MSc Thesis | Caterina Marinetti

"Exploring Water Scarcity and Drought in Sicilian Agriculture: Actors' performance of European policy instruments"

On the cover:

Snapshot of dry soil. Taken in the vicinity of the ruins of Cefalù Castle, Sicily, during a very enjoyed pleasure trip. May 8th, 2017.

A mamma, papá, Lorenzo e Annalisa,
Ughetta e Nonno Nicola
Anche, e soprattutto questa, é a voi!

“Water, water everywhere, nor any drop to drink,”
laments the sailor in Samuel Coleridge’s Rime of the Ancient Mariner.

La Sicilia rurale (come ogni regione, del resto), è contraddistinta da una modulata varietà di condizioni agronomiche, i cui estremi termini sono l'aranceto e l'uliveto costieri, e il latifondo: che occupa le alte superfici dell'interno. La coltura intensiva, la suddivisione della proprietà, la presenza di abitazioni in tutta la campagna caratterizzano le parti più fertili e più accessibili del territorio, tenute dall'agrumeto, dall'ulivo, dal mandorlo, dalle vigne, dai frumenti densi, mentre che il latifondo si estende nella solitudine e si direbbe costituisca veramente il feudo della solitudine.

C. E. Gadda, da *I nuovi borghi della Sicilia Rurale,* 1941

MSc Water Management, Delft University of Technology

Exploring water scarcity and drought in Sicilian agriculture: Actors' performance of European policy instruments

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ABSTRACT

Water scarcity and drought (WS-D) are growing concerns throughout Europe and especially in Southern Regions. This study focuses on agriculture on Sicily, Italy. It explores the way(s) European policies to tackle WS-D are actively performed by the actors in the Sicilian water and agricultural sectors, in order to uncover potential disparities between the European policies on paper and how they are shaped in the practice. To do so, a qualitative research approach was used. Actors were retraced in the field, outlining the physical and political landscapes that they have shaped and in which they act; their interpretation of WS-D and their behavior towards such phenomena were continuously under study. While the policies on paper present various measures to tackle WS-D, the performed policies (in practice) are different and the use of available measures is often limited. The involved actors identified tools and measures within the Water Framework Directive and Rural Development Programme, available to tackle WS-D issues. However these are not fully implemented and their embedding presents complexities. Access to measures set under the RDP seems hampered for farmers. Not only because of bureaucratic and financial constraints, more so because of ideas of farming size, excluding small and many medium farms. Low level of information and participation also limits the involvement of farmers in the regional water-agricultural governance. Parallel to it, complex water governance, financial constraints and social acceptance issues give rise to barriers in the implementation of policy instruments. Behind this, the interpretations of WS-D phenomena result to be different according different stakeholders.

Nomenclature – list of acronyms

CAP	Common Agricultural Policy
DG AGRI	Directorate-General for Agriculture and Rural Development
DG CLIMA	Directorate-General for Climate Action
DG ENV	Directorate-General for the Environment
EC	European Commission
EU	European Union
FA	Framework Analysis
FAO	Food and Agriculture Organization
GT	Grounded Theory
MS	Member State
RBMP	River Basin Management Plan
RDP	Rural Development Programme
UAA	Utilized Agricultural Area
PA	Partnership Agreement
WFD	Water Framework Directive
WRM	Water Resources Management
WS-D	Water scarcity and drought

1. Introduction

Water scarcity and drought (WS-D) are growing concerns throughout Europe (EC, 2007). Within the European Union, southern regions are likely to be the most affected by water scarcity and/or droughts, with many of them generally facing more economic barriers (EC, 2011; EEA, 2009; MED WS&D WG, 2007). In response, the EU has developed several policy instruments to tackle WS-D. The uptake of such policy instruments and their embedding may be dependent on multiple factors. Hence, this study wants to explore the way(s) European policies on paper are actively performed in practice, in order to uncover potential disparities between the policies on paper and the policies in practice. It focuses on agriculture on the Italian island of Sicily. Sicilian agricultural sector is often struggling with recurring water shortages, caused by

either water scarcity or drought (Rossi, 2003; Iglesias et al., 2009; Giglioli and Swyngedouw, 2008). The study uses a qualitative research approach. Actors were retraced in the field, outlining the physical and political landscapes that they have shaped and in which they act; their interpretation of WS-D and their behaviour towards such phenomena were continuously under study. In this introduction, three related phenomena of importance for the study, are briefly discussed: what are water scarcity and drought, what European policies are discussed and what does performing policies entail?

Many definitions of the terms 'water scarcity' and 'drought' are available (Annex I). Following the definitions given by the European Commission (EC, 2007) and FAO (2012), this paper defines water scarcity as a "long term water imbalance, resulting from high rate of demand compared with available supply, under prevailing institutional arrangements and infrastructural conditions". Drought is defined as a "temporary decrease of average water availability due to meteorological conditions e.g. rainfall deficiency". Existing management approaches for water scarcity include supply enhancement and demand management (FAO, 2012). Drought is typically handled reactively, through crisis management (Wilhite and Pulwarty, 2005). Yet, international organizations (WMO and GWP, 2014) are increasingly encouraging governments to shift towards integrated drought risk management to enhance preparedness and mitigate drought effects (Gutierrez et al., 2014).

At European level, various policy instruments have been developed and improved to tackle the effects of WS-D (Annex I; see also Stein et al., 2016). The primary water policy of the EC is the 2000 Water Framework Directive (WFD), which sets out environmental objectives for European surface and groundwater, and requires the development of River Basin Management Plans (RBMPs). The directive addresses WS-D only to a limited extent, but provides technical tools and guidance to incorporate water demand management and drought risk in the management plans (Kampragou et al., 2011). In 2007, the European Commission published a (non-binding) Communication Addressing the challenge of water scarcity and drought in the European Union (WS-D Communication; EC, 2007), revised in 2012 (WS-D Policy Review; EC, 2012). The Communication invites to rethink the approach to WS-D in proactive terms and promote participation in the water governance. Next to them, the EU Climate Adaptation policy mainstreams climate change aspects into other European policy areas and represents one of the main drivers for activities related to WS-D (Stein et al., 2016). Yet, these policies do not provide direct financial support. Funding opportunities are available under the Common Agricultural Policy (CAP). CAP's first pillar provides agricultural market and income support to farmers (direct payments), while the second is represented by the Rural Development Policy (RDP). Greening practices and agri-environmental measures in the first and second pillar, respectively, aim at increasing sustainable practices, also targeting water issues. The current RDP (2014-20) also contains a toolkit to manage risks in agriculture, including drought.

The approach of this study builds on the idea that policy instruments are not standing outside the society as imposed and stagnant entities. On the contrary, policy instruments are performed every day by actors who continuously construct and define what a policy is. Policy becomes as performative as society: Strum and Latour (1987) introduce a 'performative model' of the society, which is "more compellingly seen as continually constructed or 'performed' by active social beings" (1987:784-785). Policies are important in enacting society, as they potentially relate larger groups of agents over space and time (Schubert, 1986; Kaufmann-Hayoz et al. 2001). Societal actors perform society by constantly and actively exercising "negotiation and control", with differences between agents being found in the "scale on which others can be organized, mobilized and influenced" (Strum and Latour, 1987:796-797). Similarly to the concept of performative society, Hernes (2014:104) conceives organizations as "consisting of conceptual, human, or material elements forming interconnected wholes". Agents' acts should not be seen as taking place within organizations, but rather as forming organizations in their spatio-temporal ordering. Following Gephart (1978:556), the argument becomes that organizations "must be discovered by studying their use in the real scenes of action".

This study takes up how European policies and measures are shaped by Sicilian actors involved in WS-D policy discourses, as farmers, agencies and other stakeholders. It discusses how they use their "everyday constructs to make a variety of everyday events, objects, and activities meaningful" (Gephart 1978), including differing interpretations of water scarcity, drought and policy options. The research focuses on interpretations from individuals – that would reflect their cultural background and their role in groups/organizations/institutions –, but also highlights issues of access to policies and subsidies that appear to be different for different stakeholders.

2. Methodology

2.1. Research approach

To gain a detailed understanding of how policies are actively performed, a qualitative-explorative research approach was adopted (Creswell, 2013; Patton, 2002; Stebbins, 2001; Junier, 2017). The used approach comes closer to Grounded Theory (GT) (Charmaz, 2012; Corbin &

Strauss, 2008; Locke, 2001; Patton, 2002), which flexibly allows "to construct theories 'grounded' in the data themselves. It begins with inductive data, invokes strategies of going back and forth between data and analysis, uses comparative methods, and keeps the researcher interacting and involved with data and emerging analysis (Charmaz, 2012)". Data was collected using a mix of desk research with field research methods, including document consultation, survey, interviews and participant observation. Then, collected data was analysed, flexibly applying Framework Analysis (FA) (Srivastava and Thomson, 2009). FA is a qualitative method used for applied policy research. It consists of five steps: familiarization; identifying a thematic framework; indexing; charting; mapping and interpretation (see Ritchie and Spencer, 1994). The data analysis initially led to three lists of themes and finally to three main topics, which represent the main contribution of this paper.

2.2. Data collection

A first desk research allowed to identify European policy instruments available on paper and their "written" implementation, and get a preliminary idea of the Sicilian setup. Next, a field research took place in Sicily, namely in Palermo, three villages in Palermo's province, and Catania. It was carried out in March and April 2017 and consisted of parallel activities: qualitative survey; semi-structured open-ended interviews; participation in events; and additional document analysis. Documents consultation was carried out during each step of the research, since new and relevant documents emerged during the interviews. As Junier explains, this fact results from the decision "to let the data shape the direction of the research" (2017:14), rather than a priori choice or data selection. Interviews (Charmaz, 2012) were carried out among stakeholders in the water and agricultural sectors; participant observation (Creswell, 2003) allowed gathering data from events pertinent to the research topic. Parallel to them, a qualitative survey (Jansen, 2010) was developed to gather information from a wider group of farmers.

Documents Consultation

Documents were collected from internet official websites (EC; Italian Ministries; Regional Departments; Research Institutes; etc.), Universities libraries or provided by interviewees. They encompass:

- Scientific documents and technical reports, including reports from statistical and research institutes, and journal papers;
- Policy and project documents, including Communications and Regulations issued by the EC, Sicilian River Basin Management Plans, Sicilian Rural Development Programmes, Ministerial Decrees and others.

Documents often outline existing gaps between the policies on paper and in practice. Yet, underlying reasons behind them, as well as insights in actors' perceptions, are not described and need to be assessed by additional methods.

Survey

The research objective requires an accurate understanding of how local realities are actively performed. The 'discovery process' started by exploring the perceptions of the main group affected by WS-D in agriculture, that is farmers. A preliminary study on the Sicilian agriculture and preliminary interviews with stakeholders allowed to identify common discourses within the farmers community. Thus, a survey was set up to collect information by a wider group of farmers. Multiple-choice questions were preferred over open questions to facilitate the questionnaire compilation; options were based on technical reports and scientific literature. The questionnaire was submitted for review to a Professor at the Agrarian Department of Palermo University and employees at the Reclamation Consortium of Catania, which manage the public water supply. The questionnaire was iteratively tested and improved during interviews with farmers and after a first set of responses. It was eventually structured into seven sections and two subsections, addressing information on public and private irrigation, experience with WS-D, financial instruments and future expectations. Next, the questionnaire was set up in a Google Form. Its compilation was promoted through different channels: informal contacts, Universities, Reclamation Consortia and Social Media. Hard copies were distributed in case of unavailable internet connection. In total, 70 responses were collected. Annex III (pp. 53-57) presents the full questionnaire form, translated to English.

Semi-structured open-ended interviews

Interviews are particularly useful to assess individuals' attitudes and values, which do not transpire from questionnaires (Charmaz, 2012; Byrne, 2004 and Silverman, 2001, p.115). The aim of the interviews was to investigate which factors influence the water governance in agriculture and the implementation of European policy instruments. Other topics where also addressed, as WS-D's interpretation and recommendations for the future. 26 interviews were carried out with actors in the water-agricultural sector, including farmers, professors and researchers, consultants, water managers, Regional and European officers. They were only partly pre-selected, as agencies were traced in the field. This means that reference contacts were asked during interviews, to

identify (influential) individuals at stake in the researched topics, and understand the formal and informal relations between them. Actors' role and expertise are described in more detail in Annex II, Stakeholders description (pp. 33-39) and illustrated in Figure a. (Annex II, pp.34). Interviews were performed making use of two flexible guides to ensure consistency in the findings: one for farmers, retracing the survey sections; a more general one for other actors, adjusted prior each interview according to interviewee's role and expertise. The guides were submitted for revision to research supervisors. These are reported in Annex III and IV (pp. 106, 126), respectively. The interviewees were first briefly introduced to the research topic. Open-ended questions were preferred over closed ones, since they provide a better access to interviewees' points of view. Probing questions were repeated among different actors, to obtain deeper insights. The interviews lasted approximately one hour. They were carried out individually or with two or more interviewees. Notes were taken during the interviews, later translated to English and transcribed. To preserve anonymity and let the interviewees freely speak, the transcripts are omitted from the Annexes.

Participant observation

Participant observation allowed gathering qualitative data while being part of the research itself. As explained by Creswell (2003), it is a process of data collection where "the researcher observes or is a participant of the event/phenomenon being studied". Observations occurred during a workshop on water governance and a seminar on Sicilian dams. Active participation took place during a public debate pertinent to the role of reclamation in agriculture. This allowed gaining more insights on political views influencing actors' opinions. Notes and recordings were taken during speeches of influential actors. They were later translated and transcribed. Annex IV (pp. 128-140) contains the summary of the events and the transcripts of the speeches.

2.3. Data Analysis

Document analysis

The consulted documents were selected and reorganized into multiple categories, depending on main topics. Several themes were identified to filter and classify the documents (Table 1). Relevant portions of the documents corresponding to each particular theme were indexed. Then, the selected portions from multiple documents were combined to check homogeneity and coherence in the data or to present disparities when these were colliding. The analyzed information is presented in the Chapter 3.1, following the order of the identified themes.

Survey analysis

Responses to the survey were organized into an Excel spreadsheet and translated to English. The Pivot Table function in Excel was used to explore the links between the characteristics of the respondents, such as age and farm size, and their responses. Figure 1 below gives an example of Pivot table. An interactive Excel file has been created to consult the responses making use of the Pivot pane. Several tables were generated to present the responses and their combinations (Annex III, pp. 58-99).

	Values	
Subsidies/Funding receiving	Count	Percentage
⊞ n.a.	1	1%
⊟ No	34	49%
Big	3	4%
Medium	20	29%
Small	11	16%
⊟ Yes	35	50%
Big	20	29%
Medium	14	20%
Small	1	1%
Grand Total	70	100%

Fig. 1 - An example of Pivot table, showing responses to the question "do you receive subsidies of funding?" and the link to a respondents measurable feature (farm size).

Next, responses were described by clustering the respondents on the basis of their measurable features, when these appeared relevant. Six main themes (Table 1) are identified from the analysis of the answers, and described in Chapter 3.2. Extensive description of the themes is provided in Annex III (pp. 41-52). In the analysis of the responses, results from the interviews with six farmers were also integrated to deepen the understanding of particular features.

Interviews and observations analysis

The full transcripts of interviews and notes from observations were coded together (indexing in FA). The coding process followed multiple steps. First, pieces of the transcripts were given a name to explicate what was seen in conceptual terms. Next, recurring names and links between them were identified, clustered and categorized. Then, the named excerpts were organized into an Excel file, according to individual stakeholders and category. The excerpts under each category were integrated and compared, analyzing stakeholders' shared and divergent opinions. A last clustering iteration allowed restructuring the emerging findings into six major themes (Table 1) and 25 sub-themes (Chapter 3.3).

Table 1 - Themes identified during data analysis

Documents
1. Sicilian agriculture and water uses
2. Sicilian climate, drought and water scarcity discourses
3. Actors' description
4. Sicilian implementation of European policy instruments
Survey + interviews with farmers
1. Characterization of the respondents and study area
2. Shared opinions on public water management and "self-adaptation"
3 Perceptions on water scarcity and drought events
4. Role of public subsidies and funding
5. Trust in European and Regional policies and knowledge assessment
6. Future climate, optimism and potential changes
Interviews + participant observations
1. Farms characteristics & farmers habits
2. Reclamation Consortia
3. Regional administration
4. Water Scarcity and Drought
5. Policies
6. Financial Instruments

While document analysis provided descriptive data from official papers, field research allowed discussing the performed realities by looking at individuals agencies and differing actors' interpretations and perceptions. A final stage of data analysis took place (mapping and interpretation in FA). The different types of collected information were combined to identify key characteristics and guide the interpretation of the findings as a whole. The three lists of emerged themes (Table 1 above) were compared and aggregated/integrated into three macro-categories: "Agricultural structure and water governance", "Water scarcity and drought perceptions and management" and "Policies and Instruments". These are described in detail in Chapter 4.

3. Results

This section describes the themes from the analysis of documents, survey responses, interviews and attended events. Part 3.1. "Sicilian WS-D landscape and actors" presents relevant information derived by documents analysis. The second part 3.2. "Farmers" presents the results from survey analysis, integrated with data collected through six interviews with farmers. The third and last section 3.3. "Other stakeholders" reports the findings from the analysis of interviews with other actors, including information gathered through participant observations.

3.1. Sicilian WS-D landscape and actors

Sicilian agricultural arrangement

Sicily is the largest island in the Mediterranean Sea. Its surface is over 25'700 km2, of which 68.5% is covered by agricultural land and about 15% by forestry. 97% of the total area is classified as rural, while 60% of the total Utilized Agricultural Area (UAA)* is currently classified as Less Favoured Area (RDP, 2015). In 2010, about 220'000 farming holdings occupied a total UAA of almost 1'400'000 hectares. The number of farms decreased by 37% in the decade 2000-2010 (Istat, 2014), while the UUA increased by 8,4%. Thus, the average farm size passes from 3,7 to 6,3 ha. Table 2 below gives the regional count of farms, according to their size†, together with changes in the recorded changes.

Table 2 - Respondents clustered per farm size; comparison of respondents and regional data

Farm size	UAA (ha)	Regional data (Istat, 2014)		% change in the period 2000 -2010
Big	≥ 30	9.164	4%	+40%
Medium	[2; 30)	93.354	43%	-14%
Small	< 2	117.159	53%	-50%
Total		**219.677**	**100%**	-37%

As reported in the RDP (2015), the increase in farm size is partly due to the activation of the agri-environment and income-support measures, which contributed to develop a new scenario of economic organization for the holdings. Rather than being a spontaneous strengthening trend, the creation of big farming holdings, as production and sale choices, would be influenced by National and European legislative actions (Istat, 2014). The fact that Sicily has always received a financing support higher than other Italian regions, would have steered the development of rural development strategies to adapt to the objectives of international programs.

Even if big farms are increasing, 53% of the farms have a UAA smaller than 2 hectares; 78% do not reach 5 ha; while only 2% exceed 50 ha. Farms' economic dimension is also very limited: half of the farms have a standard production smaller than 4'000 € per year, while 82,5% smaller than 25'000 €. The preponderant presence of small farms with a small standard production is acknowledged in the RDP as the "structural and economic fragmentation of the Sicilian agricultural system". The Sicilian Chambers of Commerce report a high degree of "marginalization" of agricultural holdings (RDP, 2015) and acknowledge the increasing risk of abandoning lands and the agricultural activity.

Holdings are generally family-run (92,2%). More than 45% of the farms are conducted by "over 60" farmers and only 12% are managed by "under 40"; the level of professional education in agriculture remains low. Istat

* The Utilized Agricultural Area (UAA) is the total area taken up by arable land, permanent pasture and meadow, land used for permanent crops and kitchen gardens. Source: CODEC, EUROSTAT's Concepts and Definitions Database

† Farms size as big, medium and small, are defined following the classification of Istat (2014) and based on the definition of UAA

(2014) reports that the number of young farmers increases together with the economic dimension of the farms.

The primary sector, especially crop farming with quality products (PDO/PGI and organic), has the highest contribution to the Regional economy. However, the sector remains affected by an overall lack of infrastructure and services throughout the territory, adverse to holdings' economic development and rural population's life quality (RDP, 2015). Better organization, chain integration and technical assistance to farms would enhance the value of quality products and the development of the sector.

Water uses in agriculture

Agriculture has the highest water demand and use among the economic sectors in Sicily. The most common water sources are: public aqueducts and water networks managed by Reclamation Consortia (which supply water on demand or following rotation schemes); private wells, small reservoirs and springs. Data on irrigation are retrieved by various documents and reported in Table 3 below. Data are often heterogeneous. In particular, private irrigation, mainly through wells, has a different extent and impact on water uses depending to different sources. Data from the University of Palermo report the irrigated area to be almost twice as much as that reported by National Statistics (Istat, 2014), with the main contribution being represented by private supply. Same applies for the total water uses. As reported by the regional RBMP (2016), private supply would account for almost 85% of the volumes used for irrigation while, according to Istat (2014) this would amount to 46%.

Table 3 - Regional irrigated surface and water uses according to different sources

Source:	**Istat (2014)**	**RDP (2015)**	**RBMP (2016)**	**Palermo University, Agrarian Faculty[‡]**
	Data to 2010	**Data to 2010**		**Data to 2013**
No. of farms practicing irrigation	50'000 (in 2010)	70'000+ (2009-2010)	-	-
Supplied by Consortia	-	37%	-	-
Privately supply	-	35.7%	-	-
Using micro-irrigation	-	32%	-	-
Total irrigated surface [ha]	147'163	160'000+	-	307'400
Supplied by Consortia	63'280 (43%)	(32%)	64'431	70'700
Privately supplied (mainly wells)	57'770 (39%)	(39%)	-	236'700
Using sprinklers	66'223 (45%)	(44.8%)	-	-
Using micro-irrigation	60'337 (41%)	(41%)	-	-
Total water uses [Mm3/yr]	688[§]		823[**]	-
Supplied by Consortia	323 (47%)		130 (16%)	-
Private supply (mainly wells)	316 (46%)	(38.6%)	693 (84%)	-
Using sprinklers	378 (55%)		-	-
Using micro-irrigation	158 (28%)	(31%)	-	-
Through surface irrigation	(12%)			

[‡] Data from the Agrarian Faculty of Palermo University, provided during interview.

