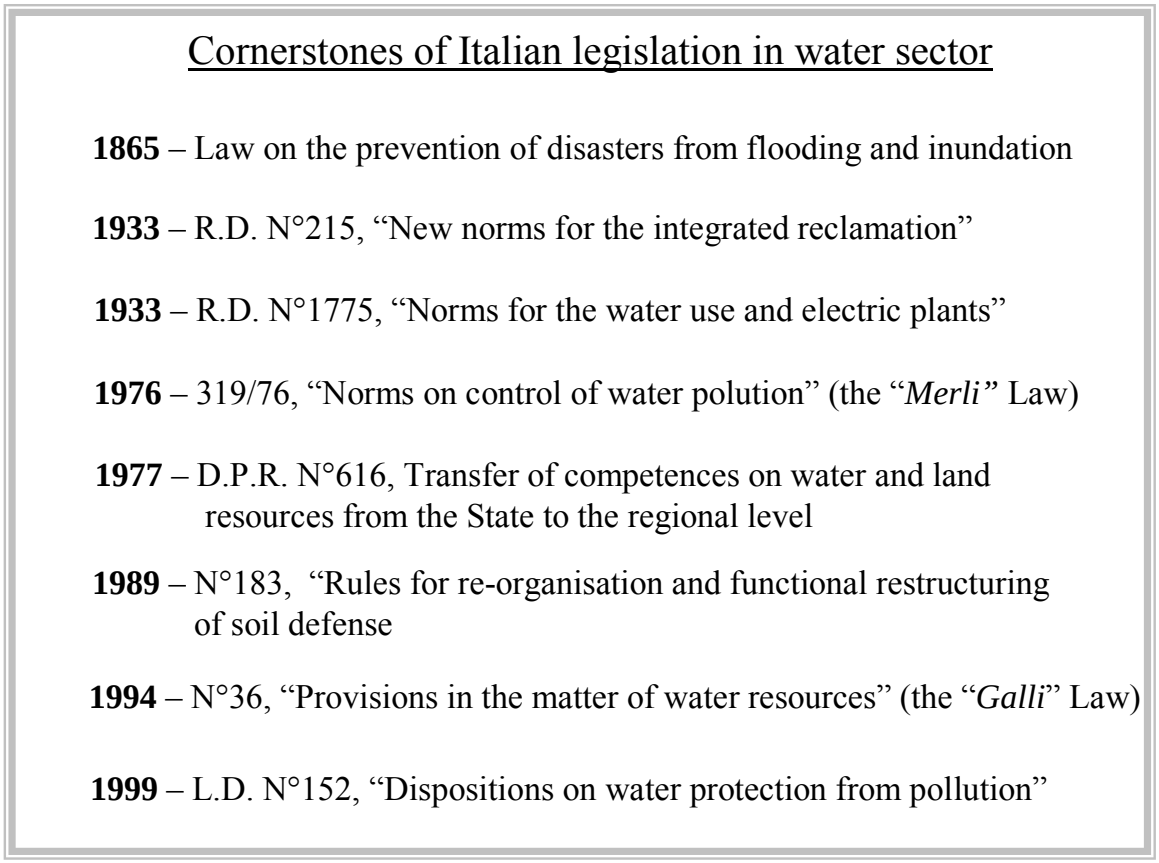

Figure 3 - Cornerstones of Italian legislation in water sector

The first comprehensive water legislation after World War II was in 1976 the 319/76 Water Pollution Control Law (the "*Merli"* Law) which regulated the discharge of industrial and municipal effluent into surface and ground waters. Presidential Decree 515 of 1982 incorporates EC directive 75/440 and it was the first Italian legislation dealing specifically with *drinking water.*

In the seventies, after the institution of the regional authorities, has occurred a progressive transfer to them of public administration functions in the matters of agriculture and land and water management. These competencies include water policies, hydrogeological constraints, thermal and mineral waters, aqueducts, surface and groundwater, small derivation of public waters, multi-sectorial water use, public waters, catasters and uses, water protection, hydraulic works and watersheds and roles of Reclamation Consortia and Mountain communities. In fact, since this period, the Italian Consortia have been subjected to a double and concurrent legislation of the State and of the Region; the former is involved only in the determination of the fundamental principles that govern such bodies while the latter is implicated in the reclamation and land improvement works, concessions on water use, etc..

In the eighties, a general concern on the necessity to manage integrally land and water resources within the river basin hydrological boundaries had been achieved. This has resulted in one of the major pieces of water legislation in Italy - the Framework law 183/89 on the "Rules for organisation and functional restructuring of soil defence". According to this law, the Italian territory was subdivided into 29 technical and administrative basin authorities with the task to draw up watershed plans for guide the regional authorities in land use planning and setting of water quality objectives. The basin authorities are authorised to operate in the competent watershed with the function to co-ordinate the competencies subdivided between the State, the regions and local authorities. The river basin authorities, organized into Institutional Committee (of political nature) and Technical Committee (of technical and advisory nature), articulated the course of approval and enforcement, role and function of different territorial bodies (Provinces, Municipalities, Consortia, etc.) and National Technical Services that, in the framework of their own competencies, participate in the implementation of the activities scheduled to fulfill the objectives of the law.