[§] Value estimated during the project MARSALa (Modelling Approach for irrigation wateR eStimation at fArm Level), funded by Eurostat

[**] This value would represent 55% of the total uses in the district (36% civil, while only 9% industrial).

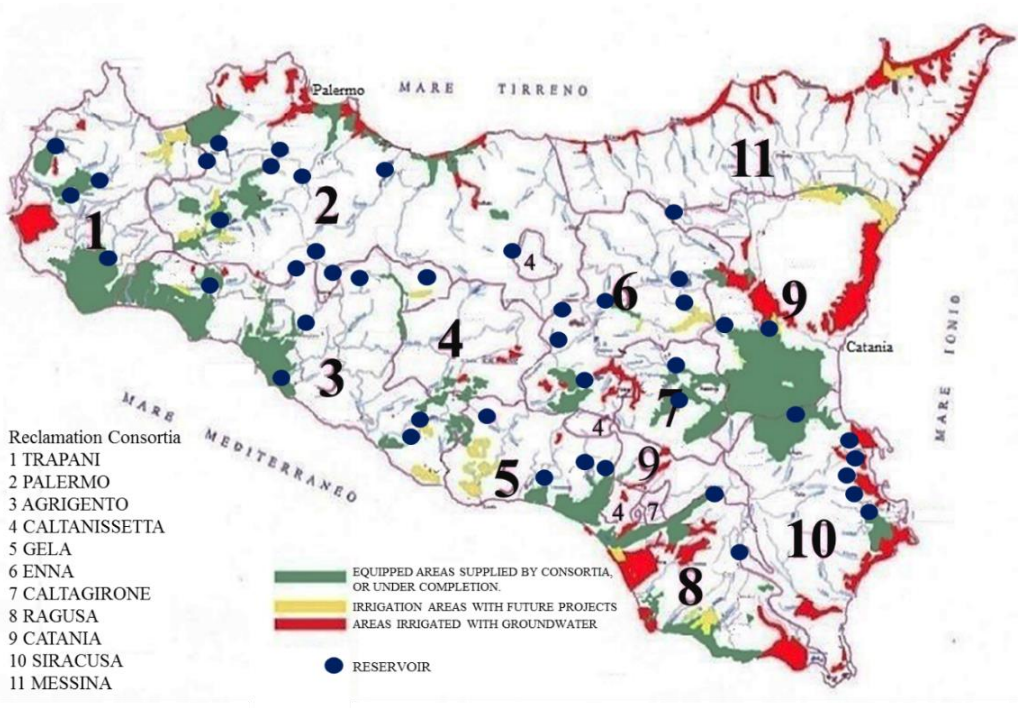

Figure 2 - Reclamation Consortia administrative borders, irrigation areas and reservoirs. Source: Agrarian Faculty Palermo University

The irrigated surface does not exceed 11% of the total UUA (Istat, 2014). Even if 85% of it is irrigated with water efficiency technicques (sprinklers and micro-irrigation), the average amount of water used to irrigate one hecater is estimated to 4'673 m3, higher than the national value (4'588) (RDP, 2015). The number of holdings with irrigated surface has dropped by 31,6% in the decade 2000-2010. According to data provided by Palermo University, the "equipped area" that could be potentially irrigated thanks to the presence of public networks amounts to about 156'000 hectares, more than twice the area actually supplied by Consortia. Figure 2 shows the irrigation areas as well as the administrative borders of the Consortia, which mainly correspond to provincial borders.

Farmers served by Consortia pay a fee for the water services: half of the served farms (per number and per utilized area), would pay a tariff according to actual consumptions (€/m3); 35% based on a surface criterion (€/ha); while the remaining do not pay or pay following different criteria (RBMP, 2016).

The reservoirs system is rather developed and infrastructures were mostly funded by the Fund for the South during last century. Sicily has a total of 46 big reservoirs (Region Sicily, 2016). Of these, 41 are operational: 19 in regular operation; 8 with limited storage capacity and 14 under testing. Their total potential storage is 1'129 Mm3, while the actual is under 900Mm3. 573 Mm3 are intended for agricultural use, according to current authorizations (Region Sicily, 2016). As for groundwater, the RBMP (2016) identifies 82 aquifers being part of 19 basins. Direct monitoring is carried out for 28 groundwater bodies, while water balances are made for the remaining 54. 17 aquifers resulted "at risk" due to anthropic factors, including over-abstraction. Finally, almost 10% of the regional surface has high salinity. As stated in the RDP (2015), limited access to irrigation water has led farmers to use waters with high salt content. The latter partly come from coastal wells, of which excessive use has led to salt intrusion. Additionally to salinity intrusion, over-exploitation of surface and groundwater is reported also by INEA (2010) as a cause of resources depletion.

Sicilian climate, drought and water scarcity discourses

Sicily falls into the Mediterranean climate zone. Average rainfall is around 600 mm/year, concentrated in the period from November to February. Precipitation values are close to zero from June to August, when the irrigation season typically occurs. This period is also characterized by the highest temperatures and evapotranspiration rate of the year (5 to 7 mm/day) (RDP, 2015). Climate variability and drought events in Sicily have been widely studied by researchers (Bonaccorso et al., 2003; Cancelliere et al. 2011; Rossi, 2003). In particular,

climate change further intensifies water scarcity and drought (Cannarozzo et al., 2006; Garcia-Ruiz et al., 2011), as also acknowledge by the Region Sicily (RDP, 2015; RBMP, 2016).

The Regional Department for Water and Waste monitors drought by elaborating the Standardized Precipitation Index (SPI) as recommended by WMO guidelines (WMO, 2012), and publishes a monthly drought bulletin. In the bulletin, the department gives conceptual and operational definitions of drought in line with the FAO definitions. It officially states that accurate monitoring of droughts and resources availability represents an essential tool for water management, as also indicated and required by the Sicilian RBMP. The department also refers to the 2015 National Strategy to Adapt to Climate Change, which sets a priority to water resources and drought risk management. A remote sensing system monitoring climate conditions for irrigation purposes is also made available by the Regional Department for Agriculture, namely the Sicilian Agro-meteorological Informative System (SIAS).

Santino (2001) reports that, despite a water availability nearly three time as much as the demands at the beginning of this century, access to water has been "highly erratic and inconsistent". He underscores how Sicilians have always organized their life around the cycle of water rationing hours. Giglioli and Swyngedouw (2008) interestingly debate the power relations "embedded in the harnessing and distribution of water in Sicily" (2008:395), focusing on how the "perceived, and occasionally real, water scarcity" is better interpreted as a combination of ecological, political and socio-economic factors. Thus, island's water shortages shall not be considered as deriving from inherent water scarcity, rather from the "institutional and material embedding of the hydro-social cycle" (2008:395). Certainly, the concept of water scarcity as partial reflection of power relations cannot be retrieved from official documents, which attribute water shortages to climate contingencies and occasional breakages. The discourse of water scarcity as related to "prevailing institutional arrangement" (UN, 2006:134) is however wide within the users' community, the media and social movements.

Sicilian actors' description

An extensive analysis of the main actors is reported in Annex II, and illustrated in Figure a. (Annex II, pp. 34). A brief description of key actors is given below.

Farmers represent the water users in agriculture. The public water supply is managed by the Reclamation Consortia, public bodies supervised by the Regional Department for Agriculture.

The expertise on agriculture and water resources management is divided among different departments of Region Sicily. The Regional Department of Water and Waste has jurisdiction in the field of water resources and waste management. It is responsible to draft and updated the River Basin Management Plan of the District Sicily. Its services (1 to 4) are appointed for: integrated water resources management; meteorological, hydrological and morphological monitoring of water bodies; planning and regulation of water uses; and management of water infrastructures.

The Regional Department for Agriculture is responsible for planning and coordinating projects within the agro-food, rural and forestry sectors; it carries out infrastructural and structural works for agriculture. Area 3 of this department is responsible for the coordination and implementation of the RDP and other National Programs related to the rural areas; it is also appointed for updating the national agriculture informational system (SIAN), which represents the information portal for the RDP. Within this area, Service 5 handles the coordination of the Sicilian Agro-meteorological Information System (SIAS), providing agro-meteorological bulletins and other services. Peripheral offices of the Department for Agriculture shall ensure territorial assistance to farmers.

Farmers associations also provide information and support to farmers. Together with farmworkers trade unions, they represent farmers' interests in the political scene.

Finally, research and education institutes, such as the Universities of Palermo and Catania, hold knowledge on local agriculture and water resources; the Agricultural and Agrarian Economy Research Council (CREA), combines research on production and consumption systems to socio-economic factors to support rural development; CREA also gives advice to Regional Departments on the implementation of EU policies.

Sicilian Implementation of European policy instruments "on paper"

Two documents of main relevance resulted to be the already-mentioned River Basin Management Plan (RBMP), demanded by the WFD, and the Rural Development Programme (RDP), regional implementation of the Rural Development Policy. The updated plans for the respective planning periods (2015-21 and 2014-2020) have recently been updated and adopted by the Region Sicily and EC, and are made available on the European database.

With the regional law no.19, 11/08/2015, the Region Sicily has started a re-organization of the water governance to implement national and European policies aimed at safeguarding water resources (RBMP, 2016). Competences on WRM have been conferred to different offices of the Regional Department for Energy and Services of Public Utility, also responsible for the draft of the RBMP. The Fourth WFD Implementation Report to the EC (2015) notes the delay of the Region in various implementation steps and the presence of un-reported

information for qualitative and quantitative states of surface and groundwater bodies. The updated Plan fills in most of these gaps, also including an "analysis of climate change in Sicily". Within its aims, the RBMP reports "to promote sustainable water use based on long-term protection of available water resources" and "to contribute mitigating the effects of floods and droughts". Measures to meet such objectives encompass: enhancing institutional activities; reducing water withdrawals; and improving monitoring systems. The plan often refers to the Rural Development Programme for financing the measures.

The new RDP (2014-20) outlines Sicily's priorities for using € 2'213 million of public money available for the 7-year period. The programme has three long-term strategic objectives: competitiveness of agriculture; sustainable management of natural resources; and balanced development of rural areas. It is structured on six priorities for action. Priorities 4 and 5 contribute to the pursuit of climate change mitigation and adaptation targets by: encouraging better water management and enhancing efficiency of water use by agriculture. These can be achieved through the implementation of measure 10 "Agri-environment-climate" and measure 11 "Organic farming". The RDP ex-ante evaluation (RDP, 2015) estimated that more than 800'000 hectares will receive support for organic farming, and that 30% of agricultural surface will be "subjected to contracts for a better water and soil management, while 31% for supporting biodiversity". For improving competitiveness, investment support for modernization has been expected for over 1'800 farms, and for the establishment of over 1'600 young farmers. Innovation, cooperation and knowledge base development are also targets of the Programme, also supported by the European Innovation Partnership .

At national level, Italy's Strategy for Adapting to Climate Change (MATTM, 2013) proposes sustainable measures for the water-agriculture interplay, aimed at tackling water shortages. Actions as "reducing risks through crop diversification" (favouring climate resilient and less water-demanding crops), and adopting Drought Management Plans (DMPs), are recommended. Measures to reduce risks are included in the RDP; a DMP is not available for the Sicilian Region.

To coordinate actions set in the RBMP and RDP, and to maximise synergies with other European Funds, a Partnership Agreement (PA) has been signed between EU and Italy. The PA sets ex-ante conditionalities prior the disbursement of European funds. Among the requirements, monitoring water uses in agriculture and setting a tariff for water consumption are yet to be met. In 2012, the regional Consortia adopted Classification Plans that expect the application of a water tariff to farmers, as required by the WFD and the ex-ante conditionality.

3.2. Farmers

The themes emerged from the analysis of survey plus six interviews with farmers are here described. Annex III reports the extended analysis of responses (pp. 41-52), as well as responses to each question in tables (pp. 58-99).

Theme 1. Characterization of respondents and study area

Respondents to the survey amounted to 70 farmers. Table 4 in the next page gives an overview of respondents general details, together with regional data.

The respondents set presents some differences from the regional data (Istat, 2014) especially as concerns age, education and farm size. Regional statistics report higher percentages of the elderly (39%), a low level of professional education, and majority of small farms. By combining respondents' details (see Annex III, pp. 58-99), some clusters can be identified. First, 72% of farmers more than 65 y.o. are full time, while 72% of farmers less than 35 are part-time. Medium and big farms are mainly managed by farmers less than 54 y.o. and almost all the small farms (83%) are managed by part-time farmers. Regarding crops production, 71% of medium farms and 50% of small farms grow fruit and citrus; 70% of big farms cultivate arable crops; while olives are grown by 56% and 51% of respondents having big and medium farms, respectively. Small farmers are more oriented towards local and direct sale (65%) and none of them sell to international markets. Local and national markets are also the most common sale channels for big and medium farmers. Comments and interviews with small farmers highlighted their difficulty to sustain competition with bigger holdings, especially referring to a costly production chain.

Theme 2. Shared opinions on public water management and "self-adaptation"

Most of the respondents, especially those supplied through public water networks, don't hold in high regard the public water management. The inefficiency of the latter and poor communication could limit farmers' access to water resources. Self-adaptation would have occurred as a consequence, including recourse to private supply and water efficient and saving measures.

73% of the respondents are registered to Consortia but only 60% is supplied through public water networks. The remaining 40% resort to private sources. Combination of public-private supply is also widespread (34%). Farmers having at least one private water source for irrigation amount to 70%; 43% make use of wells and 34% of small reservoirs. Table 5 shows the used supplied sources according to farms size. Among the respondents reporting occasional inability to irrigate (49%), almost three quarters are supplied by public network. Reported causes behind it

include restrictions posed by Consortia (71%), as inadequate supply schedule, scarce maintenance of infrastructures and consequent breakages. Contrarily, 88% of those who say to be able to irrigate mainly rely on private sources.

Communication between farmers and Consortium employees is good for 31% of the respondents served by the Consortia, while not enough interaction is reported by 41%. More shared is the perception of scarce communication between farmers and regional water authorities (72% of the total respondents) and of poor cooperation among within farmers' community (63%).

As a consequence of supply restrictions and low level of communication, many farmers would have resorted to private adaptation measures. Two thirds of the respondents have implemented water efficient techniques and saving measures, including: drip irrigation (installed in total by 73%); rationalizing water consumption (47%); harvesting water in tanks or small reservoirs (43%). As emerged from the analysis of public funding instruments (see Theme 4) and from comments and interviews with farmers, these solutions were often privately funded, rather than consequence of water efficiency programs. In extreme cases, missing reparations to breakages would force farmers to abandon the lands, if no other ways to get water are found.

Private supply through wells is a widespread phenomenon. However, wells are often 'abusive' (unreported). According to the interviews with farmers, the latter avoid reporting a well being afraid to pay unaffordable tariffs or get imposed restrictions on water withdrawal. Water thefts as 'illegal connections' to public hydrants and water pipes are also reported (see Figure 3).

Table 4. Overview respondents details

Respondents details		Count	Percentage	Regional data (Istat, 2014)
Age	Less than 35	18	26%	7%
	35-44	13	19%	-
	45-54	20	29%	-
	55-64	8	11%	-
	More than 65	11	16%	39%
Education	Elementary school	2	3%	32%
	Secondary school - 1st degree	3	4%	30%
	Secondary school - 2nd degree	19	27%	21%
	Tertiary school - 1st cycle (Bachelor)	10	14%	8.8% (coupled value)
	Tertiary school - 2nd cycle (Master)	28	40%	
	Tertiary school - 3rd cycle (PhD)	1	2%	-
Occupation	Part-time farmer	38	54%	-
	Full-time farmer	32	46%	-
Farm size	Big (≥ 30 ha UAA)	23	33%	4% (9'164 farms)
	Medium (2-30 ha UAA)	35	50%	43% (93'354)
	Small (< 2 ha UAA)	12	17%	53% (117'159)

Table 5. Source of water supply and farm size

	Big farms		Medium farms		Small farms	
Water supply source	**Count**	**%**	**Count**	**%**	**Count**	**%**
Combination public-private supply	11	16%	12	17%	1	1%
Multiple private sources	3	4%	2	3%	3	4%
Single private source	5	7%	8	11%	4	6%
Single public source (Consortium)	1	1%	13	19%	3	4%
None	2	3%	-	-	1	1%
n.a.	1	1%	-	-	-	-
Grand total:	**23**	**33%**	**35**	**50%**	**12**	**17%**

Figure 3: Example of five illegal connections to a public water network in Gela. The withdrawal rate amounted to 30 l/s per connection[††]

Finally, users are often reluctant from paying for water services. 59% of the respondents pay a tariff, mainly in €/ha of crop irrigated. 76% of them consider the tariff to be inappropriate, due to the scarce or absent service, or because too excessive compared to the agricultural revenue. 67% of the respondents also report the absence of water meters to monitor the actual consumption. Yet, where meters are present, these are not controlled for the majority of the cases. Meters should be placed on wells, often unclaimed, and public hydrants, subjected to illegal connections, as just described .

Theme 3. Experience and perceptions on water scarcity and drought

Almost 80% of the respondents experienced limited water availability. Among them, 67% experienced drought. Answers resulted very heterogeneous as far as concerns the identification of events and their duration. Table 6 below shows the most selected WS-D's causes and impacts, as well as preventive actions and emergency measures adopted by respondents.

Among implemented actions, changing to less water demanding crops shows how water availability issues influence choices on crops specialization, which are not only market-driven. Even if preventive actions have been undertaken by a large group of respondents (76% in total), only 26% believe to be prepared in case a new drought event. This group consists of farmers privately supplied. Farmers considering themselves not enough equipped to face new drought periods amount to 67%, of which 75% are served by the Consortia and 15% by only one private source. Assessing farms vulnerability and monitor drought risks, e.g. as a Drought Early Warning System, represents a preventive action. Three quarters of the respondents claimed that this service does not exists, 10% did not provide an answer, while 14% answered positively. Among the latter, only the 10% could identify the service provider as represented by the Region Sicily. This would suggest that, even if a system is operating, it is not efficiently widespread or accessible to end users.

Half of the respondents provided definitions for WS-D (Annex III, pp. 100-105). Among them, 73% believe there is a link between the two phenomena. The difference between water scarcity and drought is not commonly acknowledged and, due to their similar impacts, concepts could be blurry. Two main groups have been identified by analysing the given definitions:

- Group 1 (46% of respondents): Respondents to this group seem to better distinguish water scarcity as to be a social construct while drought climate-determined. Two thirds of them are served by public networks.
- Group 2 (35%): No net difference is seen in the definitions. About 70% of this group only rely on private sources, thus getting the water without use of public infrastructures. For them, a reduction in precipitation e.g. during drought periods, leads to less water directly available to meet the demand, heading to the general perception of water scarcity.

WS-D phenomena are perceived as very serious or serious by two thirds of the respondents, especially by those relying on public water supply. Only 7% and 8% perceive drought and water scarcity as to be not-serious, respectively. This group is represented, except for one, by farmers who rely on private water sources.

Theme 4. Role of public subsidies and funding

Financial instruments available to farmers to support their activity[‡‡] and address water quantity issues are identified. Access to such instruments seems to be dependent on farmers features as age, farm size, type of crops and level of information.

Half of the respondents receive financial support. 67% get direct payments under the CAP[§§], 24% funding through RDP measures, while 9% get them both. The recipients group is mainly represented by big farmers (57%), less than 54 years old (74%), practicing poly-culture and mainly growing olive trees, fruit and citrus and arable crops. In total, two thirds of farmers who sell to the international market receive financial support. Small farms are excluded, except for one that gets direct payments. This would partly depend on the eligibility criteria set to apply to RDP measures, restrictive in terms of UAA and economic dimensions. Comments and interviews with farmers highlighted the burdensome bureaucratic application procedure, which discourages and often excludes farmers from participating.

[††] Source, regional newspaper http://www.quotidianodigela.it/images/luglio2016/allacci.jpg

[‡‡] "By supporting the agricultural sector" implies that policies and measures taken by international, national or regional administrations conform to farmers' needs in the way that the employment within the sector is encouraged

[§§] Regional data (Istat, 2014) reported 62% of the total farms receiving benefit from direct payments

Table 6. WS-D's causes; environmental and socio-economic impacts; adopted preventive actions; and undertaken actions in case of drought.

	Water Scarcity		Drought	
Causes	**Count**	**Percentage**	**Count**	**Percentage**
Insufficient or badly maintained infrastructures	39	56%	-	-
Prolonged drought periods	35	50%	-	-
Lacking water management	30	43%	-	-
Overall waste of the water resource	23	33%	28	40%
Ongoing climate change	11	16%	32	46%
Prolonged lack of precipitation	-	-	61	87%
Environmental impacts				
Increase in soil aridity	46	66%	43	61%
Drop in groundwater levels	29	41%	25	36%
Draining of surface water bodies	20	29%	23	33%
Socio-economic impacts				
Loss of production	57	81%	56	80%
Economic loss	53	76%	52	74%
Conflicts for water access	19	27%	18	26%
Migration	12	17%	12	17%
Adopted preventive actions				
Measures of water efficiency (e.g. drip irrigation)	35	50%	22	31%
Rationalizing water consumption	33	47%	-	-
Water harvesting	30	43%	25	36%
Change to less water demanding crops	20	29%	22	31%
Water reuse	2	3%	-	-
None	5	7%	9	13%
Actions undertaken while a drought was occurring				
None	-	-	21	30%
Rationalizing water consumption	-	-	30	43%
Excavation of wells	-	-	17	24%
Extra supply by tanker truck	-	-	4	6%

A summary of relevant criteria for the most selected measures, together with their target to water quantity issues and applicants' features, is available in Annex II (Table III, pp.50).