Another important piece of Italian legislation in water sector is the Law 36/94 on water resources of January 1994 (better known as the "Galli" Law) which deals with the consolidation of water services (both water supply and wastewater treatment) into larger management units, and authorizes the regions and municipalities to set user chargers and raise finance. This laws has introduced the concept of ATO - "Ambito Territoriale Ottimale " - i.e. Optimal Territorial Domains for integrated water management within the urban sector which should be established following the main hydrograhic boundaries and boundaries of municipalities in order to overcome the fragmentation of management services and to achieve adequate sizes in terms of population served and water volume delivered. The "Galli" law addressed to the Basin authority the tasks of a periodical update of water balance and estimation of available and exploitable water resources as well as the water requirements for different uses (including minimum flows and environmental needs. This law is declared the priorities for water supply to domestic, agricultural and industrial sector, respectively. The law 36/94 also stated that all water sources (including groundwater) should be licensed and invoked the necessity to the application of economic criteria in water use and management. Furthermore, the "Galli" law promoted the sustainable use of land and water resources and implementation of water saving strategies as:

- the diffusion of techniques and methods for the water saving in agricultural, domestic and industrial sector;
- the restoration of the leakage-exposed water distribution systems;
- the installation of dual distribution networks in new urban and industrial settlements of relevant dimensions, etc.

In accordance with its general objectives, the "Galli" law authorised the Reclamation and Irrigation Consortia to the use of multiple water systems provided they are renewable and compatible with the reuse in irrigation sector.

The last important national legislation act is the Legislative Decree N° 152, from May 1999, related to the "Dispositions on water protection from pollution". This decree intended to fulfil the EU Directives 91/271/CEE on the urban waste-water treatment and 91/676/CEE on the protection of water against pollution caused by nitrates from agricultural sources. The L.D. 152/99 anticipated the content of the EU Framework Directive on Water and amended all previous laws (R.D. 1775/33, L. 183/89, L. 36/94) regarding water quality of surface and groundwater, drinking water, effluents and

other water-related environmental issues. The Decree was abrogated the “Merli” law and has introduced the environmental quality objectives which should be assessed for all surface waters from ecological, chemical and environmental point of view and for all groundwater from only chemical point of view. According to this L.D., the Regions are authorised to classify all water bodies on the basis of monitoring and according to the environmental quality objectives which are under development by the Italian National Environmental Protection Agency (ANPA). Moreover, according to this decree, the Reclamation Consortia have acquired several additional operational roles in the maintenance and management of hydraulic structures and protection of environment, as well as some new roles in the sector of experimental works, services and dissemination of information to the public sector and water users.

FRAMEWORK OF RESPONSIBILITIES IN WATER SECTOR

Governmental level

The framework of responsibilities for the management of natural resources in Italy has been changing accordingly with the evolution of legislative acts and, actually, it is based on two laws (L. 183/89 on soil defense and the "Galli" law 36/94 on water resources) and two legislative decrees (the L.D. 152/99 on water protection and the L. D. 112/98 from March 1998), the latter specifically aims at the overcoming the division of competencies in the management of natural resources among the governmental authorities and other institutions.

A schematic distribution of responsibilities for the water sector among government levels may be synthesised as given in Table 3. The competence of the State is limited mainly to the release of frame legislation (national policy acts and guidelines for their implementation) according to national interest and the European Directives. At the governmental level, the issues related to the management of natural resources are subdivided between the Ministry of Infrastructures and Transportation (ex Ministry of Public Works), Ministry of Environment and Ministry of Agriculture, each within the specific frame of competence. The Ministry of Infrastructures and Transportation is responsible for the development and co-ordination of the programmes related to main infrastructures (dams, aqueducts, water delivery network, sewage water network, etc.), while the Ministry of Environment co-ordinates the water quality issues and related investment programmes.

Table 3. Schematic distribution of responsibilities in water sector at different government levels

Government levels	*Responsibilities for the water sector*
Central	Co-ordination; planning; development of guidelines; implementation of European Directives; approval of regional plans; permitting of dumping from ships at sea.
Regional	Formulate regional water plans and water protection plans; monitoring of water resources; control of implementation of legislation; data collection for surface and drinking waters; release of concessions on water use; collection of abstraction fees.
Provincial	Inventory of discharge of sources (surface and groundwater; permitting and enforcement for discharges into surface waters; release of concessions for small water sources (e.g. wells).
Local (municipalities)	Delivery of water supply and waste water treatment services; permitting of discharges into sewer systems; "hydraulic police".