71% of the respondents report that no incentives are available to promote efficient water use, while 20% identifies the RDP as the available tool for water-related measures, referring to e.g. measure 214 'Agri-environment payments' or 4.1 'Investments in agricultural holdings'. Comments stated the chance that incentives and water saving measures exist, but farmers are not correctly informed about it.

Insurances against atmospheric adversities, including droughts, are available to farmers. Only 7% of the respondents have applied to insurance against drought. These are medium and big farmers, growing fruit and citrus trees. Their characteristics are shown in Table 6.6.1 (Annex III, pp. 89). Comments and interviews highlighted that farmers cannot afford investing on a new insurance. In addition, they are sceptical to apply given the uncertainties related to the identification of drought events and the long procedures prior the compensation disbursement.

19% of the respondents have applied to funding programmes considering climate change-related objectives, including adaptation measures for drought and water efficiency. This group is made up by big and medium farms managed only by farmers less than 54 y.o.. Almost 70% of them is aware of the available European budget for climate actions (29% of the total respondents set).

Yet, the majority of the respondents (89%) state that there is no enough information on water-related measures to adapt to climate change. Even when known, such instruments are not always fully implemented. Some of them individually suggested few strategies to limit energetic costs linked to irrigation and to contain water consumptions. Reported obstacles behind a poor implementation of funding instruments are, above all, lack of planning capacity by the administrative bodies (53%) and economic barriers (47%). Reasons related to habits, as scarce inclination to adopt changes in the traditional practices (31%) are also pointed out.

Theme 5. Trust in the European and Regional policies and knowledge assessment

Respondents' perceptions on European and Regional agricultural policies resulted to be very low especially as far as the regional administration is concerned. Further knowledge assessment is carried out, suggesting that a rather scarce level of information among farmers on current water, climate and agricultural policy instruments, together with poor communication with managing authorities, negatively influence answers and expectations.

The agricultural employment is not supported by European and regional policies according to 73% and 96% of the respondents, respectively. The group positive towards EU policy consists of 17 farmers (24%), mainly less than 35 y.o. (41%) and between 45 and 54 (41%), with a high level of education and from all over the region. They mainly own big and medium farms, while only 3 have small farms. Among them, 59% receive subsidies (60% direct payments and 40% from RDP). Two thirds of this group believe there is insufficient communication and cooperation within the farmers' community and none is happy with the public management. This could represent their mistrust towards Regional policy. In particular, when asked to identify the main problem in the agricultural sector related to water resources, 35% pinpoint lack of maintenance of public networks and 30% lacking or inappropriate water management. 77% of them identify lack of planning by regional authorities as the major obstacle to implementing water saving measures.

Among the few that trust the EU policy, only two are content with Regional policies, accounting for 3% of the total respondents. These are young farmers (less than 45 y.o.) that own big farms growing arable crops, destined to local and national markets; both receive direct payments from the CAP. Even if they trust regional agricultural policies to be supportive, they identify lack of communication and coordination between farmers and managing authorities as to be the main problem related to water resources in agriculture. Nothing is specified about their knowledge on existing policies to address WS-D.

Causes of 'mistrust' towards both European and Regional policies are searched within the level of awareness that farmers have regarding available policy instruments. Information level is very different among various groups of farmers and depends on the diverse topics. As reported in the previous section, information on funding instruments for agricultural activity and climate-change related objectives is not widely spread. Among those who know instruments or incentives for a water-efficient use, or consider information on climate change-related programs to be available, only one each 4 farmers is content with EU and Regional policies. 83% don't know about the existing policies to address WS-D in the EU. More than half of those aware about such policies trust Europe to be supportive.

Theme 6. Future climate, optimism and potential changes

Future expectations in terms of climate, water availability and agricultural sector are important to understand respondents' needs, as well as their attitude towards possible changes.

Water scarcity and drought events will likely be more frequent in the future for 80% and 74% of the respondents, respectively. Among those who don't expect any change, two thirds rely on private sources and are able to irrigate following crops needs.

A consistent group (60%) is relying on their current water source for the future, including farmers who believe that WS-D events will be more frequent. Respondents to this group are supplied by private sources or combination of private and public.

37% of the respondents are optimistic towards the future of the agricultural sector[***]. This group increases to 60% when referring to trust towards young generations. Except for one respondent, the group that does not believe in the new generation is also pessimistic about the future of agriculture. Farmers less than 44 y.o. are more optimistic and trustful in their generation. They mostly have a higher education and are part-time employed. For all the three categories of farm size, negative answers are higher as far as concern the future of the agricultural sector; a greater number of farmers, especially from medium and big farms, believe in the youth. A pessimistic view is observed among who practices open-field horticulture, while far more optimistic are the farmers oriented to international markets. The group that does not get subsidies is more negative respect who gets financial support. It mainly corresponds to medium and small farms, and includes more than half of the elders who took part to the survey. Who receives funding from the RDP is more positive than who gets direct payments from the CAP. This is partly because who takes part to the RDP is likely to have a more established and solid activity (medium and big farms, selling to national and international markets). As stressed by comments and during interviews with farmers, direct payments from the CAP, generally smaller compared to farmers' needs and to the costs that they have to sustain. Among those unhappy with the European policy (73%), almost a third is still positive towards the future of the agricultural sector and

[***] The expression "optimism towards the future of the agricultural sector" is used to indicate the faith that potential challenges (climate related or socially constructed) would be faced, to the extent that the primary sector would keep ensuring employment opportunities. Same applies to "optimism towards the capacity of the new generation to face current and future challenge", especially referring to young farmers (age categories under 45 years old).

more than half towards the new generation. Again, the level of information plays a role: who does not know other supportive instruments, ignores climate change-related programs or existing WS-D policies is more pessimistic (and viceversa).

Many measures are recommended by respondents to face WS-D events. The most reported are shown in Table 7 below. Table 8 shows how investments should be directed. As already seen, a water tariff is not always applied. More than half of the respondent, mainly under 54 y.o., would be willing to pay a (higher, if already applied) tariff, if they know this would serve to improve management and delivered services.

3.3. Other stakeholders

This section describes the results from the analysis of interviews and participant observations. Table 9 gives the list of themes and subthemes, together with the number of interviewees/speakers mentioning them. Annex IV reports the extended description of the themes (pp. 110-125).

Theme 1. Farms characteristics & farmers habits

Increasing economic difficulties for small farmers are acknowledged by researchers and professors of agrarian economy, as well as by the peripheral office of the Regional Department for Agricultural. The existence of small realities would have its origins in the so-called structural "fragmentation of the land ownership", resulted from past agrarian reforms. The resulting units are considered to have an "anti-economic marketing" due to heterogeneity of grown crops and a consequent fragmentation of the product line. This, with an ongoing market crisis, would create a situation of disadvantage in the agricultural sectors, likely to increase land abandonment, and decrease agricultural employment. According to the same interviewees, gathering into cooperatives would be a good option for small farmers to grow and sustain competitiveness. However, a prevalent individualistic approach is pointed out unanimously by the interviewees. This would be also seen in the expanding recourse to private water supply.

As explained by officers at Regional Departments and a researcher at Palermo University, the autonomous supply often assumes an illegal character, as undeclared wells or water thefts through connections to public networks. Illegal abstractions and over-exploitation of water resources are pointed out as negatively affecting the water balance and increasingly hindering a realistic monitoring of the water uses.

Moreover, researchers blame farmers to waste large volumes of water by excessive irrigation, especially referring to the elders. This would come from a cultural "paradigm of the excess", following which farmers would consider greater volumes of water to increase crops yield. Optimized irrigation is likely to occur within big farming businesses, according to Consortia employees. Contrarily, the interviewed agronomist and a policy officer at DG ENV argue that big farmers may practice intensive farming, which could be more harmful for the soil, increasing aridity and consequently requiring bigger volumes of water.

Table 7. Measures needed to face WS-D in agriculture as recommended by respondents

Most selected measures (frequency of answers)	Count	% over the respondents
Increase the implementation of water efficient measures for irrigation	42	60%
Guarantee a proper, reliable and equitable water supply	36	51%
Improve technical skills of farmers and managing authorities	34	49%
Increase transparency on the management of water for irrigation	32	46%
Reuse treated wastewater for irrigation purposes	28	40%
Improve the monitoring system and data collection on availability, demand and use of the water resource	22	31%
Improve the dialogue among the responsible bodies and the farmers	22	31%
Change attitude among the institutions and the managing authorities	19	27%
Total ticked responses	**259**	

Table 8. Objectives of future investments as recommended by respondents

Objectives of future investments (frequency of answers)	Count	% over the respondents
To modernize the existing infrastructures	49	70%
To create new water infrastructures	43	61%
To foster the research on climate and technical innovation	34	49%
To promote the farmers' participation in educational and scientific innovation events	25	36%
For the institutional reconstruction of the water managing authorities	22	31%
Total ticked responses	**176**	

Table 9. Themes and sub-themes emerged from the interviews analysis

Theme	Subtheme	# of interviewees and speakers mentioning the subtheme and their category										
		Total	Professors	Researchers	Regional officers	Consortia employees	National Ministries officers	EC officers	Farmworkers trade unionists	Farmers representatives	Consultants	Citizens representatives
		6	4	3	10	2	2	3	2	1	5	1
1. Farms characteristics & farmers habits	Fragmentation of land ownership and land abandonment	6	2	-	2	1	-	-	1	-	-	-
	Little cooperation among farmers	4	2	-	1	1	-	-	-	-	-	-
	Private water supply and illegal behaviours	7	1	1	2	2	-	-	1	-	-	-
	Excessive irrigation	3	1	2	-	-	-	-	-	-	-	-
	Soil conditions affecting water consumptions	4	-	1	1	-	-	2	-	-	-	-
	Lack of awareness	5	1	-	1	-	-	2	1	-	-	-
2. Reclamation Consortia	Reforming administration	14	2	1	6	2	-	-	2	1	-	-
	Poor management of water resources	8	1	-	5	2	-	-	-	-	-	-
3. Regional administration	Missing District Authority and lack of planning	22	4	3	5	2	2	1	2	-	2	1
	Hindered data sharing and heterogeneous dataset	9	1	1	2	-	1	3	-	-	1	-
4. Water Scarcity and Drought	Definition of water scarcity	13	4	2	4	2	-	-	-	-	1	-
	Definition of drought	12	3	3	4	1	-	1	-	-	1	-
	Climate change perception	5	2	-	-	1	-	2	-	-	-	-
	WS-D management strategies	24	4	2	7	2	1	2	1	-	5	-
	Insurance against drought	7	-	2	2	1	-	2	-	-	-	-
	Water reuse	7	1	2	3	-	-	1	-	-	-	-
5. Policies	Policies and practice, gaps	11	3	2	2	1	-	3	-	-	-	-
	Participation process	8	1	2	-	1	1	3	-	-	-	-
	Addressing water quantity issues in environmental law	6	1	1	2	-	-	2	-	-	-	-
6. Financial Instruments	National funding	11	3	1	3	2	1	2	1	-	-	-
	European funding	11	1	2	2	2	-	3	-	-	1	-
	EU budget for climate change-related objectives	5	-	1	1	-	1	2	-	-	-	-
	Ex-ante conditionality: a. Monitoring water volumes in agriculture	11	1	2	4	1	-	3	-	-	-	-
	b. Tariff for water consumption and environmental costs	10	2	2	3	1	-	1	-	-	1	-

Unanimously, it is reported that best practices have been developed but scarcely implemented, also due to lack of information and awareness among farmers. Regional Department officers report to have increased educational programs. Differently, a trade unionist affirm that farmers are very aware of the value of water, but mismanagement is threatening the agricultural development.

Theme 2. Reclamation Consortia

The activity of the eleven Consortia is of main importance, as they are the responsible body for supplying irrigation water. However, they are facing a persisting financial crisis and management problems, which make the modernization of the existing outdated infrastructures very scarce. According to researchers and officers at the Regional Department for Agriculture, inefficient allocation schemes and water tariff system (€/ha) are applied. Political interests would steer the operation of these bodies, rather than productive and collective ones. In consequence, cooperation and data sharing is lacking. Moreover, an internal representation of farmers misses, further increasing communication and cooperation issues.

On their behalf, Palermo headquarters' employees argue that the service is improving and many maintenance projects are ongoing. A reform should be on place from 2014, aimed at unifying into two offices the existing ones. In practice, the eleven offices keep unchanged.

'Classification Plans' have been drafted to plan management and maintenance works, as well as to define a water tariff for farmers. Yet, according to the interviewed researchers and officers at Regional Departments, these Plans are not fully implemented.

Theme 3. Regional administration

The existence of multiple stakeholders in the water governance is an issue if competences are fragmented without coordination, creating confusion in the allocation of responsibilities. This is the case for Sicily, as unanimously acknowledged by the interviewees. Even officers at Regional Departments, appointed for water resources management (WRM), acknowledge the existing complexities in coordinating and planning. Yet, in their opinion, the negligence goes to the National Government. The latter is blamed to lack supervision, a guiding role and efficient delegation of tasks. Interviewees often refer to the WFD, which calls for the establishment of a River Basin District Authority in each European District. The Region Sicily represents a District itself and lacks this Authority, which could coordinate and guide the WRM. Due to missing coordination, Sicilian RBMPs and RDPs were published late and with lacking information. According to Regional Department officers, administrative delays are due to prior delays of the Italian State in transposing the WFD and issuing guidelines. Finally, a poor management is also reflected in hindered data sharing and heterogeneous dataset, as widely complained by researchers, the officer from the National Ministry of the Environment and EU policy officers. The latter underline the value of exchanging knowledge and data, and especially of involving local Universities, which represent the holders of scientific knowledge.

Theme 4. Water scarcity and drought

Researchers, professors and consultants clearly recognize the presence of permanent water scarcity issues in local agriculture, due to lack of planning and management. A consultant for the Ministry of the Environment points out that resources availability is overestimated, due to the fact that decisions are taken "around a table" with little contact with local realities: losses and illegalities are not taken into account in water balances and allocations.

On their behalf, Regional Departments offices appointed for WRM argue that water scarcity would not exist, given the existing of infrastructures and available resources. Drought and water quality would be the big pressures on water availability. Yet, they acknowledge that the distribution network should be strengthened and that structural problems to many regional dams limit the storage capacity.

In response to this, researchers explain that water resources would indeed be sufficient to meet the demands, but the malfunctioning water governance arises problems in the actual supply. The burden of drought is unanimously recognized by the interviewees as a recurring temporary problem, characteristic of the Sicilian semi-arid climate. Researchers and consultants also refer to the human-induced intensification of droughts, e.g. several dams are so poorly maintained that the lowest water levels are easily reached, even in case of short periods of rain deficiency. The pressure of climate-change is also recognized by interviewees at Regional Departments and Consortia, while two professors consider themselves sceptical about the occurring of the phenomenon. They rather refer to a 'cyclic nature of the climate'.

WS-D management occur very reactively, as unanimously reported. The 'reactivity' would be part of the Sicilian cultural background, as explained by researchers, professors and Regional officers. No proactive measures are taken to safeguard water quantity; when shortages occur, priority is given to the domestic sector. In case of extreme droughts, Consortia report to maximize water transfers between near water systems. However, they state that measures are often inadequate to compensate the shortage. Researchers report the consequent resort to private sources by many farmers. Drought monitoring is carried out by the Regional Departments of Water and Waste and for Agriculture. However, no risk management plan is combined. A new Drought Observatory is being established to proactively manage the water resources.

The Regional Department for Agriculture encourages farmers to apply to insurances against drought to cope with the risk in agriculture. This is also supported by the DG CLIMA, with the goal to protect farmers' income. Insurances do not directly diminish the risk of drought to occur. Yet, officers at DG AGRI explain that this could be achieved by issuing conditionalities to farmers prior to apply for insurances.

Among water efficient measures, water reuse is often mentioned. However related costs and regulatory barriers make hardly feasible its implementation.

Theme 5. Policies

Researchers, consultants and regional officers often argue that "EU is too distant to be a real motor" and that available policy instruments do not fit local realities. A consultant for the Italian Ministry of the Environment states that "money and situations are disassembled". Lack of communication and participation in water governance would have led to misrepresentation of Sicilian needs. Yet, according to the same interviewees and professors, the major gap would occur between National and Regional governments. By issuing reforms on regional water governance without clear guidelines, the State have "launched a deconstruction without imposing any reconstruction".

Regional officers explain that policies on paper are powerful and stimulating tools. Yet, aligning the practice according to what is on paper presents many complexities. First of all, a reorganization of the governance is required. This demands expertise, a solid economy and social acceptance. Legal instruments are seen as dictating revolutionary changes to already complex internal systems. Then, implementation and adaptation processes result very hard. The EC is making efforts to simplify implementation processes, especially concerning the WFD, as reported by interviewed policy officers.

To the other hand, policies on paper also present "glitches", as stated by European officers. They refer to the complex policy making process internal to the EC. A given policy is revised many times by different parties (DGs, MSs, organizations and associations, other lobbies) prior to be published. As a result, the final version may take different facets from the original idea. In addition, a European policy has to be flexible since it addresses very diverse European territories. Often, this flexibility "means that the policy loses clarity, entailing ambiguities". However, if guidelines associated to the policy are carefully drafted, they can ease its interpretation. This was the case for the last RDP reform. The shift from thematic axes to priorities created doubts on how to articulate the measures. Moreover, poor administrative capacity of the regions, including lack of expertise, information and communication constraints, represent big barriers to implementation processes.

Supporting their role, researchers and professors stress that scientific evidence must be at the basis of policies on paper, to better fit measures and actions to the territorial diversities. Thus, they call for enhanced participation and involvement of Universities and Research Institutes in policy making and implementation processes. As stated by European officers, support to research is given, with special focus on innovation, through the EU innovation partnership on Agriculture and on Water.

Participation is actively promoted by the EC. DGs collaborate within working groups for intra-sectoral issues as water-agriculture and climate impacts on water resources; contacts between DGs would take place at each stage of the policy process. DG AGRI has constant contact with European farmers organization, to better represent European farmers' needs. Involvement of local farmers in decision making has to happen at decentralized level, being responsibility of the Regions. However, advisory tools for farmers are also available through European platforms as the Rural Development Network.

How environmental and agricultural laws address water quantity issues was discussed several times with researchers, professors, Regional and European officers. A researcher and an EC officer argue that the full implementation of WFD would target WS-D related issues, by fulfilling requisites on over-abstraction and water demand management and by applying a tariff that includes environmental costs. Hence, no new policies are required, nor big changes are expected for the future in terms of water quantity issues. Interviewees at DG AGRI state that there is an extensive number of tools to address water quantity issues in the RDP, through measures for water efficiency in irrigation, environmental protection and risk management. The uptake of these possibilities depend on the capability and will of the single Regions, since the RDP represents a "sort of voluntary and flexible tool". It is up to managing authorities to make the Programme more inclined to local needs or to enhance the uptake of given measures.

Theme 6. Financial instruments

First, as unanimously reported by interviewees, available financial instruments do not target existing issues efficiently, as it is the case for infrastructures' maintenance. Public funding does not cover ordinary maintenance, which should be done with internal budgets by managing authorities. Yet, the latter complain financial constraints. Consultants and researchers report the need to have a supra-regional supervision over funding expenditure, given the limited internal capacity to plan expenses.

CAP's direct payments and RDP are the two main tools available to farmers that can tackle WS-D in agriculture, as reported by interviewees. Direct payments are more easily accessible by farmers. Yet, employees at Consortia and Regional Department for Agriculture state that the financial aid is often too small for the real costs of farming activities. The RDP has specific measures to modernize farms and realize water saving measures. Yet, eligibility criteria are size-selective, leaving out most of the small and medium Sicilian farms, as pointed out by researchers, Consortia employees and Regional Department officers. DG AGRI's policy officers explain that eligibility criteria mainly come from MSs, which have a good degree of freedom. The same interviewees illustrate the possibility that farmers associations could carry out lobbying to managing authorities during the draft of the Programme, influencing the decision of eligibility criteria and measures' details. This would steer the allocation of funding toward specific groups of farmers. In addition to eligibility criteria, farmers have to face bureaucratic procedures often long and too difficult compared to their resources, as explained by employees at Consortia and Regional Department for Agriculture. At EU level, a simplification of bureaucratic burdens is expected for the CAP post2020. European officers further explain that funding under the RDP is intended for a limited number of farming holdings, to foster their competitiveness. Although funding should go

to farmers facing more economic difficulties, this is often allocated to already established and strong businesses.

The share of European budget for climate change-related objectives should encourage farmers to apply for adaptation measures. However, as reported by researchers and Regional officers, this depends on the capacity and awareness of the individual farmer. In addition, measures to combat climate change are also limited in the RBMP, which missing the "climate-proof" feature as denounced by the Ministry for Environment's officer and a researcher.

Interviewees from Regional Departments and research institutes recognized that specific ex-ante conditionalities, set between Italy and EU and to be fulfilled prior the disbursement of funding, would help tackling WS-D effects. They encompass: monitoring and quantifying water uses in agriculture; and defining a water tariff including environmental costs. Meeting these requirements is complex and not yet accomplished by the Region Sicily. Regarding monitoring of water uses, barriers are found in the absence of water meters over the territory and uncontrolled water abstraction, as unanimously reported. Lack of coordination between responsible offices also plays a role. As for the tariff, the current one set by Consortia and based on a surface criterion is considered inadequate by researchers, consultants and Regional officers. They acknowledge that farmers are reluctant to pay for inefficient services and that the definition of environmental costs is still under discussion. A European officer argues that water in agriculture is either undervalued or highly-subsidized and recommends to improve the tariff system in the way that farmers pay for services and modernization works, as well as to ensure transparency and implement tools as the greening.

Last but not least, projects as INTERREGs and LIFE program are considered very useful to promote knowledge exchange and enhance collaboration with Universities and other Regions. Yet, the University involvement is diminished over time, as reported by the interviewed researchers.

Table XVII (Annex IV, pp. 125) presents the recommendations on the emerged themes given by the interviewees.

4. Discussion

The last stage of data analysis allowed interpreting findings as a whole. Three main topics are defined, presented in sections 4.1, 4.2 and 4.3. They discuss actors' shared and divergent opinions on the emerged themes, taking into account information retrieved by documents. Section 4.4 presents the limitations of this study and recommendations for future research.

4.1. Agricultural structure and water governance

Small farmers are the majority in Sicily, although their number is dropping in favor of expanding big and medium farms. Their increasing marginalization due to economic difficulties is acknowledged on official documents, by farmers and other actors, as a factor potentially increasing the risk of lands abandoning. Their gathering in cooperatives would help them to sustain competitiveness with bigger farms. Yet, both survey and interviews highlighted a poor cooperation within the farmers' community. Moreover, lack of communication and representation between farmers and managing authorities may represent an additional barrier to a better organization of the agricultural sector.

From the survey it emerged that the majority of the farmers is reluctant to pay the public water supply managed by Consortia, given the scarce service. Many have combined public and private supply. Farmers and interviewees report that the latter often corresponds to illegal solutions, as unreported wells and water thefts. Retrieved data on water uses for irrigation are highly heterogeneous, resulting difficult to quantify the impact of (illegal) private supply. Another uncertainty concerns the type of applied water tariff. According the Sicilian RBMP, half of the farmers pay a volumetric tariff (€/m3). Conversely, results from survey and interviews show that the common tariff method applied to water uses is based on a surface criterion (€/ha), set by Consortia.

Interviews at the Consortia highlighted that the bad state of infrastructure hampers an efficient water supply. Poor maintenance is due to economic constraints, in turn deriving from missing farmers' payment and limited budget given by the Region. On the other hand, Regional officers and researchers blame negligence of Consortia's employees, lack of cooperation and lack of planning.

As unanimously pointed out, competences on water resources management are divided among multiple stakeholders. A clear definition of responsibilities and coordination are missing, making difficult a long-term planning of water and financial resources.

4.2. Water scarcity and drought perception and management

The definitions of drought found in regional documents, given during interviews and by majority of farmers are agreeing to those proposed by the EC and FAO. The discourse around water scarcity is more complex and the phenomenon assumes many nuances. Official documents and Regional departments refer to water shortages as determined by climate contingencies and occasional breakages. Scarcity is seen as related to prevailing institutional arrangement mainly by farmers who are supplied through public networks. They depend

on the state of infrastructures and decisions over allocation schemes. Frequently they blame the Consortia to be responsible for undelivered water. To the contrary, farmers relying on private sources (e.g. well or small reservoir), have relatively more autonomy on water withdrawal. They define water scarcity when water availability from their source is limited due to low recharge rates, e.g. during drought periods. Yet, over-exploitation of groundwater for irrigation is reported in documents and by interviewees, who also stress illegal actions. This sums to a standard idea on farmers practicing excessive irrigation. Conversely, results from survey and regional statistics show that the majority of farmers have implemented efficient techniques, as sprinklers and drip irrigation; and it seems that the greatest waste of water occurs due to missing and/or outdated infrastructures (leakages in the network and limited storage of dams). According to interviewed researchers and consultants, water scarcity at the level of agricultural holdings would be due to over-estimation of water availability, coming from inaccurate water balances and monitoring of water uses. Bad allocation schemes would result as a consequence.

Mainly due to lack of planning and coordination, a proactive approach to WS-D is missing. A drought observatory is being established by the Region to set up monitoring and management plans. When situations of water shortage occur, emergency measures are taken by giving use priority to the civil sector. This worsens the situation for farmers, who underscore the negligence of public bodies. In response, many farmers have adopted private actions. Additionally to efficient irrigation, some have rationalized water consumptions, harvested water and changed to less water demanding crop. In case of recurring drought periods, wells have been excavated. Interviews with farmers have highlighted that wells are often unreported.

4.3. Policy instruments

European policy instruments that resulted at stake in the actors discourses are the WFD and the CAP, which tackle WS-D only to a limited extent. None of the interviewees, apart from European officers, mentioned the EC Communication on WS-D (EC, 2007), which would be the main policy addressing WS-D on paper. Few respondents to the survey reported to be aware about its presence, as well as about EU climate strategy. The latter is integrated through different measures in official documents, as the RBMP and the RDP. Regional Departments steer their efforts toward the implementation of the WFD and the CAP. The attention paid to the latter seems coming from the urgency to comply with binding requirements (under the WFD) and the opportunity to benefit from consistent funding (from the CAP). However, their implementation result difficult, and disparities emerge from the policies on paper and the policies in practice.

The WFD requires a new arrangement of the water governance, which is taking place only very slowly in the Region. The Regional Departments blame the National Government for prior delays, lack of supervision and guidelines. Already existing internal complexities in the regional water resources management, as numerous actors, confused allocation of responsibilities and financial constraints, represent the main challenge to an effective implementation. (Binding) measures that would help tackling WS-D are represented by monitoring water uses for a long term planning of supply and demand, and efficiently pricing water, considering cost recovery and environmental costs. These measures are still unimplemented, mainly due to economic and bureaucratic constraints and issues of social acceptance. Summed to these, widespread illegalities, e.g. unreported water abstraction and water thefts, would make difficult an accurate monitoring and management of the resource, according to multiple interviewees.

The Rural Development Programme (RDP), under the CAP, is the main funding instrument for farmers that partly addresses the water-agriculture interplay. The RDP encourages holdings to rearrange the productive structure, with the objective of enhancing a competitiveness that small farms are not always able to sustain. As emerged from survey, interviews and RDP analysis, measures are mainly intended for big and medium farms. Eligibility criteria for applying to RDP measures are restrictive in terms of size and economic dimensions, excluding small and many medium farms. This is summed to bureaucratic procedures considered too complex and with a low payoff for farmers with less resources. As explained during interviews with farmers, for the application to measures intended to modernize the water system, small farmers would need to invest more efforts and economic resources compared to the case of privately-funded works. This could partly explain the widespread uptake of WS-D adaptation measures, independent from public subsidies. Peripheral offices of the Regional Department for Agriculture, closer to farmers, acknowledge the presence of barriers for small farmers. Conversely, the headquarters that draft the plan have generally limited contact with small local realities, and advise small and medium farms to arrange cooperatives to comply with RDP applications requirements. The above-mentioned scarce propensity of farmers to gather together plays here an important role. Direct payments under the CAP are more extensively received by farmers. Yet, they do not target WS-D issues unless greening actions are considered, which aim to meet

environmental and climate goals. However, these do not seem widespread within the farmers' community.

Farmers complain limited access and spread of information. The need for advisory systems is also reported in documents and during interviews. Measures in the RDP target this issue, but awareness about available instruments remain low. This is the case for climate change-related options. The main constraint to their embedding seems deriving from scarce information level among farmers and expertise within Regional offices.

Other private instruments as drought insurances are promoted by Regional Departments and European policy officers. Yet, farmers are hesitant to their uptake. Investments on already existing infrastructures would be the priority according to all actors. This is also recommended by European officers, but public funding is not intended for ordinary maintenance.

Finally, interviews at European DGs stress that complexities exist in the policies on paper themselves. These derive from a tangled making process, made up of many revisions, that often leads to documents difficult to interpret and to implement. Plus, the necessity of flexible policy instruments, since these address highly diverse Countries, may make policies to lose clarity and entail ambiguity. Hence, policy officers emphasize that the Region's administrative capacity lies at the heart of an optimal use of policy instruments, to adapt these to local realities and vice versa, in order to reduce disparities between the policies on paper and the policies on practice. A participatory governance approach is recommended (and requested by the WFD) as emerged from survey, interviews and official documents. This aims to put actors' together, using the dialogue as instrument to negotiate and fill in gaps with respect to actors' needs.

4.4. Limitation of the study and future research

Qualitative analysis depends on the insights and conceptual capabilities of the analyst (Patton, 2002:553). To limit researcher bias, the analysis was constantly checked for its integrity by looking for alternative explanations, assessing rival conclusions on specific themes during interviewees and by triangulation. Triangulation is a powerful technique that facilitates validation of data through cross verification from two or more sources (Denzin, 1978). Specifically, methodological and data triangulation were implemented. Methodological triangulation involves the use of more methods to gather data on the same topic to try to overcome the weakness that come from a single method (Yin, 2009): this study combines survey, interviews, documents and observations. Data triangulation consists in engaging multiple researchers to discuss analysis output; in this study, it was particularly used to discern interviewees biases due to political involvement and institutional role. In addition, access to original textual data gives transparency to the research, allowing readers to formulate judgments (Archer et al., 2005).

Yet, limitations are present. This study was conducted in a time span of two months following an explorative approach that, by its nature, depends on contingencies. Some actors, agencies and other relevant information may be left out of the research as "not encountered" or not emerged. Contingencies are also dependent on the research chronological placement. Particular political affairs or climate conditions could influence such type of studies, e.g. an ongoing drought potentially gives rise to a media event that may influence actors' interpretations and perceptions. Thus, this study does not want to give a fixed interpretation of processes governing performance of policies by given groups of stakeholders. Rather, it analyses agencies and perceptions to unveil which factors could potentially influence the uptake of certain policies' elements in a real scene of action and which factors could create disparities between the policies on paper and the policies in practice.

To further test the validity of the findings, a quantitative follow-up research can be useful to significantly analyze farmers points of view, as well as a second round of interviews to present divergent perceptions and agencies to same and new actors.

Last but not least, Sicily presents "in paper" many similarities with other Mediterranean regions. First, it is periodically affected by WS-D as most of the Mediterranean Regions. In addition, Mediterranean Regions are mostly classified as less developed (as the case for Sicily) or under transition by Eurostat: the economic classification influences the allocation of EU funding. Furthermore, Sicily is an autonomous region, as Sardinia, Corse, and Southern Spanish territories: this influences the transposition and implementation of international and national legal and financial instruments. Finally, not only climate makes Mediterranean Regions similar for type of farmed crops, also farms' structure plays a crucial role: the Sicilian average farm size is within the range of those Mediterranean countries affected by the WS-D, as Greece, Portugal, Cyprus and Malta. The presence of these similarities may suggest that this study could inform other Mediterranean Regions as well. A future research is recommended to see whether similar features in actors performance of policies are also observed in other Mediterranean areas.

5. Conclusions

This study explores the way European legal and financial instruments, aiming at tackling water scarcity and drought (WS-D), are performed in Sicilian agricultural realities. It does it by focusing on interpretations and

agencies of main actors and official documents. A qualitative approach was used, consisting of documents consultation and analysis, a survey to 70 farmers, 26 interviews with stakeholders in water-agriculture sectors and participant observations in three events. Shared and divergent opinions have been discussed, in relation to Sicilian water-agricultural systems, WS-D definitions, and policy instruments. This allowed retracing actors' performance of available WS-D instruments.

Results show that few policy instruments exist to directly target WS-D related issues. The (non-binding) EC Communication on WS-D, main policy addressing WS-D on paper, remains unmentioned by interviewees and official documents. Regional Departments steer their efforts toward the implementation of the WFD and the CAP, which resulted to be the policy instruments at stake in actors' discourses. The attention paid to them by Regional Departments seems coming from the urgency to comply with binding requirements (under the WFD) and the opportunity to benefit from consistent funding (from the CAP). The actors involved in the research identified tools and measures in the WFD and RDP available to tackle WS-D issues. However their implementation and embedding presents complexities. Complex water governance and missing coordination, financial constraints and social acceptance issues give rise to barriers in the implementation of available policy instruments. Moreover, access to measures set under the RDP seems hampered for farmers. Not only because of bureaucratic and financial constraints, more so because of ideas of farming size, excluding small and many medium farms. Low level of information and participation also limits the involvement of farmers in the regional water-agricultural governance. Behind this, the interpretations of WS-D phenomena result to be different according different stakeholders.

Actors' engagement allowed identifying disparities between the policies on paper and the policies in practice. While the policies on paper present various measures to tackle WS-D, the performed policies (in practice) are different and the use of available measures is often limited. In the process of embedding a given policy, the policy gets shaped by its actors, in a continuous entanglement and influence between policies on paper and actors. Newer and changing versions of the same policies on paper are continuously constructed by actors, who perform the policies in practice. Policies on paper influence agents and result embedded to the extent that actors' discourses and practices are shaped by policy documents. Yet, existing realities, interpretations and practices, on which the policies on paper want to intervene and diffuse goal-oriented influence, in turn play a role in determining the way(s) the policies are performed.

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Annexes

List of Annexes

Annex I. WS-D definitions and management

1.1. Water scarcity

Many definitions of the terms 'water scarcity' and 'drought' are available. According to the European Commission (EC, 2007) and the European Drought Centre (EDC), scarcity refers to "long-term water imbalances, combining low water availability with a level of water demand exceeding the supply capacity of the natural system". Scarcity occurs because of insufficient water resources to satisfy long-term average requirements. FAO (2012) defines scarcity as "an excess of water demand over available supply" or, more exhaustively as an "imbalance between supply and demand of freshwater in a specified territorial domain, as a result of a high rate of demand compared with available supply, under prevailing institutional arrangements (both resource 'pricing' and retail charging arrangements) and infrastructural conditions" (REF). This definition explicitly includes causes related to human interventions in water flows. The FAO Report acknowledges that water scarcity relates to natural hydrological variability, but more so "to prevailing economic policy, planning and management approaches and the capacity of societies to anticipate changing levels of supply or demand" (REF). It identifies three dimensions of water scarcity, depending on the physical water availability, the level of infrastructures and the institutional capacity. Similarly, the UN Human Development Report (2006) characterizes water scarcity as "the point at which the aggregate impact of all users impinges on the supply or quality of water under prevailing institutional arrangements to the extent that the demand by all sectors, including the environment, cannot be satisfied fully (2006:134). For the UN, water scarcity is a relative concept, as it could be identified at any level of supply or demand.

1.2. Drought

Similarly, various drought definitions can be found in the literature, referring to a rain deficit over different time periods, to measured impacts such as water level drop in reservoirs and aquifers, loss in crops production, etc. The EC (2007) defines drought as a "temporary decrease of the average water availability due to e.g. rainfall deficiency" (REF). It specifies that drought can occur in both high and low rainfall areas or in any season. It also acknowledges that "drought impacts are increased when it occurs in a region with low or poorly managed water resources, resulting in imbalances between water demands and the supply capacity of the natural system" (REF), introducing a link between water scarcity and drought. FAO defines drought as "an extended period - a season, a year, or several years - of deficient precipitation compared to the statistical multi-year average for a region that results in water shortage for some activity, group, or environmental sector" (NDMC, 2008). A drought can be defined according to meteorological, agricultural, hydrological, and socio-economic threshold criteria. Van Loon et al. (2016) call for a redefinition of drought as a process initiated by both climatic and human drivers. In their words, "drought is modified by hydrological catchment processes that are altered by human activities", with resulting impacts stimulating "responses, which in turn result in change to the human influence on drought and on the climate variability" (Van Loon et al, 2016:89). This definition of drought reverses the traditional separation of drought as a natural phenomenon and water shortage as human-caused.

1.3. Management approaches

The idea of understanding scarcity and drought together to reach effective WS-D management has been studied by Cancelliere et al. (2011) and Rossi (2003). WS-D management is part of water resources management and varies from region to region and depends on national regulations. Existing management approaches for water scarcity includes supply enhancement (actions to increase water supply through conventional and non-conventional sources) and demand management (measures to raise the efficiency of water use or reallocate water between sectors) (FAO,2012). All such measures require alignment of policies, legislation and fiscal measures, since decisions outside the water sector can have important repercussions on demand and supply. In contrast to scarcity, drought is typically handled through crisis management (Wilhite and Pulwarty, 2005). Yet, international organizations (WMO and GWP, 2014) are increasingly encouraging government to shift towards integrated drought risk management to enhance preparedness and mitigate drought effects. The risk management has a proactive connotation, embracing different steps, among which: monitoring and forecasting (early warning system); vulnerability, resilience and impact assessment; mitigation and responses planning and measures (Gutierrez et al., 2014).

1.4. Policy instruments

The definition of 'policy instruments' is also widely debated in the literature. This paper refers to 'policy instruments' as interpreted by Stein et al. (2016:23): "fluid tools, techniques or mechanisms for achieving overarching policy objectives", in this case to tackle WS-D. Policy instruments can be classified as regulatory, economic, infrastructure, collaborative and information instruments (2016:24).

At European level, various policy instruments have been developed and improved to tackle the effects of WS-D. A detailed description of them is provided by Stein et al. (2016). The primary water policy of the European Commission is the 2000 Water Framework Directive (WFD), which sets out objectives for water quality for European surface waters and groundwater, and requires the draft of River Basin Management Plans (RBMPs). The directive does not explicitly addresses scarcity or droughts, but it provide technical tools and guidance to incorporate and address water demand management and drought risk in the management plans (Kampragou et al., 2011).

In 2007, as a consequence of the 2003 droughts that affected a third of the European territory, the European Commission published a Communication Addressing the challenge of water scarcity and drought in the European Union (EC, 2007). The Communication contains policy options to foster water efficient and saving economy; it invites to rethink the approach to WS-D in proactive terms and to promote participation in the water governance. After follow-up results on the implementation state of the 2007 Communication, a report on the review of the European WS-D policy has been completed in 2012. The report, known as WS-D Policy Review (EC, 2012a), is part of the Blueprint for Safeguarding European Waters (EC, 2012b). The Blueprint identifies actions to enhance the implementation of water legislation and stresses the importance to fill the gaps with respect to water efficiency and quantity. It especially drafts recommendations for the agricultural sector, emphasizing the water-agriculture interplay.

Such policies do not provide direct financial support, but funding opportunities are available through the European Regional Policy and the Common Agricultural Policy (CAP). The CAP is the main funding instrument for European agriculture. It is articulated in two pillars. The first provides agricultural market and income support to farmers (direct payments), while the second is represented by the Rural Development Policy (RDP). Greening practices and agri-environmental measures in the first and second pillar, respectively, aim at increasing sustainable practices, also targeting water issues. The current RDP (2014-20) also contains a toolkit to manage risks in agriculture, including drought.

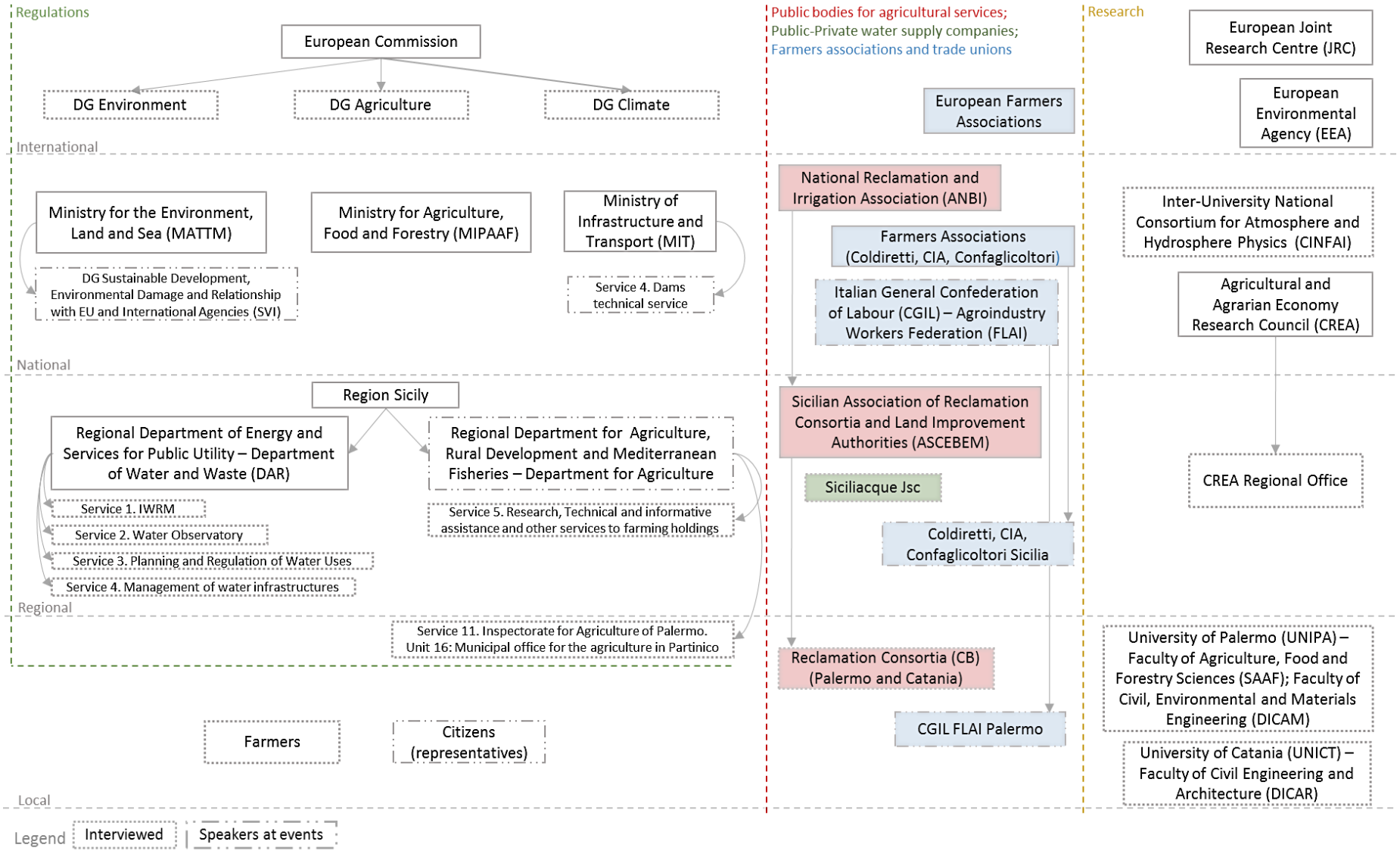
Finally, the EU Climate Adaptation policy mainstreams climate change aspects into other European policy areas. It sets out a strategy to reduce the vulnerability of relevant sectors, as environment and agriculture, representing one of the main drivers for activities related to WS-D (Stein et al., 2016).