Regional government passes regional water management legislation according to the national laws and guidelines released by the Central government. Regional governments are responsible for monitoring of water resources (regulate abstractions of water and discharges into water courses) and drawing up of resource inventories. Regional government formulate regional water plans which set priorities for investments in water supply and protection of resources from pollution. Regional governments release the concessions on water use (reduced by the D.L. 152/99 from 70 years to 40 years for agricultural use and to 30 years for all other uses) and collect the corresponding abstraction fees. Regional governments are also responsible for the release of authorisations for the activities that are potentially harmful for the water environment (e.g. sewage water release, disposal of waste,

handling of pesticides, etc.) Moreover, the regional governments draw up the agreements of unification of municipalities into Optimal Territorial Domains (ATO – Ambito Territoriale Ottimale) as indicated by the Law 36/94.

The role of *provincial government* is defined by the regional laws which can be different from region to region. In fact, there are some regions where all responsibilities are conserved by the regional authorities (e.g. the case of Basilicata region) while in some other regions (e.g. Northern regions, Toscana) provincial governments have a significant role and independence. In most cases, the role of *provincial government* is to issue permits for municipal waste-water discharges and to verify compliance by monitoring and keeping records of discharges into natural waters. Provincial government can conduct the investigations on the small surface and groundwater sources and release the concessions for the water use in the case of small derivations and wells.

Municipal councils are responsible for the day-to-day administration and monitoring of industrial wastewater discharge permits ("hydraulic police"), supported by technical services of the Local Health Units. The future role of these units in water pollution management will depend on the decisions to be taken on the creation of regional environmental protection agencies. Actually, the role of monitoring of water quality in natural water bodies is under responsibility of the National Forestry Corp.

River Basin Authorities

Next to these four tiers of territorial government, there are also some special purpose bodies active in the field of water resource management and development. Law 183/1989 on the integration of water and soil management defined three classes of river basins (national, inter-regional and regional) and mandated the establishment of *River Basin Authorities* for them. The “national” basin authorities include seven most important river basins (Po, Adige, Arno, Tiber, north Adriatic basins, Volturno and Serchio) together cover about 45% of Italy’s land area. The rest of 55% of territory is under competence of 13 “inter-regional” and 18 “regional” basin authorities.

The role of the river basin authorities is to provide water balances estimates for relevant sections of water courses according to water use and quality requirements, and to co-ordinate land and water use throughout the basins of competence. Accordingly, the law requires the basin authorities to formulate watershed plans for the guidance of regional and local authorities in the basin. The basin authorities also determine the priorities for investment in water supply, sewerage and wastewater treatment infrastructure. Each basin authority is comprised of representatives of central government agencies and the relevant regional bodies (political and technical staff). They have no staff of their own and rely on the constituent bodies to carry out the required technical studies.

PARTICIPATORY IRRIGATION MANAGEMENT AND CONSORTIA IN ITALY

Evolution of participatory approach in Italian legislation

In Italy, during the 20th Century, the development of the economic system and the evolution of the law in land and water sector have converged towards weaker individualistic factors and progressively stronger influence of collective participation in the management of land and water resources. In particular, for governing land and water resources, participatory management through the Consortia has always favorably responded to problems the individuals would have not been able to solve autonomously because of the impressive financial resources required, the technical problems related to water distribution, the excessive fragmentation of land holdings, the limits imposed on private autonomy in the use of a common good like water (Martuccelli, 1999a).

In the history of Italy, the Irrigation Consortia has represented a fundamental step of users’ aggregation, corresponding to a constantly recurring need at the different economic and social stages of the life of a country. The envisaged mechanism to ensure the actual implementation of all the actions, was to attribute to the State - as the only organism that could bear the costs - the execution of the public works beyond the interests and the possibilities of intervention of individuals. At the same time, the private owners were imposed duties about the execution of private works, complementary and integrative to the public works and needed for a profitable use of the latter.

In the Italian law, after the institution of the Regions with ordinary statute and the transfer to them of the public administration functions in the matter of agriculture (Law 16 May 1970 no. 281; P.D. 15 January 1972 no 11; Law 22 July 1975 no. 3 82 and P.D. 24 July 1977 no 616), the discipline of Consortia and of the reclamation and land improvement works falls within the regional competence. The Constitution of the Italian Republic foresees, however, that this regional power be exerted in compliance with the fundamental principles of the State legislation in force for the specific sector. The result is that, since 1972, the Consortia have been subject to a double and concurrent legislation: the State and the Regional ones; the former involved only in the determination of the fundamental principle that governs such bodies.

According to the Italian legislation, the institutional functions granted to the Consortia in the irrigation sector can be grouped into four main categories:

a. execution of public works and systems (intake works, storage works, conveyance and delivery works, drainage, lifting plants, hydraulic management). According to the R.D. of 1933, the State gives in concession to the reclamation Consortia for the execution of the public works of their competence;
b. execution of works and actions concerning several fields falling within the competence of the private citizens and compulsory for the latter (actions necessary for the use of the works indicated in paragraph a);
c. maintenance and operation of all the public works and systems indicated in paragraph a);
d. assistance to the associated owners for the transformation of the cropping patterns at the farm level and for irrigation.