Annex II. Stakeholders description

Following, the main actors are described by their group or institution of belonging and their role and expertise within it. Stakeholders are grouped by category: public/private sector; information (research, monitoring, education); regulation and planning on water supply and use; water supply service; crisis management; water users. Financing sources are specified where possible, as well as cooperation among institutions and flow of information. Interviewed people within the groups are reported as well.

Figure a. bellow illustrates the actors classification according to their group, organization or institution of belonging, and distinguishing between international, national, regional and local level. Dotted boxes are used when individuals from a specific group were interviewed or had a speech during the attended events (see Annexes III and IV).

Figure a. Stakeholders map



Public sector, research and education

1.1. University of Palermo

1.1.1. Faculty of Agriculture, Food and Forestry Sciences (SAAF)[1]

The University of Palermo is the main public university of the Sicilian capital. The Faculty of Agriculture encompasses researches on agrarian, forestry and environmental sciences, focusing on aspects related to water resources management, environmental protection, agrarian economy, agroindustry innovation. It integrates such themes to propose scenarios for rural development support. The reference person is an associate professor, specialized in water resources management, irrigation and drainage, agrarian economy.

1.1.2 Faculty of Civil, Environmental, Aerospace and Materials Engineering (DICAM)[10]

The faculty of Civil and Environmental Engineering carries out researches on water resources management, water infrastructures, hydrological and meteorological analysis. The department has an agreement with the Service 2 'Water Observatory' of the Regional Department of Water and Waste, to exchange data and information. Three interviews were carried out within this department, respectively with:

- A researcher in the field of water policy and water resources management, who took part to the draft of the RBMP, in particular for the economic analysis related to the PoMs contained in the plan.
- An associate professor of water resources management, ex director of various public-private consultancies and member of the Experts Committee of the Ministry of the Environment, active in the field of water policies;
- An associate professor specialized in water infrastructures, hydrological and meteorological analysis.

1.2. University of Catania, Faculty of Civil Engineering and Architecture (DICAR)[11]

The department of Civil Engineering has a degree course in Water Resources Engineering. Within it, a professor from the hydrology section was interviewed. The interviewee is fellow of the European Drought Centre and the European Water Resources Association, especially involved in research on: statistical methods for drought analysis; stochastic methods for hydrological series analysis; planning and operation of the water supply systems; extreme events analysis. Moreover, he was involved in national projects as PRIN 2007 'Management of droughts and climatic variability' and PRIN 2005 'Prediction of drought indices and definition of water systems operation rules'; as well as in the European projects MEDROPLAN 'Mediterranean drought preparedness and mitigation planning', and MIT-DROUGHT, aimed at the organization of workshops on Drought Mitigation for the Near East and the Mediterranean.

1.3. Inter-University National Consortium for Atmosphere and Hydrosphere Physics (CINFAI)[12]

CINFAI is a National Research Foundation with legal entity, recognized by the Ministry of Education, Universities, and Research (MIUR). It gathers 22 Italian universities. It carries out academic-scientific research in cooperation with the Research Units (U.d.R.) of the associated universities, with which shares laboratories and infrastructures. Its research topics encompass meteorology, climatology, oceanography, hydrology, with expertise on environmental monitoring, spatial data analysis, technological innovation. To carry out its activities, the CINFAI makes use of financial instruments as: contributions to scientific research by the MIUR, the Ministry of Environment, The National Research Council, Italian and International Agencies, European Union, other National Administrations and Italian or foreign public or private bodies; any donations, legacies or bonds. The interviewee is a researcher in the field of drought monitoring and meteorological analysis.

1.4. Agricultural and Agrarian Economy Research Council (CREA)[13]

CREA is the main national research institute for the agri-food sector, with legal entity of public law, monitored by the Ministry of Agriculture, Food and Forestry (MIPAAF). It has scientific expertise on the agricultural, food, fishery and forestry sectors, it combines research on production and consumption systems to socio-economic factors to support rural development and advise on the implementation of EU policies. CREA works as an intermediary, encouraging the integration of research activities with European and international realities, universities and other national, public and private research bodies, with the territory and enterprises. It has full scientific, statutory, organizational, administrative and financial autonomy. The reference person is a researcher on the field of agriculture, especially focusing on tools and methods for the integration of policies for protecting the water resources.

[10] http://www.unipa.it/dipartimenti/
[11] http://www.dicar.unict.it/
[12] http://www.cinfai.it/
[13] http://www.crea.gov.it/conosci-il-crea/

Public sector: water resources regulation and planning; monitoring activity; water supply service

1.5. Region Sicily

1.5.1. Regional Department of Energy and Services for Public Utility – Department of Water and Waste[14]

The Regional Department of Water and Waste has jurisdiction in the field of water resources and waste management. In collaboration with ARPA Sicily (Regional Environmental Protection Agency) and under the technical coordination and support of the private water company Sogesid Jsc[15] it drafted the update of the River Basin Management Plan (2016).

The Services responsible for the water resources management are:

- Service 1: Management and Implementation of the Integrated Water Service
- Service 2: Water Observatory
- Service 3: Planning and Regulation of Water Uses
- Service 4: Management of water infrastructures

Thus, interviews were carried out at these offices, which are following described in more detail:

- *Service 1: Management and Implementation of the Integrated Water Service*
  It has competencies on the integrated water management, focusing on: improvement of the water quality and the sanitary services; adoption of measures to reduce water bodies pollution; water reuse and water efficient and saving economy; implementation and compliance of the legislative decree 152/2006 (WFD). An officer from the board of directors was interview.

- *Service 2: Water Observatory* [16]
  This service has techno-scientific competence in the water resources management. It elaborates and implements programs to characterize and verify the qualitative and quantitative state of surface and ground-waters, according to the regulations of the legislative decree 152/2006 (WFD). It carries out the hydrological and morphological monitoring of the water bodies, drafts the regional water balance, and monitors meteorological parameters to study climate change and drought phenomena. It is entrusted for the collection, classification and spread of socio-economic information related to the water bodies. In addition, it monitors, analyses and reports the expenditure related to works and projects financed by the European and National funds. Two officers are interviewed; they are decision makers in the Palermo headquarters.

- *Service 3: Planning and Regulation of Water Uses*
  This service fulfils the competences of the ex-Basin Authority, according to the Legislative Decree 152/06. It coordinates the draft of the Aqueducts Strategic Plan, Water Bodies Safeguard Plan, River Basin Management Plan. It is entrusted for the planning of the water resources allocation among the civil, industrial and agricultural sector. It holds the regional water think tank for the implementation of the European directives concerning the water pollution from dangerous substances, and for the national and regional legislation related to the wastewater. An officer from the Operative Unit 2, 'Planning of the water resources in Sicily' was interviewed, together with an engineer from Service 4 (see below).

- *Service 4: Management of water infrastructures*
  The Service 4 develops and carries out projects pertinent the water infrastructures (dams and related systems, aqueducts). It coordinates and gives assistance to the Reclamation Consortia concerning the planning, realization and management of water infrastructures for irrigation. An engineer from the operative unit 2 'Territorial coordination of West Sicily' was interviewed, who is responsible for the operation, monitoring and maintenance of the reservoirs systems.

1.5.2. Regional Department of Agriculture, Rural Development and Mediterranean Fisheries – Department of Agriculture[17]

This Regional Department is responsible for the planning and coordination of projects within the agro-food, rural and forestry sectors. It carries out infrastructural and structural works for the agriculture. Within the Department of

[14] http://pti.regione.sicilia.it/portal/page/portal/PIR_PORTALE/PIR_LaStrutturaRegionale/PIR_AssEnergia/PIR_DipartimentodellacquaedeirifiutiI

[15] Agreement with the ARPA financed by national funds for 6 million of euro; ministerial agreement with Sogesid Spa

[16] http://www.osservatorioacque.it/

[17] http://pti.regione.sicilia.it/portal/page/portal/PIR_PORTALE/PIR_LaStrutturaRegionale/PIR_AssessoratoregionaledelleRisorseAgricoleeAlimentari/PIR_DipAgricoltura

Agriculture, the Area 3 is responsible for the coordination and implementation of the Rural Development Programme (RDP) and other National Programs related to the rural areas. This area is also responsible for the communication with all the bodies involved in the RDP, the European Commission, and the National Ministries. It is appointed for updating the national agriculture informational system (SIAN), which represents the information portal for the RDP.

An interview was carried out with two officers from the Service 5, Units 5 and 6, of this Department. Service 5 provides innovation, research, technical assistance and agricultural information to the agro-food sector. In particular:

- *Operative Unit 5: Territorial assessment and management of the risks in agriculture, SIAS (Sicilian Agro-meteorological Information System)*[18]
  This unit is responsible for characterizing the territory to assess the risks in agriculture. It defines the economic, environmental and climatic risks, focusing on methods for risks and emergencies management. It carries out studies on crops climate tendencies to evaluate the best land management and irrigation practices; it develops management systems for an efficient use of water and soil resources in agriculture. Moreover it handles the coordination of the services: SIAS (Sicilian Agro-meteorological Information System) that provides weather forecasting, agro-meteorological bulletin service, meteorological time-series, etc.; IRRISIAS (Support for the applications aimed at improving the irrigation efficiency in the farming holdings); SIASFIRE (Fires risk prevention); GELOALERT (Frost risk management); and the Observatory for equity and justice in the agro-food production chain.

- *Operative Unit 6: Territorial Informational Systems, Cartography, Broadband connection spread in agriculture.*
  It provides the informational systems (SIT) for the agricultural holdings and for the Sicilian territory; it is responsible for the regional cartography, the implementation of the GIS, remote sensing technologies and information technologies and telecommunication infrastructures (ITC). It cures projects related to the introduction and spread of the broadband connection in the rural areas, including the RDP measures.

- *Service 11 'Inspectorate of Agriculture of Palermo', Operative Unit 16: Municipal office for the agriculture in the district of Partinico*.
  The peripheral offices are entrusted to ensure territorial assistance to farmers and handle the relationship with the central office of the province.
  Interviewee: officer and agronomist

1.5.3. Regional Department of Agriculture, Rural Development and Mediterranean Fisheries – Department of Agriculture of Rural and Territorial Development[19]

This department carries out activities aimed at ensuring the technical-administrative management of the regional forestry areas. An interview was carried out to a Director of the former Department of the Infrastructural Works for Agriculture, *Service 4: Rural development projects and leader measures*, which provided technical assistance in agriculture, planning and informational systems. He also was the special commissioner of the former Agricultural Development Agency (ESA), now winding up, and of various Reclamation Consortia.

Public sector: water resources planning; monitoring activity; water supply service

1.6. Reclamation Consortia of Palermo and Catania – Land Reclamation Authorities[20]

The Reclamation Consortia are the public-law bodies that manage the public reclamation works, which include hydraulic security, managing of water for irrigation, participation to urban works, defence of agricultural and environmental heritage. In Palermo, an employee and agronomist of the land estate registry was interviewed. An interview was carried out in Catania to the appointed agronomist for the irrigation network and an engineer responsible for the infrastructures operation.

Public-private sector: water supply service

1.7. Siciliacque Join stock Company[21]

Siciliacque is one of the main public-private water supply company of Region Sicily; it controls the operation of most of the main aqueducts. In 2004, an agreement with the Sicilian government (with due date on 2044) conferred to the company the management of the regional aqueducts, artificial basins, wells, desalination and drinking water plants,

[18] http://www.sias.regione.sicilia.it/

[19] http://pti.regione.sicilia.it/portal/page/portal/PIR_PORTALE/PIR_LaStrutturaRegionale/PIR_AssessoratoregionaledelleRisorseAgricoleeAlimentari/

[20] http://www.consorziobonifica.it/palermo-2/ and https://www.consorziobonifica9ct.it/

[21] www.siciliacquespa.it/

before managed by the Region. The responsible engineer for the monitoring of the systems operation has been interviewed.

Public sector: Regulations and policies on water, environment and agriculture

1.8. European Commission[22]

The European Commission is one of the main institutions of the European Union, representing the general interest of the EU. It proposes laws and policies and monitors their implementation.
The Commission is organised into policy departments, known as Directorates-General (DGs), responsible for different policy areas. The Directorates Units develop, implement and manage EU policy, law, and funding programmes. Three portfolios and the related encompassed Directorates are of relevance in the research context: Climate Action (DG Clima); Environment (DG Environment); Agricultural and Rural Development (DG Agriculture).

1.8.1. DG Environment (DG ENV)[23]

Currently, an environment action program is guiding the European environment policy up to 2020. Such program is led by the DG ENV and concentrates the action in three key area: protecting, conserving and enhancing the EU's natural capital; turning the EU into a resource-efficient, green, and competitive low-carbon economy; safeguarding EU citizens from environment-related pressures and risks to health and wellbeing. Among the DG's policy areas, water plays a central role. In particular, the DG ENV is responsible for the WFD implementation monitoring and to coordinate working groups from other sectors to converge the environmental objectives. The interviewed policy officer works at Unit C1 – Clean Water, with special focus on groundwater, environmental indicators, water scarcity and drought issues.

1.8.2. DG Climate (DG CLIMA)[24]

The EU formulates and implements climate policies and strategies[25], especially focused in climate change adaptation. The DG CLIMA seeks to ensure that climate concerns are taken on board in other policy areas (e.g. agriculture, environment) and also promotes low-carbon technologies and adaptation measures, which includes measures in the water and agricultural sectors. Climate action is incorporated into the whole EU budget. From 2014-2020, 20% of the EU budget goes to climate related action. Two policy officers from Units A3 – Adaptation Unit are interviewed. They both work on the mainstreaming of climate change adaptation strategy among the different policy areas.

1.8.3. DG Agriculture (DG AGRI)[26]

The DG Agriculture pursues multiple objectives related to the agricultural sector. Among them: helping farmers in a safe food production in line with sustainability and environmental rules; protecting farmers from market prices' fluctuations; supporting investments within the farming sector; creating and enhancing employment in the agri-food business; sustaining the rural areas. It cures the CAP and RDP regulations, flanked by the European Network for Rural Development (ENRD) that contributes to the effective implementation of RDP by generating and sharing information.

Water users

1.9. Farmers & Agronomists

Farmers represent the users of the water resource in agriculture. A detailed analysis of regional farmers characteristics and perceptions is given in the Chapter 3.1 and Annex III, fully dedicated to the understanding of the issues at the local scale. Additionally to the view of the farmers, an agronomist specialized in the European agricultural policy and its effects at a micro-scale was interviewed.

[22] https://ec.europa.eu/commission/index_en
[23] http://ec.europa.eu/environment/index_en.htm
[24] https://ec.europa.eu/clima/index_en
[25] EU climate strategy up to 2050
[26] https://ec.europa.eu/agriculture/index_en

Additional relevant stakeholders

Following, other relevant stakeholders are described. These stakeholders were not interviewed due to time and/or distance constraints. However, during the attended events (see Annex IV), some of them held speech manifesting their point of view, thus allowing to include them in the analysis.

1.10. Regional Department for Land and Environment and Regional Environmental Protection Agency (ARPA Sicilia)[27]

This Department of Region Sicily has competencies on the environment protection and monitoring. It carries out the Strategic Environmental and the Environmental Impact Assessments.

It monitors the functioning of the Regional Environmental Protection Agency (ARPA Sicilia) that carries out environmental monitoring of water quality parameters, it is entrusted for the operation of the environmental information systems, and for the compliance with the environmental certifications. Together with the Department of Water and Waste it drafted the RBMP.

1.11. Palermo Aqueducts Municipalized Agency[28]

It is the municipalized company responsible for the civil water supply of the province of Palermo.

1.12. National service of civil protection, Regional office[29]

Part of the Region Sicily, is the Service responsible for the crisis management. The civil protection includes the activities aimed at defending the integrity of life, goods, urban areas and environment from dangers that derive from natural disasters. In Sicily, this service takes part to the Regional experts' think tank to come up with solutions to stop desertification and mitigate climate change effects. It is more and more involved in water emergencies, even if is not its official task. There is not, however, a specific ministerial institution for water emergencies. The Regional Water Observatory collaborates with the Functional Multi-risks Centre of the Regional Department of the Civil Protection.

1.13. Farmers Associations: Coldiretti, Confagricoltura and CIA Sicilia[30]

Coldiretti Sicilia (National Confederacy of the Direct Farmers), Confagricoltura Sicilia (Regional Federation for the Sicilian Farmers) and CIA Sicilia (Italian Confederation of Sicilian Agriculture) are the main associations for the representation and assistance of the Italian Sicilian farmers. They pursue the economic, technological and social development of the agriculture and the farming holdings. They provide information and support to the farmers and represent their interests in the political scene.

1.14. Sicilian Association of Reclamation Consortia and Land Improvement Authorities (ASCEBEM) and National Reclamation and Irrigation Association (ANBI)[31]

ASCEBEM associates, coordinates and supervises the work of the Regional Consortia, with the aim of coherently representing sectoral needs and issues. It works under the statute of ANBI, which represents and defends the interests of the Reclamation Consortia, actively working on the themes of irrigation and rural development at national level.

1.15. CGIL FLAI[32]

The Italian General Confederation of Labour (CGIL) is a the most important trade union in Italy. It was formed in 1944 by an agreement between the existing parties: socialists, communists, and Christian democrats. Yet, in 1950, socialists and Christian democrats split forming UIL and CISL, and since then the CGIL has been influenced by the Communist Party (PCI). The Agroindustry Workers Federation (FLAI) is one of its affiliated union federations.

[27] http://www.arpa.sicilia.it/

[28] https://www.amapspa.it/

[29] http://www.regione.sicilia.it/presidenza/ProtezioneCivile/index.asp

[30] http://www.sicilia.coldiretti.it/; http://www.confagricoltura-sicilia.it/; http://www.ciasicilia.it/

[31] http://www.ascebem.it/ and http://www.anbi.it/

[32] http://www.cgil.it/ and http://www.flai.it/

Annex III. Farmers

This Annex presents findings from the survey and from the interviews with farmers. Survey responses and interviews were analysed with the aim of gaining understanding on: agricultural structures and water systems; existing shared and divergent perceptions WS-D, management approaches, role of public and private subsidies, role of regional and international policies; expectations for the future. Patterns were searched within the survey, among different groups of respondents and according to their general details. Specifically, answers to the questions were tested for farmers' measurable features (age; gender; education; farm size; type of crops; etc.). Several couplings of one or more features resulted of particular interest, suggesting the existence of patterns. To the contrary, when a variable (e.g. age) didn't seem to play a role in describing answers to other questions (e.g. do you pay a tariff for your water consumption?), this was left out of the report.
Findings from the analysis were complemented by information obtained during six semi-structured interviews with farmers in the province of Palermo. They were finally structured into six major themes, described in *Section 3.1* of this Annex.

Following, Box 1 briefly presents the seven sections and two subsections of the questionnaire, while Box 2 lists the six themes that have emerged from the survey analysis.

Box 1. Sections of the questionnaire

Section 1. Respondents details
Section 2. Data on irrigation
Section 3. Data on public irrigation
Section 4. Experience with water scarcity
Section 5. Experience with drought
Subsection I. Water scarcity and drought, link and definitions
Subsection II. Main water-related problem in agriculture in Sicily
Section 6. Financial and administrative measures and instruments
Section 7. Future expectations, changes and alternative solutions

Box 2. Main themes

Theme 1. Characterization of the respondents and study area
Theme 2. Shared opinions on public water management and "self-adaptation"
Theme 3. Perceptions on water scarcity and drought events
Theme 4. Role of public subsidies and funding
Theme 5. Trust in the European and Regional policies and knowledge assessment
Theme 6. Future climate and potential changes

The questionnaire form can be found later in this Annex in *Sections 3.2*. *Section 3.3* contains the responses to each question and combined questions, reported in tables. *Section 3.4* presents the analysis carried out to evaluate WS-D definitions given by respondents. *Section 2.5* includes the interview guide used for the six interviews with farmers. Finally, respondents answers can be also consulted in the Excel file.

3.1. Themes

N.B. This section often refers to Tables. These are reported in the Section 3.3 of this Annex, *Responses to the questionnaire (in tables)*.

Theme 1. Characterization of the respondents and study area

This section presents the characterization of the respondents based on the background of the Sicilian agriculture, as emerged from the survey sample and the analysis of regional statistics. The regional data used to complement the questionnaire results are those presented by the Italian national Statistical Institute (Istat) agricultural census[33]. Relevant features highlighted by the census are that: farmers holding an educational title not beyond the secondary school are the majority in Sicily; small farms are far more than medium and big farms; production and sale choices are influenced by European and Regional policies.

The respondents set accounts for 70 farmers. An overview of respondents general detail is given in Table I, together with retrieved regional data (Istat, 2014).