The Consortia are also responsible for the implementation and management of irrigation systems by ensuring both maintenance and operation and thus developing the irrigation of the fields located in their scheme. For these purposes, the Consortia have different powers of public law nature; for instance, the taxing power on the owners of the Consortia who benefit from the activity carried out by the Consortia and the power to act for the owners (and subsequently imposing the expenditure on them) for the execution of all the private works, integrative and complementary to public works, that the legislator considers to be compulsory for the private associates. The Consortia, by virtue of the powers conferred to them, guarantee the involvement of the associated owners in the public activity. On the other hand, the owners themselves administer the Consortia.

The legislative evolution of the ‘90s in the sector of waters, on one hand recognizes a greater value to the participation and aggregation of users; on the other hand, it starts a privatization process consistent with the new orientations in governing the different sectors of economy. In this context, the legislator (law no. 36/1994, art. 27) had necessity to attribute, for the productive uses of waters, a specific importance to Irrigation Consortia that are indicated, together with the Reclamation Consortia, among the institutions that are granted, not only the traditional tasks of implementation and management of irrigation, but also new important functions consistent with the new objectives of water resource policy. In particular, it is a matter of multiple use of water as one of the guiding principles of the new water policy.

The role of the Reclamation and Irrigation Consortia, that had been partially overshadowed in the past, is newly appreciated and considered autonomously. This should lead the regional legislator to a similar orientation and guarantee to these authorities smooth and flexible regulations in view of maximum efficiency. The Reclamation and Irrigation Consortia have overcome the stage of institutional incertitude resulting from the definition of their role within the scope of the regional laws. The regional laws confirm the validity of Consortia as a self-governing body, managed by the users, under the supervision of the Region, with specific tasks in the sector of waters, such as the participation in programming, implementation and maintenance of the works and systems mainly used for irrigation, as well as in the management and safeguard of irrigation waters (Martucelli, 1999b).

The recognition of such major institutional functions in the sector of water use and prevention of disasters from flooding and inundation, stems from the century-old role of the Consortia in the protection and safeguard of the soil and waters through a constant work of hydraulic plants and watercourse regulation and a careful hydraulic surveillance (Martuccelli, 1999b). In the evolution of the specific discipline in this subject, there is on one hand the consolidation of the Consortia as an

institution and, on the other hand, the adaptation of its functions to the changed needs of the country (Hamdy et al., 2000).

Consortia in Italy: territorial distribution, main characteristics and duties

Nowadays, as a results of land reorganization and unification process, in Italy operate about 199 Consortia over almost 15 million hectares of land (Figure 4) and 50% of Italian territory (Table 4). The territorial extent of Consortia is delimited not to the administrative boundaries but according to the hydraulic characteristics of water distribution schemes and irrigation needs it has a special reference to the watersheds. From the operational point of view, the Reclamation and Irrigation Consortia cover more than 80% of the plain land of the whole country and they manage all the most important irrigation systems, hydraulic infrastructures and plants. In fact, the Consortia in Italy manage approximately:

- 105,000 km of canals, irrigation conduits and related works;
- 57,000 km of drainage canals and related works for water regulation;
- 33,000 km of canals for multiple purposes;
- 1,090 lifting plants for a total discharge of more than one million litres per second
- 560 storage and compensation reservoirs with a storage capacity of more than 2 billion cubic meters of water.

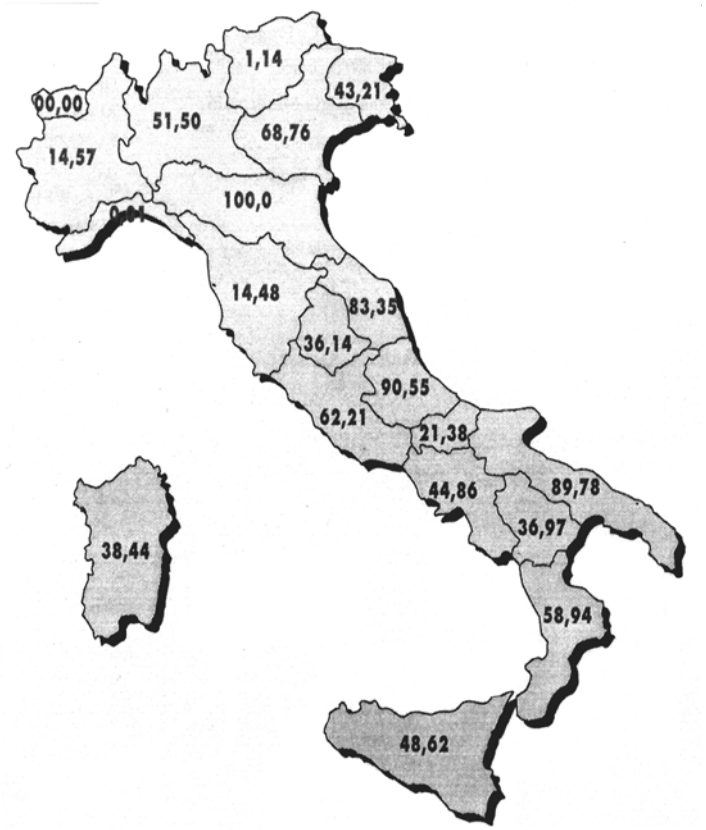

Fig. 4. Percentage of territory of each Italian region managed by Consortia

Inasmuch as surface are managed by Consortia is slightly greater in the Southern part of the country than in the North, the area irrigated by Consortia in the Northern part is more than two times larger than in the South (Figure 5). This is not only due to greater availability of water in the northern part of the country and higher economic status of the farmers but it is also due to the fact that most Consortia located in the North are farmers associations oriented mainly to irrigation while the Consortia in the South are usually large public-private organizations with a primarily role of land reclamation and, then, of irrigation. In fact, the size, role and type of organization of Consortia is not the same in Northern and Southern Italy due to different structure of water supply systems. In the

Northern part of country, water supply is highly segmented and separated among various sectors (urban, industrial and irrigation). In the most cases, irrigation is managed collectively through local-scale farmer's associations which are dedicated only to water supply for irrigation purposes and do not have particular connection with urban and industrial water supply agencies. Contrarily, on the South, irrigation is managed mainly by large-scale public Consortia which are highly interconnected with urban and industrial water supply agencies. This is essentially due to the fact that most important water structures (e.g. dams, aqueducts, pumping stations, etc.) are constructed for multi-sectorial water use and their management is frequently under Consortia competence. An example is the biggest earth-dam in Europe (Monte Cotugno, located in Basilicata region, with useful capacity of 450 Mm^3 of water) which is managed by a public irrigation Consortium (EIPLI - Ente Irrigazione Pugia Basilicata e Irpinia). Moreover, this Consortium is responsible for the management of main aqueducts transferring water not only for irrigation sector but also for urban and industrial water use.

Table 4. Surface area (in ha and as %) managed by Land Reclamation and Irrigation Consortia (Adapted from INEA, 1995 and ISTAT, 2002)

Region	Total surface of the region [ha]	Surface managed by Consortia [ha]	Surface managed by Consortia [% of total surface]
Piemonte	2,539,894	370,176	14.57
Valle D'Aosta	326,226	-	-
Lombardia	2,385,855	1,228,800	51.50
Trentino Alto Adige	1,361,831	15,563	1.14
Veneto	1,836,456	1,262,752	68.76
Friuli Venezia Giulia	784,413	338,980	43.21
Liguria	541,797	3,506	0.01
Emilia Romagna	2,212,318	2,212,318	100.00
Toscana	2,299,248	331,111	14.48
Umbria	845,604	305,627	36.14
Marche	969,342	807,936	83.35
Lazio	1,720,274	1,070,181	62.21
Abruzzo	1,079.413	977,368	90.55
Molise	443,764	94,867	21.38
Campania	1,359,533	609,907	44.86
Puglia	1,935,725	1,737,892	89.78
Basilicata	999,227	369,484	36.97
Calabria	1,508,032	888,814	58.94
Sicilia	2,570,723	1,249,825	48.62
Sardegna	2,408,989	926,051	38.44
ITALIA	*30,128,664*	*14,801,158*	*49.13*

In Italy, the main tasks of Consortia are the maintenance of reclamation and irrigation works, soil defense and land programming use, soil conservation, regulation and use of water, as well as the management of water pricing policies and tariffs. The huge amount of newly irrigated lands, the resulting high yield potentiality, call for continuous investments and actions. The institutional function of managing reclamation and irrigation works also entitles the Consortia to exert their power for the safeguard of works in order to preserve the integrity of works and plants and than assure the efficiency and operation of irrigation and drainage structures. Such an importance of the Consortium for irrigation purposes is also justified by economic reasons taking into consideration that about 60% of water resources is allocated to irrigation sector.

Furthermore, according to the recognition of legislative framework (L. 183/89), the Consortia play an important role in the *soil defense and land programming use* as a whole. The Consortia are the

only public authorities having such characteristics and adequate potentialities to accomplish this task in the best way since they are really present on the land, they deeply know it, they have a huge amount of data on water regimes and soils, they have carried out important studies and they have by law the priority for water concession mainly used for irrigation.