Table I. Overview respondents details

Respondents details		Count	Percentage	Regional data (Istat, 2014)
Age	Less than 35	18	26%	7%
	35-44	13	19%	-
	45-54	20	29%	-
	55-64	8	11%	-
	More than 65	11	16%	39%
Gender	Female	5	7%	30%
	Male	65	93%	70%
Education	Elementary school	2	3%	32%
	Secondary school - 1st degree	3	4%	30%
	Secondary school - 2nd degree	19	27%	21%
	Tertiary school - 1st cycle (Bachelor)	10	14%	8.8% (coupled value)
	Tertiary school - 2nd cycle (Master)	28	40%	
	Tertiary school - 3rd cycle (PhD)	1	2%	-
Occupation	Part-time farmer	38	54%	-
	Full-time farmer	32	46%	-
Province	Palermo	24	34%	-
	Catania	20	29%	-
	Other provinces	26	37%	-
Farm size	Big (≥ 30 ha UAA)	23	33%	4% (9'164 farms)
	Medium (2-30 ha UAA)	35	50%	43% (93'354)
	Small (< 2 ha UAA)	12	17%	53% (117'159)
Specialization of production	Fruit and citrus farming	41	59%	64%
	Olive growing	35	50%	26%
	Arable crops	25	36%	18%
	Viticulture	14	20%	13%
	Open-field horticulture	14	20%	3.4%
	Greenhouses horticulture	5	7%	
Production's destination	Local market	36	52%	12.4%
	Direct sales to friends and acquaintances	15	21%	12.2%
	National market	36	52%	65.3%
	International market	10	14%	
	Others	6	8%	-

The majority of the respondents is male (93%), mostly between 45 and 54 years old (29%)[34]. 56% hold a university degree and 27% a high-school diploma, while only the 3% and 5% stopped at the primary and secondary school, respectively (Tables Section I). Regional data show that the percentage of farm managers[35] holding a high educational

[33] Istat, 2014. *Sicilian Agriculture Atlas, A guided reading of thematic maps*. ISBN: 978-88-458-1799-1.

[34] At 2010, in the whole region, farmers more than 65 years old amount to 39%, while young (less than 35 y.o.) are 7% (Istat, 2014).

[35] The farm manager is the natural person who ensures the current and daily management of the farming business. In case of family business, this is generally the tenant farmer (95% of the cases in Sicily in 2010). This form is called direct management and it is equivalent to family-run business (Istat, 2014).

level is relatively small, around 8%[36]. The medium and big farms that received the questionnaire could have forward it to the appointed agronomist, which would explain the higher percentage of graduates compared to regional statistics. Small farms are usually family-run, with a smaller presence of employees.
Farmers from 8 of the 9 Sicilian provinces were reached by the questionnaire, excluding Caltanissetta. The provinces of Palermo and Catania are more represented, with 34% and 29% of responses respectively. The questionnaire was spread through different channels, mainly by formal contacts with the interviewed stakeholders, who reside in Palermo and Catania, which explains the higher number of respondents from the two towns.
Farm sizes are defined as big, medium and small, following the classification of Istat and based on the definition of Utilised Agricultural Area (UAA)[37]. Table II presents the number of respondents from small, medium and big farms, flanked by regional data from Istat (2010).

Table II. Respondents clustered per farm size; comparison of respondents and regional data

Farm size	UAA (ha)	Count	Percentage	Regional count (2010)		% change in the period 2000 -2010
Big	≥ 30	23	33%	9.164	4%	+40%
Medium	[2; 30)	35	50%	93.354	43%	-14%
Small	< 2	12	17%	117.159	53%	-50%
Total respondents:		**70**	**100%**	**Total farms: 219.677**	**100%**	-37%

The small amount of answers to the survey from small-size farms (17%) could be explained by the fact that small farms are generally family-run, managed by the elderly and less reachable through internet[38]. However, they are the majority in Sicily (53%). Tendencies of the last decade (Table II above) show big farms increasing to the detriment of small farms, consistently dropping. As reported by the Istat, the creation of new big farming businesses seems to be influenced by National and European legislative actions, rather than a spontaneous strengthening trend: the agricultural policies[39] encourage the primary sector to rearrange the productive structure, with the objective of enhancing a competitiveness that small farms are not always able to sustain. As also explained during the interviews with farmers, to compete on the national and international markets farmers should be able to afford the costs of the production chain: checks, packing, labelling, distribution, etc. The capacity of small farms to afford this process and comply with the requirements to sell to bigger markets is often limited. Nonetheless, the Sicilian agriculture keeps being represented by small farms[40].
56% of the respondents' farms consist of poly-culture, while 44% is monoculture with the prevalence of fruit and citrus farming. The latter are farmed by the 59% of the respondents, followed by olives (50%) and arable crops (36%). The combination of the three cultures is also common among the farmers (11% of the total respondents). The specialization in particular crops' production is also of relevance, since it is influenced by the trends of national and international markets and by the measures of the European Common Agricultural Policy (CAP). Compared to other Italian regions, Sicily has always received a higher financing support, which steered the development of rural development strategies to adapt to the international programs' objectives[41].

[36] The most common educational level among the Sicilian farm managers is the primary school certificate (32%) followed by the secondary school (31%). Less than 19% holds a high-school diploma, while just 2,4% has a professional certification. Graduated amount to 9% (national value is about 5%). Farm managers without education title amount to 7%. Generally, 70% of the Sicilian farm managers have an educational title not beyond the secondary school.
[37] CODEC, *EUROSTAT's Concepts and Definitions Database*, available at http://ec.europa.eu/eurostat/ramon/
The Utilized Agricultural Area (UAA) is the total area taken up by arable land, permanent pasture and meadow, land used for permanent crops and kitchen gardens.
[38] The Istat Report quotes the "backwardness" of the region: only a few businesses use the internet connection or technology to carry out business activities, administration or crop management. Data report only 3709 farms (1,7%) using internet connection in Sicily, out of the total farms in 2010.
[39] Common Agricultural Policy (CAP), last reforms; and CAP's second pillar: Rural Development Policy (RDP).
[40] To better understand the social and economic reality of the Italian agriculture it is useful to shortly retrace the evolution of the land management. After century XVI, the ancient forms of management in Southern Italy, as the latifundium, have gradually disappeared. Later, the sharecropping has also ceased to exist, leaving space to the family management, supported by direct and indirect effects of the agrarian reform and the application of rules concerning the development of the small agricultural property. Therefore, the direct management increased together with the farmed surface, till reaching 12,2 million of UAA in 1990. In the next decades, the agricultural area started decrease for the first time, linked to a drop of the agricultural activity in mountainous and hilly areas. In the period 2000-2010, in Sicily, the number of direct managed farms has decreased by 120'000 units, however keeping the same UAA.
[41] The agricultural sectors' strategies defined by the Region Sicily and carried out through multiyear programs (Rural Development Program, CAP Pillar II) have fostered the farming of specific crops and the improvement of the production chain, in order to increase the competitiveness in national and international markets. To give an example, as reported by Istat[1], this could partly explain the shrinkage of the surface intended to arable crops in the last decade (-37% of arable crops farms): the farming of these crops became less profitable due to the low sale's income and the scarce support of the latest European policies. Same applies to

Finally, the respondents mainly sell to local (52%) and national markets (52%). Direct sale to friends and acquaintances is also widespread (21%), while only a smaller group exports to the international market (14%). Comments from the questionnaire and the interviews with farmers underlined not only the increased difficulty to sell to national and international market due to a costly production process but also the increasing competitiveness of cheaper produce from countries other than European (especially fruits from Morocco and olives from Turkey). Many of the farmers have therefore changed the destination of the production. Four of them are part of cooperatives that stock the piles.

Theme 2. Shared opinions on the public management and "self-adaptation"

This paragraph presents an overview of used irrigation techniques, shared opinions on public water supply management and the measures that farmers have adopted to overcome water supply issues. Results suggest that, due to a lacking public water management and consequent bad state of the infrastructures, farmers started employing private solutions, with a high incidence over time.

First, not the entire farm area is irrigated (Table 2.1.2, Section 3.3), partly because some crops are rain-fed or need irrigation only in case of emergency (e.g. viticulture in prolonged drought periods), partly because water is not always available from the public supply network or through nearby sources. Among the techniques used to irrigate, drip/trickle irrigation is the most widespread, implemented by the 73% of farmers who practice irrigation (66 in total). Sprinklers are also commonly used (36%), as well as combinations of irrigation systems (26%). Drip irrigation is a water-efficient technique that allows limiting the water volumes fed to the crops, without impairing the production. Many farmers have switched to this technique abandoning the more intensive surface irrigation. Comments from the survey and interviews with farmers have underlined that the change to drip irrigation was determined by the farmers' will and necessity to preserve the resource, given the semi-arid climate, rather than by water-saving policies and incentives.

Famers are supplied by the public network and/or through private water sources. 60% of the farmers are served by public networks managed by the Reclamation Consortia. Among them, more than half make use of a private water supply source as well. In total, 70% the respondents that have at least one private source. Private sources include individual wells (36%), ponds (34%), shared well (11%), springs (7%) and rivers (3%). The combination of public/private water supply sources seems to be the consequence of a lacking resource management.

Among the respondents who reported occasional inability to irrigate (49%), almost three quarters are supplied by the public network. In particular, reported causes for inability to irrigate include restrictions posed by the Reclamation Consortium (71%), among which: general lacking management, inadequate water supply schedule, scarce infrastructures' maintenance and breakages. Stressing this concept is the fact that, when farmers use of the phrase "waste of water" both in the comments and during interviews, they mainly refer to volumes lost due to breakages and inefficient allocation, not to excessive volumes fed to the crops, since such volumes are generally already limited. To the contrary, 88% of those who say to be able to irrigate mainly rely on private sources.

To overcome water scarcity issues, two thirds of the respondents have implemented water efficient techniques, as drip irrigation (installed in total by 73%), rationalizing the water consumptions (47%) or harvesting water in small reservoirs (43%). These solutions were often privately funded, rather than consequence of water efficiency programs. This information is important to understand the farmers' perception of water scarcity, as a phenomenon related to management and infrastructures factors.

This first assessment would suggest that many water supply issues are linked to the public management, hence this requires a deeper focus on the activity of the Consortia, to which 73% of the respondents are registered[42]: 30% to the Consortium of Catania, 23% to Palermo, while the rest is divided among other four of the eleven Consortia (Siracusa, Agrigento, Trapani and Caltagirone). Even if the systems and the service may be different from area to area (aqueducts, reservoirs, rivers, etc), and even from lot to lot within the same Consortium, common problematics are found.

Farmers were firstly asked to specify the logic the Consortia use for the water supply planning. Almost a half reported that there is no clear logic. Respondents reported that this could be the result of poor management, but also of a poor communication between the body and the farmers. In other cases, water is supplied following a list of reservations (20%); based on a schedule planned at the outset of the irrigation season (20%), based on the availability at the source (18%), and for a smaller case (10%) upon request, according to the plant's water needs. When the supply should

viticulture: the Italian wine sector experienced a drop in consumptions also influenced by European interventions, which gave subsidies for the withdrawal of the surplus. Farmers gradually adjusted their offer, uprooting the vineyards and planting other crops as olive and fruit trees that have a relative easier management, especially for small size farms.

[42] NB: Not all of those registered to the Consortia are supplied by them. One must be registered if his land falls into the Consortia administrative territory. This explains the percentage difference between the respondents supplied by the public network (60%) and those registered to the Consortia (73%).

follow a list of reservation or a planned schedule, comments and interviews report that this is not always fulfilled and poor explanation is given by the Consortium, neither any compensation for the undelivered water. Farmers generally receive water once or twice per week, but they do not choose the day in which the supply takes place. This means that they are not always able to allocate the water as they prefer or as the crops need. Some of them have therefore implemented private storage facilities, like ponds or tanks, to collect the water publicly supplied and reallocating it during the week. This may explain the higher percentage of people with combined public-private water supply. However, not everybody is able to equip himself with a secondary private system and a fixed schedule could put limitations to a more efficient irrigation, as it is also confirmed by 24% of the respondents who consider rotations in the irrigation schedule as a restriction to the use of water. Other reported water use limitations include: maximum amount of water that can be abstracted from wells per week or month (32%) insufficient to meet the demand; and priority of water supply given to domestic use (24%).

The state of the infrastructures is also crucial: more than half of the farmers served by the Consortia consider the maintenance to be absent or scarce, 11% mediocre, while only 6% and 1% believe it is good and perfect, respectively. The most commonly reported breakages consist of general damages due to outdated pipes. Comments and interviews claim that after a breakage occurs, hardly ever a reparation takes place, forcing the farmer to abandon the land if no other ways to get the water are found, e.g. excavation of wells, nearby sources, storing facilities.

Users often complain or refrain from paying for the service. The fee to be paid to the Consortium is generally in €/ha of crop irrigated. 59% of the respondents pay a tariff and 76% of them consider it inappropriate, due to the scarce or absent service - including inadequate supply and bad maintenance of the infrastructures -, or because too excessive compared to the agricultural revenue.

Moreover, the tariff is not volumetric, thus it does not take into account the actual consumption but it is based on estimations of the crops' water need. On one hand, this is counter-productive for the collectors, since farmers could declare a false amount of hectares while controls are rather limited, as reported during the interviews at the Reclamation Consortium, later discussed. On the other hand, water meters to account for the actual consumption are not always present and when they are available, they are often unmonitored (Table 2.5, Section 3.3).

Water meters are generally placed on wells or public hydrants. However, the presence of wells is not always claimed. Unclaimed wells are referred as to 'abusive wells'[43]. During the interviews, it has emerged that farmers avoid claiming a well, being afraid to pay unaffordable tariffs or get imposed restriction on the water withdrawal. Yet, 'abusive connections' to public hydrants are also reported, increasing the complexity to monitor the actual consumptions and number of users.

The importance of knowing the actual water consumptions and water needs is not negligible, since it represents essential information to plan preventive actions to tackle water scarcity and drought events. Moreover, having monitored the water uses for irrigation is a requirement for the regional authorities to get access to the European Agricultural Fund for Rural Development (EAFRD), instrument that finances the Regional Rural Development Program (RDP), as emerged during the interview with CREA.

Finally, 5 farmers pay a volumetric tariff (€/m^3) to the Consortia of Trapani (2) and Catania (3). This group is represented by 3 big, 1 medium and 1 small size farms. Four of them consider the tariff to be appropriate and are generally more satisfied for the service, reporting a communication with the operators. Limited cooperation among farmers and limited water availability issues are still claimed.

Overall, the level of communication between farmers and Consortium employees is good for 31% of the respondents served by the Consortia, while not enough interaction according 41%. The first group is satisfied with the service (24% on average, 8% satisfied more than average), while the latter is absolutely not (41%) or just not (25%) content about the work of the Consortia. These groups are very heterogeneous, given the fact that the service can be spatially very different, depending on the presence of breakages, the capacity of making direct contacts with the operators and the central offices, and the farms characteristics.

More shared is the perception of a scarce communication between farmers and water managing authorities (72% of the total respondents) and a poor cooperation among the same farmers (63%).

To conclude, a single-answer question was posed to identify the main water related problem in agriculture in the area of the respondents (Subsection II, Section 3.3). It has emerged that main problems are widespread among the different farmers' groups all over the region. They include: missing or bad maintained infrastructures (33%), lack of a proper management of the water resources (29%), which in turn has a determining role in the state of the infrastructures. Yet, frequent drought periods are also pointed out by 14% of the respondents, following by lack of communication and coordination between users and managing authorities (9%), and a physical scarcity of fresh water resources (6%).

[43] They negatively affect the water levels in the aquifers and make the water balances – carried out by research institutes as CREA and the Water Observatory - less close to the reality. *Data from interviews*.

Theme 3. Experience and perceptions on water scarcity and drought events

Before to move to the role of policies and funding instruments and their effectiveness to foster the agricultural activity, it is essential to understand how the people perceive water scarcity and drought issues, according to the groups' characteristics. This paragraph gathers the answers to sections 4, 5, and subsection I of the questionnaire, that often presented quite technical questions, resulting in high percentage of not given answers. However, some important patterns are found.

Almost 80% of the respondents experienced limited water availability. Among them, 67% experienced drought, mainly during the past year (35%). Half of those who claimed a water scarcity or drought event in 2016 believe that the phenomena have a yearly frequency. Almost two thirds of them state these are permanent problems. Especially for drought, answers resulted very heterogeneous as far as concerns the identification of the event and its duration. The latter varies depending on the season at issue: generally, precipitations are concentrated during autumn and winter (November to February) while during summer (June to September) these hardly ever exceed 40mm[44]. Right in this season most of the irrigation takes place, except for greenhouse farming that keeps on during winter. 21% of the respondents identify the dry summer period as to be the drought prone, while a few of them (4%, together with comments and interviews) specify that whenever a drought occurs in winter, this causes water scarcity in summer, given the fact that aquifers and reservoirs are not recharged. Identifying a shared perception results difficult, being also scientifically under discussion how to determine the start, the duration and the end of a drought.

Causes reported for water scarcity mainly refer to poor management of infrastructures and resources, together with prolonged drought periods. For drought events, climate conditions are the most determinant causes, as lack of precipitation and ongoing climate change. Causes for water scarcity and drought events seem to have changed compared to the past for 17% and for 10%, respectively, mainly due to a worsening of the management of the resource.

Two similar lists of socio-economic and environmental impacts were proposed for both phenomena. Regarding the socio-economic impacts, economic loss due to a spoilt production is the most shared one. Yet, migration is pointed out by 17% of the respondent, all but one consisting of medium farms. This phenomenon was stressed also during the interviews, in which farmers and researchers acknowledged the urgent need to take on-site precautionary measures to limit the people flow and to reinstate trust on the agricultural sector. Among the environmental impacts, increase in soil aridity (66%) and drop in groundwater levels (41%) are the most selected. The shared perception on the increase in soil aridity highlights the importance of the soil quality for farmers, which rely on soil moisture content for the crops' health and yield. Moreover, lots of attention is regionally put on the risk of desertification, for which the aridity is a major index. Concerning groundwater level, this is additionally impaired by the previously mentioned 'abusive wells', often excavated to deal with prolonged lack of precipitation[45].

Actions implemented to tackle the phenomena are also similar. These include: measures of water efficiency, as drip irrigation, rationalization of the water consumption, private excavation of a well and water harvesting. Changing to less water demanding cultures shows that water availability issues influence the choices on crops specialization, not only market driven. Only 3% reuses treated wastewater. The potential to implement this measure is high, as reported also during the interviews at the research institutes and regional departments; however, matters related to quality requirements and energy costs leave the reuse of water for irrigation purposes still under discussion.

Only a smaller amount of those who took measures (26%) believe to be prepared in case a new drought event. This group is represented by farmers who are privately supplied and do not rely on the public water network, suggesting that a poor management of the resource increases the vulnerability and the impacts of droughts. Farmers who consider themselves not enough equipped to face a new drought amount to 67%, of which 75% are served by the Consortia and 15% by only one private source.

Monitoring the vulnerability and thus the risk of a drought to occur is important to contain the extent of the impacts. A good monitoring system allows alerting the farmers about the possibility of a coming drought, giving them relative time to prepare (storing water; installing more efficient systems; rationalizing the water use; etc.). This is the function of a so-called 'Early Warning System', which is nowadays implemented also for drought hazards[46]. Three quarters of the respondents claimed that a Drought Early Warning System does not exist, 10% did not provide an answer, while 14% answered positively. Among the latter, only the 10% could identify the service provider as represented by the

[44] To better understand the answers concerning the occurrence and the duration of droughts, it is helpful to remind the average yearly precipitation and monthly distribution, even if this may have an important spatial and temporal variance. Data precipitation (yearly av. 500 to 700 mm); data from Regional Department of Water and Waste – average long-term series 1921/2005.

[45] As reported by an interviewed farmer (B.Z.), during the early 1990s, recurring droughts brought farmers to their knees; in search of water, everybody started digging wells. Even the resort to water diviners became a popular custom.

[46] European Drought Observatory; in USA, Australia, and others.

Region Sicily[47]. This could support the thesis that, even if a system is operating, it is not efficiently widespread or accessible to the end users.
Finally, who perceives drought as to be not-serious (7%) is also who consider the same for water scarcity issues (8%). This group is represented, except for one farmer, by farmers who rely on private water sources. The perception of the phenomena as to be a very serious or serious is prevalent.

Definition analysis

Subsection I of the questionnaire explicitly asked the respondents to give definitions of water scarcity and drought phenomena. The responses have been compared to the agreed definitions given by FAO and the EC (see Annex I) and eventually clustered to find shared perceptions. Having a shared definition and awareness about problems may help the identification, acceptance and implementation of corrective measures within the affected groups. The detailed analysis is presented in *Section 2.4* later in this Annex. The main results are following reported, supporting the findings presented in this paragraph.

The difference between the water scarcity and drought events is not commonly acknowledged and, due to their similar impacts, the concepts could be blurry. In total, 37 farmers gave definitions, amounting to 53% of the respondents to the questionnaire; among them, 73% believe there is a link between water scarcity and drought. As far as concerns the definitions, three groups have been identified:

- Group 1: Interpretations of both water scarcity and drought acceptably conform to the agreed definitions by the EC and FAO. It amounts to 46% of the given responses.
- Group 2: No net difference is seen in the perception of water scarcity and drought. It accounts for 35% of the given answers.
- Group 3: It consists of other definitions, differing from the agreed ones. This group amount to 19% of the given answers.

Diverse respondents' variables are analysed to characterize the groups. The source of water supply represents the most relevant feature. The majority of Group 1 (59%) is served by the public network managed by the Consortia. This fact concretely introduces the human component in the water supply and availability issues, being the farmers subjected to allocation schemes and to the state and maintenance of the public infrastructures. Respondents to this group seem to better distinguish water scarcity as to be a social construct while drought climate-determined.
To the contrary, who is supplied through private sources gets water directly from the natural hydrological cycle (aquifer, rivers, rain-fed ponds) without the use of public infrastructures. This generally means that, for instance, a reduction in precipitation leads to less water directly available to meet the demand, heading to the perception of water scarcity. This is the case for Group 2, in which 69% of respondents rely only on the private source and don't fully perceive the difference between water scarcity and drought phenomena.

Theme 4. Role of public subsidies and funding (policy context)
This paragraph investigates the role of public subsidies and funding instruments in supporting the agricultural sector[48]. Different arrays of instruments exist to give support to the agricultural sector. These go from public aids, as subsidies or incentives, to private tools, e.g. insurances or banks' loans.

In particular, the aim is to identify the most known instruments, their use by different groups of farmers, the presence of incentives for a water efficient use, as well as measures related to drought events, e.g. insurances or climate change adaptation strategies.

Half of the respondents get subsidies or funding, half does not. Already from a first analysis, it emerged that small farms have less access to subsidies and funding programs than medium and big ones (Table 6.1, Section 3.3). Looking at the provinces of Catania and Palermo, slightly more people get subsidies in Catania, where there is a larger number of answers from big farms.
Most of the subsidies are obtained by who practices poly-culture (Table 6.1.5, Section 3.3). In particular, the farms that receive subsidies are mainly growing olive trees, fruit and citrus and arable crops. None of the greenhouses horticulture farms receive subsidies. However, only few respondents represent this category. The sales' destination

[47] A drought monitoring system is intermittently operated by the Regional Department for Water and Waste, Service 2: 'Drought Bulletin'. However, it is limited to meteorological data and does not contain advise or actions to undertake aimed at limiting the local vulnerability. No common preventive action or strategy is planned by any drought monitoring centre. A Drought Observatory is under development, appointed to different Services of the Region Sicily. Data from Interviews
[48] By supporting the agricultural sector means that policies and measures taken by international, national or regional administrations conform to the needs of the farmers in the way that the employment within the sector is encouraged.

also plays an important role, as two thirds of the people who sell to the international market receive funding or subsidies.
The respondents refer to different types of subsidies: mainly direct payments by the Common Agricultural Policy (CAP) (67%) and funding for measures within the Rural Development Programme (RDP) (24%).
The only small farm that receives subsidies refers to the direct payments of the CAP. When looking at the Rural Development Programme, it is not unexpected that big and medium farms are those benefitting the most from financial aids. First, to apply to RDP measures there are eligibility criteria to fulfil, which refer to a minimum income or minimum possession extent. Table III (next page) shows the relevant criteria for the most selected measures[49], to which respondents have applied. Small farms are often discouraged or even excluded from participating. Secondly, small farms are generally family-run, which makes even more difficult to compete with more economically developed and market-driven farming businesses.
Age is here a characterizing variable: 84% of the respondents who ever applied to a RDP measure are less than 54 y.o.. Younger farmers (under 40 y.o.), get most of the time a higher score in the selection. This group of respondents points out the 'scarce inclination of farmers to adopt changes in the traditional practice' as a barrier to the implementation of water saving measures. It is likely that they refer to the elder farmers, who are also the ones participating the least in the RDP, as shown in Table 6.2.2. The relative higher participation of farmers under 54 y.o., mostly full-time employed, would suggest that this group is more dynamic, open to changes and innovations, as far as concern the farm management. Also, they have a general more optimistic attitude than the elders (see Theme 6).
Most of the applications come from those who grow arable crops, fruit and citrus and olive trees. Especially, among the olive trees farming 66% applied for a RDP measure. Farmers selling to the international market, which correspond to big and medium farms, have a higher participation also to the RDP (Tables 6.2.6 and 6.2.8, Section 3.3).
Focusing on the instruments related to the water resources, 71% of the respondents report that there are no incentives available to promote an efficient use. On the other hand, 20% that acknowledges the presence of incentives identify the RDP as to be the main opportunity (e.g. measures '214 Agri-environment payments' or '4.1 Investments in agricultural holdings'). Some mentioned the chance that incentives and water saving measures exist, but they are not correctly informed about it.
Few other instruments are identified by 8% of the respondents to support a water efficient use in agriculture: banks' loans and subsidies; private resources; the Operational Plan within the European Regional Development Fund; again the RDP is pointed out, suggesting an acknowledged popularity of this instrument within the farmers' community. However, the majority of the respondents (80%) don't know other instruments available, due either to their absence or to a poor level of information.
One private instrument is the insurance in case of drought events. The regional departments are encouraging farmers to insure themselves against atmospheric adversities, including droughts, in order to be able to get a compensation for the damages in case of the occurrence of the event[50]. However, this is not a common practice yet, as also shown by the answers to the questionnaire: 91% of the respondents don't have drought insurance. The 7% that answered positively is represented by 5 farmers, from either medium or big size farms. Their characteristics are shown in detail in Table 6.6.1, Section 3.3.
The application for drought insurance carries with it the uncertainties related to the identification of the phenomenon. To get the compensation for the damage, a farmer must present a declaration stating the occurrence of the event. This cannot be a self-certification, as the 'calamity state due to drought' has to be formally declared by the regional government and approved by the national government. Moreover, depending on the insurance company, different periods of coverage can be chosen[51]. Identifying the start and end of a drought is complex and there is no fixed method or a common practice. All of these arguments may make people sceptical and discouraged to invest on insurance.

[49] Other five measures are reported by respondents: 8.1, 112, 124, 311 and 421. The table shows the measures selected at least three times.
[50] Data from interviews, see Annex IV.
[51] Generally the insurance covers the vegetative stage of the crops. [Data from interviews and received document] The insurance policies of the various insurance companies report the definitions of the hazards. In case of drought, the most common definition is (as reported in the Regional informative material): "*Exceptional lack of precipitation, at least equivalent to a third of the average value for the referred period, calculated in a time frame of thirty days, such that determines a drop in the soil moisture content, under the critical value, and/or impoverishes the water supply sources and even the emergency irrigation is impracticable*". Received Document: Risk Management in Agriculture, F. Martella, 2015, Agri-innovation notebooks, Region Sicily [funded by measure 11, Sicilian RDP 2007-2013]

Climate change-related actions are also supported by the European Union, to which 20% of its budget is specifically intended[52], including adaptation measures for drought and water related measure to encourage an efficient use and protect the environment. Applying to measures including climate change-related objectives would give more chances to the applicants to get funding. In total, 19% of the respondents took into account climate change when applying for an EU funding program, being 69% of them aware of the intended budget. The applicants are mostly from big and medium farms; all of them under 54 years old.
To conclude, more than the availability of the instruments, the possibility to make these implemented is limiting. It seems that, even if the presence of financial resources is acknowledged by the respondents, farmers are not always able to make use of them[53]. Different obstacles to the implementation of water saving measures are pointed out by farmers: above all, lack of planning by the administrative bodies (53%), administrative, economic and technical barriers (50%, 47% and 24% respectively); but also reasons related to habits, as a scarce inclination to adopt changes in the traditional practices (31%) as reported before.

Theme 5. Trust in the European and Regional policies and knowledge assessment (policy context)
This paragraph evaluates the trust that the respondents manifest towards European and Regional policies[19], which resulted to be very low especially as far as concerns the regional administration. The group composed by those having major faith in the European policy is first analysed, seeking for the reasons of their dissatisfaction towards the Regional administration. Further research is carried out on the information level that the respondents state during the questionnaire, to understand to which extent negative answers and expectations are due to lack of awareness.

The agricultural employment is not supported by the European policy according 73% of the respondents, and by the regional policy for 96%.
The group positive towards the EU policy is represented by 17 farmers (24%) with a high level of education and from all over the region. They own big (6) and medium (8) farms, while only 3 small farms. Among them, 59% receive subsidies for the agricultural activity, especially those who grow olive trees, arable crops and fruit and citrus, selling to the local, national and international market. Specifically, 25% of them receive CAP subsidies, while 17% funding from the RDP. Two thirds of this group believes there is insufficient communication and cooperation within the farmers' community and none is happy with the public management. More than 70% experienced water scarcity due to disruption of the public service. This could represent one reason for them to be positive about the European policy but not about the regional management. In particular, when asked to identify the main problem in the agricultural sector related to the water resources, 35% pinpoint the lack of infrastructures' maintenance, 30% a lacking or inappropriate management of the resource, while a smaller percentage (18%) ascribes it to recurring drought periods. In addition, 77% of them identify the lack of planning as the major obstacle to the implementation of water saving measures. However, this group is mainly optimistic for the future of the agricultural sector (59%), far more towards the young generation (82%).
Among the few that trust the EU policy, only 2 trust the Regional policy, accounting for 3% of the total respondents. They are young farmers (less than 44 y.o.) that own big farms of arable crops, destined to local and national markets; both are located in Palermo. They receive direct payments from the CAP.
Even if they trust the regional policy to be supportive, they identify the lack of communication and coordination between farmers and managing authorities as to be the main problem related to the water resources management in the sector. However, none of them is supplied by the public network, which may reduce their interaction with the public water supply body. Both of them are optimistic about the future of the sector, one is aware about the support for climate change adaptation objectives, but he never took it into account when applying for funding. Nothing is specified about knowledge on the policy to address water scarcity and drought.
The Region is the intermediary for the implementation of the European programs intended to farmers. A higher percentage of people unhappy with the Regional policy could suggest that, even if the European policy would represent a good instrument to foster the agricultural activity, the Regional administration may be unsatisfying, resulting in a scarce application of those instruments considered potentially helpful (e.g. RDP, CAP, water efficiency measures, drought prevention, awareness enhancement, etc.).
However, the group satisfied with the European agricultural policy is also limited.
The causes of the 'mistrust' towards both European and Regional policies could be searched within the level of awareness that farmers have regarding the available instruments, or in their actual accessibility. The latter is assessed

[52] "Climate action is a key priority of the EU. To respond to challenges and investment needs related to climate change, the EU has agreed that at least 20% of its budget for 2014-2020 – as much as €180 billion − should be spent on climate change-related action" https://ec.europa.eu/clima/policies/budget_en
[53] This issue is reported during the interviews and seminaries as well (National Ministry for the Infrastructure speech). See Annex IV.

in the previous paragraph. As for the former, the knowledge state is very different among the various groups of farmers and depends on the diverse topics.
Already reported comments in the previous sections showed that information about instruments and programs for the agricultural activity is not widely spread. Even when the information is available, the rate of trust towards the EU policy is still low: among those who reported to know other supportive instruments or incentives for a water-efficient use in agriculture, or consider the information on climate change-related programs to be available, one each 4 farmers is trustful.

Table III. Most selected RDP measures; RDP of reference; objectives; eligibility criteria; % of respondents; respondents main features.

Measure selected ***RDP of reference***	**Summarized objective of the measure** ***Specific water/environmental/climate related descriptions***	**Highlight of relevant eligibility criteria[54]**	**Respondents main features**
121 Modernization of agricultural holdings *2007-2013*	To modernize the agricultural and agro-industrial productive system improving the overall efficiency; to improve the produce quality and foster the union of weaker farming businesses and their participation within the markets. *It supports investments for: Measures to safeguard the environment; Measures of water efficiency and water quality improvement; Integration of systems for quality assurance, traceability and environmental management.*	Minimum level of 'business standard gross income'[55] of: - At least 10 EDU[56] for the farming businesses within areas C and D[57] - At least 12 EDU for businesses within the other areas	*Nr. of applicants: 13 (19%)* *Polyculture: 10* Olive growing (10); Fruit and citrus farming (8); Arable crops (6) Sale: Local market (8); National market (9); International market (5)
4.1 Investments in agricultural holdings *2014-2020*	Support to investments for structural and non-structural projects, aimed at the modernization of the farming holding and its participation within the markets. *Introduction of new technologies and innovations; energy saving measures; water reuse and water efficiency systems, environmental and soil protection actions; integration of system for quality assurance, traceability and environmental management; improvement of production system, according to environmental and landscape protection needs.*	Minimum economic dimension in terms of standard gross income[20] of: - 15.000 € for the minor islands[58], mountainous and disadvantaged areas, and Natura2000 areas; - 25.000 € for the other areas. Crops requirements for specific sub-measures: Grain: min 30 ha of UAA; Legume: min 10 ha of UAA; Olive trees and viticulture: min 15 ha of UAA; Fruits and citrus: min 2 ha of UAA	*Nr. of applicants: 5 (7%)* *Polyculture: 4* Fruit and citrus farming (4); Olive growing (4); Arable crops (2) *Sale:* Local market (2); National market (5)
11 Organic farming *2014-2020*	Support to the integration of organic farming *The organic farming as a sustainable production system, must contribute to: Improve the soil and water quality; Mitigate and adapt to climate change; Improve the biodiversity.*	The minimum allowable business surface is 2 ha. For minor islands[23] the limit is reduced to 0.5 ha.	*Nr. of applicants: 3 (4%)* *Polyculture: 2.* Open-field horticulture (2); Fruit and citrus farming (2); Olive growing (2) *Sale*: Local market (2); National market (2); Direct sale (2)
214 Agri-environment payments *2007-2013*	Biodiversity preservation; protection and spread of agro-forestry systems with high naturalistic value; environmental sustainability; soil and water resources protection; implementation of practices to reduce GHGs emissions. *Different sub-measures:* *214.1.a – Eco-sustainable management methods – Includes: water resources conservation, efficient water use; soil protection against desertification.* *214.1.b – Biologic agriculture –implementation of techniques with low environmental footprint.* *214.1.c – Adoption of crops rotation to improve the soil structure.*	Depending on the sub-measures: 214.1.a and 214.1.b – minimum farm area: 2 ha of UAA (1 ha for minor islands); the entire area is committed to the measure for minimum 5 years. 214.1.c – min farm area: 20 ha of UAA (1 ha for minor islands); the entire area is committed to the measure for minimum 5 years.	*Nr. of applicants: 3 (4%)* *Polyculture: 2* Fruit and citrus farming (1); Olive growing (1); Arable crops (1); Viticulture: 2 *Sale:* Local market (2); National market (1)

[54] Data excerpted from Regional invitations to tender, downloaded from the Sicilia RDP official website.

[55] The s*tandard gross income* is a profitability index of a specific agricultural activity (type of crop or livestock). It is functional to the classification of the farming businesses (EDU) according to EU rules.

[56] EDU: *Economic Dimension Unit*. It is the basic unit for the evaluation of the business economic dimension. 1 EDU corresponds to a standard gross income of 1200 €/year.
To obtain the number of EDU, the value corresponding to the type of crop/livestock (given in specific tables) must be multiplied by the number of hectares of UAA. The table for the EDU evaluation used during the Sicilian RDP 2007-2013 is available at: http://www.psrsicilia.it/2007-2013/Allegati/News/PSR_Sicilia2007-2013TAB_UDE.pdf

[57] Territorial classification of four 'macro-areas': A – Urban and peri-urban areas; B – Rural areas with intensive agriculture; C – Intermediate Rural Areas; D – Rural areas with development issues.

[58] It refers to the surrounding minor islands within the Sicilian administration: Aeolian Islands; Aegadian Islands; Pelagian Islands; Pantelleria; Cyclopean Isles; Ustica; others

Knowledge state about programs and policies on climate change and water-related measures was specifically surveyed: 29% of the respondents are informed about the European budget intended to climate change-related actions, mostly from big and medium farms (85%) and under 54 years old (80%). Within this group, 45% took into account climate change when applying for an EU funding program.
However, the majority of the respondents (89%) state that there is no enough information on water-related measures to adapt to climate change. Some of them individually suggested few strategies to limit the energetic costs linked to the irrigation system, which would contribute to a reduction of energy use within the farm, and measures to contain the water consumptions.
Finally, 83% don't know about the policies to address water scarcity and drought in the EU. More than half of the farmers that are aware about such policies also trust Europe to be supportive and are optimistic towards the future of the agriculture sector. The fact that the majority is unaware supports the thesis that policies are often not easily accessible by who is outside the administration sector or that, when such policies are not binding, they don't gain a central role.
In conclusions, the results show a rather scarce level of information among the farmers community on the current water, climate and agricultural policies and instruments. A lack of awareness may negatively contribute to a bad perception of the public management and an overall condition of dissatisfaction, likely increased by a poor participation. As frequently reported, negative perceptions are largely observed along the questionnaire responses.

Theme 6. Future climate and potential changes
In this paragraph, the perception of the future, both in terms of climate and agriculture, are discussed. The derived information is relevant to understand the respondents needs, as well as their attitude towards possible changes.

Water scarcity and drought events will likely be more frequent in the future for 80% and 74% of the respondents, respectively. No changes are expected in their frequency by the 14% and the 20%. It is interesting to note that, within these last two groups, half of the respondents did not provide any definition of water scarcity and/or drought and two thirds rely on private water sources, also for the future, being able to irrigate when the crops need it.
A consistent group (60%) is relying on the current water source for the future, including farmers who believe that water scarcity and drought events are going to be more frequent. This group is represented by who is supplied by private sources or combination of private and public. On the contrary, the number of people served only by the Consortium that are not relying on their future supply is slightly higher (Table 7.2.2, Section 3.3).
Water scarcity and drought events could be faced by implementing several means. First, by increasing the use of water efficient measures for irrigation according the majority of the respondents (60%), guaranteeing a reliable and equitable water supply (51%), improving technical skills of farmers and managing authorities (49%) and increasing transparency on the management of water for irrigation (46%). Yet, shared options are also reusing treated wastewater for irrigation purposes (40%), strengthening the data collection for water resources management (31%), and improving the participation and dialogue among stakeholders (31%). In line with these, investments should be mainly directed to modernize the existing infrastructures (70%) or to create new ones (61%). Research on climate and technical innovation should be more financially supported (49%), as well as the involvement of farmers to educational program (36%). Finally, strengthening of the water managing authorities should be target of investments according a third of the respondents.
Fixing a price for the water consumption and services may be an instrument to incentive an efficient use and support the resource management. As already seen in Paragraph 2, a tariff for the water consumption is not always applied. Ideally, assuming that water services would work better, more than half of the respondent would be willing to pay a (higher, if already applied) tariff[59]. Especially, this group is represented by farmers less than 54 years old.
The information that emerged from the analysis of the responses is finally combined with the attitude that the respondents manifest towards the future of the agricultural sector and the capacity of young farmers to face current and future challenges. The expression 'optimism towards the future of the agricultural sector' is used to indicate the faith that potential challenges (climate related or socially constructed) would be faced so that the primary sector would keep ensuring employment opportunities. Same applies to the 'optimism towards the

[59] The definition of an appropriate tariff is currently under discussion, both by the national and regional administrations, and by the users' community. The latter is mainly split between those who see water as common good, for which a price cannot be imposed and its management must stay public, and those who believe that the privatization of the water sector, with a consequent determination of a water tariff, would support a better management and facilities operation. For more information on this debate, refer to Carrozza, C. and Fantini, E. 2016. The Italian water movement and the politics of the commons. Water Alternatives 9(1): 99-119

capacity of the new generation to face current and future challenge', especially referring to young farmers (age categories: less than 35, and 35 to 44 years old).
In total, 37% of the respondents is optimistic towards the future of the agricultural sector. This group positively increases to 60% when referring to the trust towards the young generations. Except for one respondent, the group that doesn't believe in the new generation is also pessimistic about the future of the agriculture.
A trend could be observed in the age distribution: farmers less than 44 y.o. are more optimistic and trustful in their generation. They mostly have a higher education and are part-time employed.
For all the three categories of farm size, negative answers are higher as far as concern the future of the agricultural sector; however, the situation is reversed for the trust in the new generation and a greater number of farmers, especially from medium and big farms, believe in the youth.
A pessimistic view is observed among who practices open-field horticulture, while far more optimistic are the farmers oriented to the international markets, who own medium and big farms.
Looking at the subsidies and funding receivers, the group that doesn't get subsidies is more negative respect who gets financial support. It mainly corresponds to medium and small farms, and includes more than half of the elders who responded. In particular, who receives funding from the RDP is more positive than who gets the direct payments from the CAP. This is partly because who takes part to the RDP is likely to have a more established and solid activity (this group is represented by big and medium farms, mainly owned by farmers less than 44 y.o.[60], who sale to international and national markets), while the direct payments from the CAP are a basic income support based on the number of hectares, and are generally smaller compared to the needs and the costs that farmers have to sustain[61]. Moreover, the concept of funding is different from the one behind subsidies. In the first case, people get support to realize a project, bringing along a creative and dynamic force that may stimulate fulfilment and optimism.
These results suggest that the RDP has a high potentiality, being acknowledged and positively seen by a relatively large group of farmers. However, the long bureaucracy discourages and often reduces its implementation. Emphasizing this fact, who is not optimistic mainly blames the scarce planning capacity of the managing authorities. This would shed light on the importance of promoting the use of funding programs among the farmers community.
Among those unhappy with the European policy (73%), almost a third is still positive towards the future of the agricultural sector and more than half towards the new generation. Again, the level of information plays a role: who doesn't know other supportive instruments, or ignores the existing policies and climate change-related programs is more pessimistic, suggesting that the spread of information and the enhancement of the farmers participation would help the overall trust towards the primary sector.

[60] In this context, it is important to remind that the RDP scoring system privileges young farmers, less than 40 years old.
[61] Claim stressed in comments and interviews

3.2. Questionnaire form

Water scarcity and drought in Sicily: farmers' perception.

The following questionnaire aims to collect data on farmers' perception on water availability issues in agriculture. Special focus is put on the identification of causes and impacts of water scarcity and drought and the instruments available to cope with them.
The answers are anonymous. Space for comments is given at the end of each section.