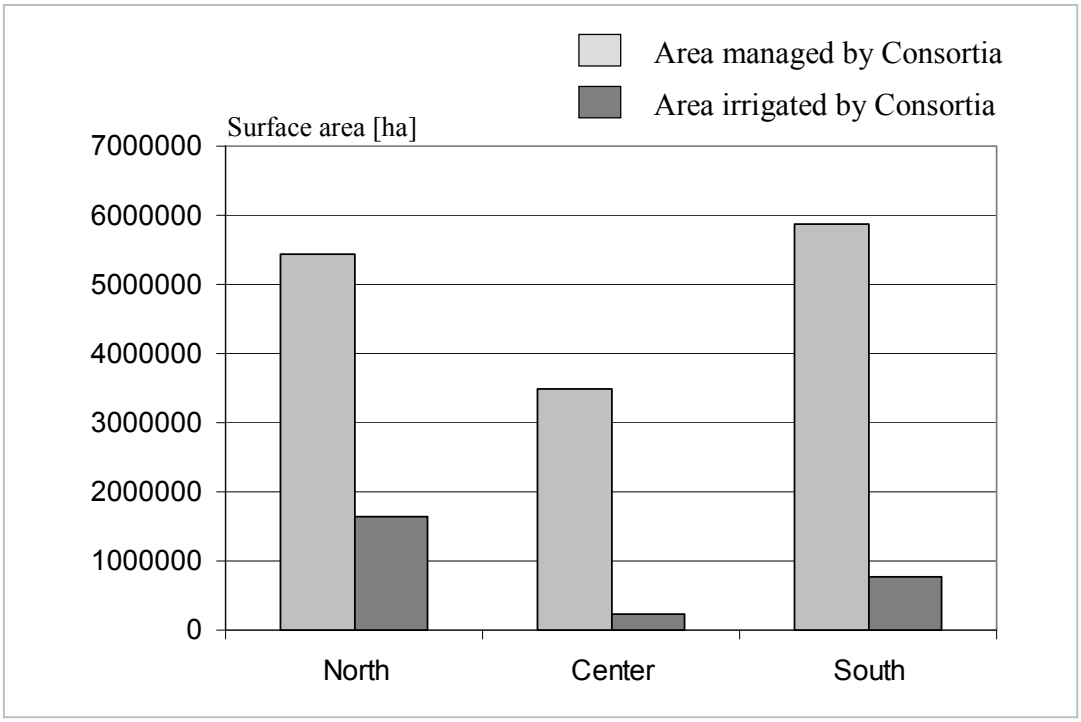

Fig. 5. Distribution between surface area managed and irrigated land by Consortium in Italy (Source: INEA, 1995; ISTAT, 2002)

The Consortia are administered by the users, directly involved in *soil conservation, regulation and use of water* and the preservation of its quality. It is well established that the constant participation of the concerned categories, i.e. the users, is indispensable for the required co-ordination between public and private activity. The Consortia guarantee such an objective in that, on one hand, the associated users are subject to the duties and constraints imposed by the public action on the land; on the other hand, the associated users financially participate in the management through paying the fees to the Consortia and they are also in charge of all the activities complementary and integrative to the public action that assures the best profitability (Hamdy et al., 2000).

As for the financial participation of private users, in the reclamation and irrigation sector in Italy, the users participate in the expenses for maintenance and management of hydraulic works. For this purposes, the state has recognized to Consortia a specific *taxing power* through which they impose the financial participation of users. The associated users are obliged to pay the irrigation fees imposed by the Consortia based on a special sharing of expenses plan that has to take into account, as prescribed by law, the achieved or achievable benefit.

Extension service is another important activity of the Consortia. Technical assistance is indispensable for the sound and correct use of waters for which adequate knowledge and training are required. Also, the direct relationship of Consortia with users facilitates the reorganization of irrigation which is so urgent today as a result of water shortage.

Consortia aim at assuring the hydraulic efficiency of their canals and works as well as irrigation. Consortia can play an important role in the *preservation of ground waters.* They are the only public authorities, everywhere present in the country, that have historically collected and processed a huge amount of hydrological data on surface and underground waters. For the groundwater level in particular, Consortia rely on quite numerous survey points. In some areas, they have carried out

important studies on ground waters with subsequent mathematical models that are used to make forecasts on the consequences induced by the present uses and any future withdrawal. The present legislation is definitely oriented towards a more rigorous discipline of underground waters and, in this context, reclamation and irrigation Consortia are called upon to co-operate with the public administration for their preservation.

Further considerations refer to the *multiple use of waters* which has become particularly important during the last decade since it has been encouraged by the Law n° 36/94 and D.L. n° 152/99. Both legislative documents emphasized the necessity to re-cycle water several times for the same or for a different use especially in the areas facing serious water shortages. In this context, the legislation provided the incentives for re-use of water resources and recognized an important role of Consortia in applying the principles of multiple water use.

Participatory approach and water pricing policy

In Italy, the Consortia have a specific taxing power that allow them to recover the costs borne for the irrigation management. In fact, water pricing represents an essential aspect of irrigation policy. The farmers are obliged to pay for maintenance and running costs of irrigation infrastructures they benefit from. The taxing power is based on the sharing of expenses among users proportionally to the benefits achievable through irrigation. The extent of the benefit is evaluated on the basis of indexes that each single Consortium has to determine through a deed referred to as placement plan.

The taxing power on which Consortia are based, is to balance the expenses paid by the Consortia to assure the public service of irrigation and the fees requested to the users. Such expenses vary from year to year, both because of the different amounts of water delivered and of the irregular increase of some components such as: concession water fee; the participation share to the storage reservoir management or the intake work and conveyance network; the routine maintenance of irrigation networks; labor; materials (lime, cement, iron, wood, etc.); water delivery; hire and operation of machinery (tractors, excavators, etc.); operation and maintenance of pumps (energy, fuel, lubricants, etc.); administration expenses; overheads and miscellaneous attributable to irrigation.

In the case of collective irrigation systems, the yearly operational expenses generally include:

- expenses for the staff in charge of routine and extraordinary maintenance of the consortia intake, conveyance and distribution works;
- expenses for the operation of the works (for employees and seasonal staff, maintenance contracts, energy, material and equipment, vehicles, etc.) ;
- fees for the concessions to derive water and any other related costs;
- miscellaneous administration expenses (services, administration, secretary, etc.);
- costs of amortization of plants (only in some cases).

The cost of the collective distribution of water is influenced by many factors and in particular by:

- the infrastructure characteristics of the irrigation system (size of the area served, availability of resources, presence of lifting plants, types of network, delivery schedule, etc);
- organizational characteristics (competence and capacity of the personnel, structure and co-ordination of the consortia services, use of adequate working tools, etc.).

The contribution paid by farmers differs from region to region: in most of regions it is determined to fully cover the operational costs although, in some regions, the irrigation fee covers only part of the costs since the remaining part is paid by the regional public authorities.

The irrigation fee is based mainly on the surface area under irrigation or on the volume of water supplied by hectare, and, only in some particular cases, it is related to the type of crop under irrigation. The fee based on *irrigated hectare* is determined through the land register of irrigated lands or the seasonal reservation by the user and subsequently subject to check by the Consortia. Generally, a distinction is made between the delivery by gravity and by pressure, when the two systems do exist. To a lesser extent the fee by *discharge* (liter/second/hectare) is applied, sometimes measured through a flow-meter at the outlet, sometimes evaluated by the water stream given by the Consortia: both methods can be referred to the irrigated hectare. Even less frequent is the fee based

on the *type of crop*; it is justified when there are considerable differences in the volumes of water used (in the case of rice fields for instance). In rare cases for horticulture, and over reduced areas that can be controlled by the Consortium, specific fees per crop are established.

At the beginning of nineties, the fees related to irrigation water supply in Italy were equal to 198,566 million lire (around 102.5 million Euro) and represented about 39% of total fees to the consortia (Table 5). The average irrigation fee per irrigated hectare of land was estimated to 38.7 Euro/ha, and it varies from 14.2 Euro/ha in the Central part of Italy to 33.4 Euro/ha in the South and 44.7 Euro/ha in the North.

Table 5. Irrigation fees at the beginning of nineties (Source: ANBI, 1992; INEA,1995, ISTAT, 2002)

	Irrigation fees		Total fees		Irrigation fees over total fees	Surface managed by Consortia	Surface irrigated by Consortia
	million Euro	%	million Euro	%	%	ha	ha
North	73.847	72	171.164	65	43	5,432,092	1,650,935
Center	3.414	3	28.12	10	12	3,492,223	239,769
South	25.304	25	66.07	25	38	5,876,840	758,354
Italy	102.565	100	265.354	100	39	14,801,158	2,649,058

In Italy, the water fees for agricultural uses have been maintained almost constant for a long period (between fifties and eighties of the last Century) and they did not adjust to the increased cost of living (Goria and Lucaresi, 2002). Consequently, the irrigation water fees have been extremely low and, in real terms, in 1994, they were only one/fourth of those applied in 1933. On the contrary, in the same period (1933-1994) water fees for urban water use have been increased by 12 times in real terms (Malaman, 1994; Malaman, 1998). Nevertheless, in the last twenty years, there is a continuous increase of irrigation water fees which confirms a new policy in water sector aiming to achieve full cost recovery and more realistic water tariffs in agricultural water use. In fact, in the period 1981-1991, the irrigation water fees have been increased for about 4 times. In the last ten years, there is a general trend of further increase of water fees in all sectors and it is estimated for the period 1992-1998 to 40% in nominal terms and to 2% in real terms (OECD, 1999).

CONCLUSIONS

Nowadays, in Italy, land reclamation, irrigation and drainage are closely connected with agriculture production; with their progress they have marked the stages of the progress of Italian civilization also. However, such a level of agricultural production, based on principles of sustainability and economic reasoning, has been achieved only after many years of the concerted actions of the governmental institutions and farmer's associations.

In the fifties, agriculture was not considered to be a real development factor but rather a sector the State had a duty to assist in order either to remove age-old injustices, through the Agrarian Reform or to eliminate some factors limiting the residential suitability of rural areas. Nevertheless, over the last few decades, the introduction of new legislation acts and enormous economic, scientific and technological progress have altered the type of return given by investments in agriculture. The limits of marginal productivity have been considerably widened and agricultural economists and many politicians have changed their attitude on the role of agriculture, as is amply shown by the progressive modification of the legislation on aid to structures for development purposes. This modification has also affected the decisions of the EU which until quite recently supported the development of irrigation in Italy with reference to the equipping of the areas of new irrigation investments (Martuccelli, 1999a).

From all the above, it is evident that both the present regulations and their evolutionary trend recognize that the Consortium is an adequate tool to respond to the needs of a sound use of land and water resources in Italy. The aggregation of users is necessary not only for a sound use of waters within each sector, but also, and even more, for the management in common of a given resource for

multiple purposes. In fact, the Consortium accomplishes a profitable co-ordination of the different uses. In the present framework of environmental consciousness, also Consortia have a role to play. They can co-operate with other authorities and environmentalists for a correct management of natural water resources - soil and land. In addition, they should aim at reconciling environment protection with economic development in a period in which environment consciousness has greatly increased.

Currently, sustainability is one of the major objectives to be pursued not only in Italy but also at a regional and global scale. Both, the 5th and 6th programs of environmental action prepared by the European Commission, are aimed at policies that greatly emphasize sustainability by applying the subsidiary principle. Sustainable development is based on the link between production activities and environment. In this context, Italian Consortia can give a valuable contribution since they have examined a number of actions for the preservation of natural resources that could only be accomplished through a program agreement with the Ministry of Agriculture and the Ministry of Environment.

REFERENCES

Alfonso, F. (1877): Trattato di Idraulica Agraria- Publisher Luigi Pedone Lauriel, Palermo.

ANBI (1992). L'uso irriguo delle acque, Associazione Nazionale delle Bonifiche, Irrigazioni e dei Miglioramenti Fondiari, Edagricole, Roma.

ANPA - Agenzia Nazionale per la Protezione dell'Ambiente (2001). Primo rapporto SINAnet sulle Acque, ANPA, Roma.

AQUASTAT (2003). FAO database on water resources, FAO, Rome.

Cato, M.P. (180 BC, appr.). De Agricultura.

Consorzio di Bonifica per la Capitanata, 1984. Cinquant'anni di bonifica nel Tavoliere, Ed. Bastogi, Foggia (Italy), p.65.

Cuppari, P. (1870): Manuale dell'Agricoltore – Publisher G. Barbèra editore, Firenze

Goria. A and Lugaresi, N. (2002). "The evolution of national water regime in Italy". In EUWARENESS, European Water Regimes and the Notion of a Sustainable Status, research project report, pp. 26.

Hamdy, A., Lacirignola, C., and Trisorio-Liuzzi, G. (2000). "Second generation benefits and problems of participatory irrigation management: Italy case study". In *Participatory Irrigation Management in the Mediterranean countries*, CIHEAM/IAMB, pp-139-186.

INEA (1995). Italian Agricolture in Figures, Ministero delle Risorse Agricole, Alimentari e Forestali, Istituto Nazionale di Economia Agraria (INEA).

IRSA-CNR (1999). Un futuro per l'acqua in Italia, Eds. M. Benedini, A. Di Pinto, A. Massarutto, R. Pagnotta, R. Passino, Quaderni IRSA-CNR, Roma, in Italian.

ISTAT, (2002). ISTAT Database on census of agriculture (Censimento AGRICOLTURA), http://www.census.istat.it/wibdsi/

Lo Re, A. (1898): Nozioni di Agraria – Publisher Ditta G.B. Paravia e C.

Malaman, R. and Cima, S., (1998). "*L'economia dei servizi idrici*", Franco Agneli, Milan.

Malaman, R., (1994). "Il costo dell'acqua: canoni e tarife", *L'economia del ciclo dell'acqua*.

Martuccelli, A.M. (1999a). "Water resources and participatory irrigation management: institutional problems and the role of Consortia".

Martuccelli, A.M. (1999b). "Evolution and criteria for the use of water and the role of irrigation and reclamation Consortia in Italy".

Massarutto, A. (2002). Agriculture, water resources and water policies in Italy. In Concerted Action Document "SAGA - Sustainable Agricultural Use of Aquifers in Southern Europe: Integration Between Agriculture and Water Management Policies", EU DG XI Programme.

OECD, (1999). "Pricing for water services", Report.

Ridolfi, C.(1862): Lezioni Orali di Agraria – Coi tipi di M. Cellini e C., Firenze

UN (1997). Comprehensive Assessment of the Freshwater Resources of the World. Commission for Sustainable Development, Stockholm Environment Institute, Stockholm.

Varro, M.T. (37 BC): Res Rusticae

Virgil, P.M. (30 BC): Georgicae