Section 1: Respondent's details

1.1 Age: □ less than 35 □ 35-44 □ 45-54 □ 55-64 □ more than 65

1.2 Gender: □ Female □ Male

1.3 Education:

1.4 Are you a full-time farmer? □ Yes □ No

1.5 Municipality in which the farm is located:

1.6 Size of the farming business:

□ Little: utilised agricultural area (UAA) less than 2 ha
□ Medium: UAA between 2 and 30 ha
□ Big: UAA greater than 30 ha

1.7 Production specialized in: (multiple answer possible)

□ Greenhouses horticulture
□ Open-field horticulture
□ Viticulture
□ Fruit and citrus farming
□ Olive growing
□ Arable crops
□ Other (please specify):

1.8 Destination of the production:

□ Local market
□ National market
□ International market
□ Direct sales to friends and acquaintances
□ Other (please specify):

1.9 *Space for comments:*

Section 2: Data on irrigation

2.1 Irrigated area (in ha):

2.2 Methods of irrigation applied: (multiple answers possible)

□ Surface
□ Sprinkler
□ Drip/trickle
□ Subsurface
□ Other (please specify):

2.3 Source of water supply: (multiple answer possible)

□ Public network (managed by Reclamation Consortium)
□ Springs
□ Private well – individual use
□ Private well – collective use
□ Private small reservoir – individual use
□ Private small reservoir – collective use
□ Other (please specify):

2.4 Are you able to irrigate any time the plants need it? □ Yes □ No

2.4.1 If not, what is the reason?

2.5 Do you have a meter to monitor your water consumption? □ Yes □ No

2.6 Who is responsible for the monitoring of the meter or the effective water consumption?

□ Nobody
□ Reclamation Consortium employee
□ Regional departments' employee
□ Policeman/Carabiniere
□ Other (please specify):

2.7 Type of tariff paid for the water consumption:

□ €/m3
□ €/ha
□ I don't pay a tariff
□ other (please specify):

2.7.1 If possible, specify the tariff amount:

2.7.2 To whom do you pay the tariff?

2.7.3 Is the tariff appropriate to the service? □ Yes □ No
2.7.4 If not, what is the reason?
2.8 Do you have any restriction on the water use?
(ex. max water withdrawal per month; priority to other uses) □ Yes □ No
2.8.1 If yes, what are the restrictions?
2.9 Is there enough communication with the water authorities? □ Yes □ No □ space for comment:
2.10 Is there enough communication and cooperation among farmers? □ Yes □ No □ space for comment:
2.11 *Space for comments:*

Section 3: Data on public irrigation

If not served by the Reclamation Consortium, skip to the following section 4.

3.1 At which Reclamation Consortium are you registered?

□ 1 Trapani □ 4 Caltanissetta □ 7 Caltagirone □ 10 Siracusa
□ 2 Palermo □ 5 Gela □ 8 Ragusa □ 11 Messina
□ 3 Agrigento □ 6 Enna □ 9 Catania

3.2 What is the logic followed for the water supply?

□ Water is supplied upon request, following the plants' water needs
□ Water is supplied following a schedule planned at the outset of the irrigation season
□ Water is supplied following a list of reservations
□ Water is supplied following the availability at the source
□ There is no clear logic
□ I don't know
□ Other (please specify)

3.3 How would you rate the maintenance state of the public network?

□ Perfect □ Good □ Mediocre □ Scarce □ Absent

3.4 Are there relevant breakages or wastefulness in the Consortium area? □ Yes □ No
3.4.1 If yes, what type?
3.5 Is there enough communication with the Consortium workers? □ Yes □ No
3.6 Overall, are you satisfied with the water supply service?

□ Absolutely yes □ Yes □ On Average □ No □ Abs. not

3.7 *Space for comments:*

Section 4: Experience with water scarcity

The questions contained in this section refer to the local scale, as regards the area of your farm, and exclusively to the agricultural sector.

4.1 Have you ever experienced limited water availability for irrigation purposes? □ Yes □ No
4.2 When was the last time and what occurred?
4.3 What is the frequency of occurrence of phenomenon?
4.4 Is it a temporary or permanent problem? □ Temporary □ Permanent □ Space for comment:
4.5 What are the causes of water scarcity in agriculture in your area? (multiple answers are possible)

□ Limited natural availability of fresh water
□ Pollution of water bodies
□ Prolonged drought periods
□ Ongoing climate change
□ Insufficient or badly maintained infrastructures
□ Priority of water use given to other uses (e.g. potable; hydropower; etc)
□ Problems related mainly to the management of the resource
□ Over-exploitation of the resource
□ Over-allocation of the resource
□ Overall waste of the water resource
□ Other (please specify)

4.6 Were the causes the same in the past? □ Yes □ No □ I don't know
4.6.1 If not, what has changed?
4.7 What are the socio-economic impacts of water scarcity in agriculture in your area?
(multiple answers possible)

□ Loss of production
□ Economic loss
□ Increase in unemployment
□ Increase in water prices

□ Increase in food prices
□ Threat to food safety
□ Impacts on human health
□ Impacts on animal and plant health
□ Conflicts for water access
□ Migration
□ Other (please specify)

4.8 What are the environmental impacts of water scarcity in agriculture in your area? (multiple answers possible)

□ Increase in soil aridity
□ Increase in evapotranspiration
□ Increase in temperatures
□ Drop in groundwater levels
□ Draining of surface water bodies
□ Deterioration of water quality state
□ Loss of biodiversity
□ Loss of natural habitats
□ Other (please specify)

4.9 Which actions have you undertaken to prevent water scarcity? (multiple answers possible)

□ Measures of water efficiency (e.g. drip irrigation)
□ Change to cultures with smaller water need
□ Water harvesting (tanks; private small reservoirs)
□ Reuse of treated wastewater
□ Rationalize water consumption
□ Nothing
□ Other (please specify)

4.10 How would you rate the problem of water scarcity in agriculture in your area?

□ Very serious □ Serious □ Moderate □ Mild □ Not serious □ Absent □ Other (specify/comment)

4.11 *Space for comments:*

Section 5: Experience with drought

The questions contained in this section refer to the local scale, as regards the area of your farm, and exclusively to the agricultural sector.

5.1 When did the last drought occur?

5.2 What was the duration?

5.3 Which actions have been implemented to face the problem? (multiple answers possible)

□ Nothing
□ Autonomous excavation of wells
□ Extra water supply by tanker truck
□ Desalination of sea water
□ Inter-connection between public irrigation networks
□ Rationalization of water consumption
□ Other (please specify)

5.4 What is the frequency of occurrence of the phenomenon?

5.5 Is it a temporary or permanent problem? □ Temporary □ Permanent □ Space for comment

5.6 What are the causes of drought in your area? (multiple answers are possible)

□ Prolonged lack of precipitation
□ Ongoing climate change
□ It is an intrinsic characteristic of Sicilian climate (endemic)
□ Depends on soil characteristics (aridity)
□ Bad soil/land management
□ Atmospheric pollution
□ Overall waste of the water resource
□ Over-exploitation of the resource
□ Over-allocation of the resource
□ Other (please specify)

5.7 Were the causes the same in the past? □ Yes □ No □ I don't know

5.7.1 If not, what has changed?

5.8 What are the socio-economic impacts of drought in your area? (multiple answers possible)

□ Loss of production
□ Economic loss
□ Increase in unemployment
□ Increase in water prices
□ Increase in food prices
□ Threat to food safety
□ Impacts on human health
□ Impacts on animal and plant health
□ Conflicts for water access
□ Migration
□ Other (please specify)

5.9 What are the environmental impacts of drought in your area? (multiple answers possible)

□ Increase in soil aridity
□ Increase in evapotranspiration
□ Increase in temperatures
□ Drop in groundwater levels
□ Salinity intrusion in the coastal area
□ Draining of surface water bodies
□ Deterioration of water quality state
□ Loss of biodiversity
□ Loss of natural habitats
□ Other (please specify)

5.10 Is any drought early warning system available? □ Yes □ No □ I don't know

5.10.1 If yes, who provides the service?

5.11 Which actions have you undertaken to prevent a potential future drought? (multiple answers possible)

□ Measures of water efficiency
□ Change to cultures with smaller water need
□ Water harvesting: tanks/private small reservoirs)
□ Nothing
□ Other (please specify)

5.12 Do you consider yourself prepared enough to face a drought event? □ Yes □ No □ space for comment:

5.13 How would you rate the problem of drought in agriculture in your area?

□ Very serious □ Serious □ Moderate □ Mild □ Not serious □ Absent □ Other (specify/comment)

5.14 *Space for comments:*

Subsection I: Water scarcity and drought link and definitions

5.a Do you consider water scarcity and drought phenomena to be linked? □ Yes □ No □ space for comment:

5.b *How would you define water scarcity?*

5.c *How would you define drought?*

Subsection II: Main water-related problem in agriculture in Sicily

5.d What do you think is the main issue related to the water resource in agriculture in your area? (Only one answer possible)

□ Lack of a proper management of the water resource
□ Lack of communication and coordination between users and responsible managing authorities
□ Lack of communication and cooperation among farmers
□ Missing infrastructures or bad maintenance
□ Natural scarcity of fresh water
□ Bad qualitative state of the water bodies
□ Lack of information among users
□ Frequent drought periods
□ None
□ Other (please, specify)

Section 6: Financial and administrative measures and instruments

6.1 Do you receive any subsidy or funding for your agricultural activity? □ Yes □ No

6.1.1 If yes, which type?

6.2 Have you ever taken part to an invitation to tender of the Rural Development Programme? □ Yes □ No

6.2.1 If yes, for which measure?

6.3 Are there available incentives for an efficient use of the water resource in agriculture? □ Yes □ No

6.3.1 If yes, which type?

6.4 Do you know any other financial instrument available to improve the irrigation infrastructure or the efficient use of the water resource? □ Yes □ No

6.4.1 If yes, which one?

6.5 What are the main obstacles to the implementation of water saving measures? (multiple answers possible)

□ Economic
□ Administrative
□ Technical
□ Lobbies interests
□ Lack of planning by responsible bodies
□ Scarce inclination of farmers to adopt changes in the traditional practices
□ Other (please specify)

6.6 Have you insured your farm against drought as a natural disaster? □ Yes □ No □ space for comment:
6.7 Do you know that the 20% of the European budget is directed to the support of climate change mitigation and adaptation objectives? □ Yes □ No
6.8 Have you ever taken into account the ongoing climate change when applying for funding? □ Yes □ No
6.9 Is there enough information available on the climate change adaptation and mitigation strategies that take into account a proper use of the water resource? □ Yes □ No □ space for comment:
6.10 Are you aware of the 2007 European Commission Communication COM(2007)EC 414 "Addressing water scarcity and droughts in the EU" and its following review on 2012? □ Yes □ No
6.11 Do you consider the employment in agriculture to be enough fostered by the regional policy? □ Yes □ No
6.12 And by the European policy? □ Yes □ No □ space for comment:
6.13 *Space for comments:*

Section 7: Future expectation, changes and alternative solutions

7.1 Do you expect water scarcity and drought periods to be more frequent in the future?
Water scarcity: □ Less frequent □ No changes □ More frequent
Drought periods: □ Less frequent □ No changes □ More frequent
7.2 Do you rely on your current water supply source for the future? □ Yes □ No □ space for comment:
7.3 Which measures do you consider necessary to face water scarcity in agriculture? (multiple answers possible)
□ Create new infrastructures for water storage
□ Increase the implementation of water efficient measures for irrigation
□ Set incentive prices on the water consumption
□ Reuse treated wastewater for irrigation purposes
□ Make water consumption policies more restrictive
□ Guarantee a proper, reliable and equitable water supply
□ Increase transparency on the management of water for irrigation
□ Change attitude among the institutions and the managing authorities
□ Improve technical skills of farmers and managing authorities
□ Improve the monitoring system and the collection of data regarding availability, demand and use of the water resource.
□ Improve the dialogue among the responsible bodies and the farmers
□ Others (please specify)
7.4 How should investments be directed in the future? (multiple answers possible)
□ To modernize the existing infrastructures
□ To create new water infrastructures
□ For the institutional reconstruction of the water managing authorities
□ To promote the farmers' participation to educational and scientific innovation events
□ To foster the research on climate and technical innovation
□ Other (please specify)
7.5 Would you pay more for your water consumption, if you know it is needed to improve the infrastructures and the service? □ Yes □ No □ space for comment:
7.6 Overall, are you optimistic for the future of the agricultural sector? □ Yes □ No □ space for comment:
7.7 Do you trust the capacity of the new generation to face the coming challenges? □ Yes □ No
7.8 *Space for comments:*

To conclude… Would you like to add any comment or suggestion?
Thanks for your time and contribution!

3.3. Responses to the questionnaire (in tables)

The responses to each question of the questionnaire are reported in tables. The number of each table corresponds to the number of the corresponding question in questionnaire form. Supplementary tables combining questions are added to highlight relevant features.
Responses are reported per count of ticked answers and percentage of each given answer over the total respondents, who amounted to 70.
For multiple-choice answers, the total count of ticked answers is given.
The following acronyms are used:

- n.a.: answer not available/not given
- n.s.: answer not specified. It applies for sub-questions: e.g. Do you pay a tariff for your water consumption? Yes; If yes, to whom? n.s.: In this case, the respondent was required to give an answer but (s)he did not specify it.

SECTION 1 – RESPONDENTS DETAILS

Age; Gender; Education; Occupation; Location; Farm size; Production specialization; Production destination; Comments

Table 1.1 Age

Age	Count	Percentage
Less than 35	18	26%
35-44	13	19%
45-54	20	29%
55-64	8	11%
More than 65	11	16%
Total respondents	**70**	**100%**

Table 1.2 Gender

Gender	Count	Percentage
Female	5	7%
Male	65	93%

Table 1.2.1 Gender and age

Gender, Age	Count	Percentage
Female	**5**	**7%**
35-44	1	
45-54	2	
55-64	1	
More than 65	1	
Male	**65**	**93%**
Less than 35	18	
35-44	12	
45-54	18	
55-64	7	
More than 65	10	

Table 1.3 Education

Education	Count	%
Elementary school	2	3%
Secondary school - 1st degree	3	4%
Secondary school - 2nd degree	19	27%
Tertiary school - 1st cycle (Bachelor)	10	14%
Tertiary school - 2nd cycle (Master)	28	40%
Tertiary school - 3rd cycle (PhD)	1	2%
n.a.	7	10%

Table 1. 4 Occupation: part-time, full time

Occupation	Count	Percentage
Part-time farmer	38	54%
Full-time farmer	32	46%

Table 1.4.1 Occupation and age

Occupation, Age	Count	Percentage
Full-time farmer	**32**	**46%**
Less than 35	5	
35-44	7	
45-54	10	
55-64	2	
More than 65	8	
Part-time farmer	**38**	**54%**
Less than 35	13	
35-44	6	
45-54	10	
55-64	6	
More than 65	3	

Table 1.5 Province of belonging

Province of belonging	Count	Percentage
Palermo	24	34%
Catania	20	29%
Trapani	7	10%
Siracusa	6	9%
Enna	5	7%
Agrigento	4	6%
Messina	1	1%
Ragusa	1	1%
n.a.	**2**	**3%**

Table 1.6 Farm size

Farm size	Count	Percentage
Big	23	33%
Medium	35	50%
Small	12	17%

Table 1.6.1 Province of belonging and farms' size

	Count per farm size				
Farm's province	Big	Medium	Small	Count	Percentage
Palermo	4	15	5	24	34%
Catania	10	6	4	20	29%
Trapani	5	2	-	7	10%
Siracusa	1	5	-	6	9%
Enna	2	2	1	5	7%
Agrigento	1	1	2	4	6%
Messina	-	1	-	1	1%
Ragusa	-	1	-	1	1%
n.a.	-	2	-	2	3%

Table 1.6.2 Farm size and age

	Count per farm size				
Age categories	**Big**	**Medium**	**Small**	**Count**	**Percentage**
Less than 35	5	11	2	18	26%
35-44	5	6	2	13	19%
45-54	7	10	3	20	29%
55-64	3	2	3	8	11%
More than 65	3	6	2	11	16%

Table 1.6.2 Farm size and occupation

	Count per farm size				
Occupation	**Big**	**Medium**	**Small**	**Count**	**Percentage**
Part-time	11	17	10	38	54%
Full-time	12	18	2	32	46%

Table 1.7 Production specialization

Production's specialization (frequency of the answers)	**Count**	**% over the respondents**
Fruit and citrus farming	41	59%
Olive growing	35	50%
Arable crops	25	36%
Open-field horticulture	14	20%
Viticulture	14	20%
Greenhouses horticulture	5	7%

Table 1.7.1 Production specialization, Monoculture and polyculture

Crops production specialization	**Count**	**Percentage**
Total Mono-culture	**31**	**44%**
Fruit and citrus farming	16	23%
Arable crops	4	6%
Viticulture	4	6%
Open-field horticulture	3	4%
Olive growing	2	3%
Greenhouses horticulture	2	3%
Total Poly-culture	**39**	**56%**

Table 1.7.2 Production specialization

Production's specialization	**Count**	**%**
Fruit and citrus farming	16	23%
Fruit and citrus farming, Olive growing	8	11%
Fruit and citrus farming, Olive growing, Arable crops	8	11%
Arable crops	4	6%
Viticulture	4	6%
Open-field horticulture	3	4%
Viticulture, Olive growing	3	4%
Viticulture, Olive growing, Arable crops	3	4%
Olive growing	2	3%
Open-field horticulture, Fruit and citrus farming, Olive growing	2	3%
Open-field horticulture, Olive growing, Arable crops	2	3%
Open-field horticulture, Arable crops	2	3%
Greenhouses horticulture	2	3%
Fruit and citrus farming, Arable crops	1	1%

Open-field horticulture, Fruit and citrus farming, Olive growing, Arable crops	1	1%
Open-field horticulture, Olive growing	1	1%
Open-field horticulture, Viticulture, Fruit and citrus farming, Olive growing, Arable crops	1	1%
Open-field horticulture, Viticulture, Olive growing, Arable crops	1	1%
Greenhouses horticulture, Fruit and citrus farming	1	1%
Greenhouses horticulture, Fruit and citrus farming, Olive growing, Arable crops	1	1%
Greenhouses horticulture, Open-field horticulture, Olive growing	1	1%
Viticulture, Fruit and citrus farming	1	1%
Viticulture, Arable crops	1	1%
Olive growing, Fruit and citrus farming	1	1%

Table 1.8 Destination of the production

Production's destination (frequency of the answers)	**Count**	**% over the respondents**
Local market	36	52%
National market	36	52%
Direct sales to friends and acquaintances	15	21%
International market	10	14%
Other: Sale to retailers	4	6%
Family consumption only	1	1%
n.a.	1	1%

Table 1.9 Comments

Comments Section 1	**Count**
"Few years ago I could sell my products abroad. Currently, I can't do it anymore due to the high farming costs and the competition of cheaper produce from other countries (Spain, Morocco)"	1
"The low cost of citrus in the market is not sufficient to sustain the costs within the farm (water, taxes, manure, milling, diesel, etc). Moreover, the fluctuations in the production due to last years' weathering brought us to our knees, we had a very small production"	1
"We also have a permaculture forest"	1
"We make online sale as well, and produce aromatic plants"	1
"We are part of a farmers' cooperative"	3
"We sell to Italian and international ethical purchasing groups (community-supported agriculture)"	1
Total comments: 8	

SECTION 2 – DATA ON IRRIGATION

Irrigated area; Irrigation Techniques; Sources of irrigation; Ability/inability to irrigate and causes of inability; Metering; Tariff; Communication and collaboration; Comments

Table 2.1 Extent of the irrigated area

Irrigated area (ha)	Count	Percentage
0	3	4%
≤2	14	20%
3 - 9	18	26%
10 - 29	17	25%
30 - 49	5	7%
≥50	3	4%
n.a.	10	14%

Table 2.1.2 Size of the farm and irrigated area

Farm size	Irrigated area (ha)	Count	Percentage
Small		**12**	**17%**
	0	1	
	≤2	6	
	10 - 29	1	
	n.a.	4	
Medium		**35**	**50%**
	≤2	8	
	3 - 9	14	
	10 - 29	11	
	n.a.	2	
Big		**23**	**33%**
	0	2	
	3 - 9	4	
	10 - 29	5	
	30 - 49	5	
	≥50	3	
	n.a.	4	

Table 2.2 Applied irrigation techniques

Irrigation Techniques	Count	Percentage
Drip/trickle	31	45%
Sprinkler	10	14%
Sprinkler, Drip/trickle	10	14%
Drip/trickle, Subsurface	4	6%
Surface	4	6%
Surface, Sprinkler, Drip/trickle	2	3%
Subsurface	2	3%
Surface, Sprinkler	1	1%
Surface, Sprinkler, Subsurface	1	1%
Surface, Drip/trickle	1	1%
None	3	5%
n.a.	1	1%

Table 2.2.1 Applied irrigation techniques, total ticked responses

Irrigation Techniques	Count	% over the respondents who practice irrigation
Drip/trickle	48	73%
Sprinkler	24	36%
Surface	9	14%
Subsurface	7	11%
Total ticked responses	**88**	
Respondents who practice irrigation	**66**	

Table 2.3 Source of water supply

Source of water supply	Count	Percentage
Combination public-private supply	**25**	**36%**
- Public network (Consortium), Personal pond	11	
- Public network (Consortium), Personal well	6	
- Public network (Consortium), Shared well	2	
- Public network (Consortium), Springs, Personal well, Personal pond	1	
- Public network (Consortium), Springs, Personal well	1	
- Public network (Consortium), Shared well, Personal pond	1	
- Public network (Consortium), River	1	
- Public network (Consortium), Personal well, Shared well, Personal pond	1	
- Public network (Consortium), Personal well, Personal pond	1	
Single public source	**17**	**24%**
- Public network (Consortium)	17	
Single private source	**17**	**24%**
- Personal well	10	
- Personal pond	5	
- River	1	
- Shared well	1	
Multiple private sources	**7**	**10%**
- Personal well, Shared well	2	
- Shared well, Personal pond	1	
- Personal well, Personal pond	1	
- Springs, Personal pond	1	
- Springs, Personal well	1	
- Springs, Personal well, Personal pond	1	
None	**3**	**5%**
n.a.	**1**	**1%**

Table 2.3.1 Source of water supply and farm size

	Count per farm size				
Source of water supply	Big	Medium	Small	Count	Percentage
Combination public-private supply	11	12	1	24	34%
Single public source (Consortium)	1	13	3	17	24%
Single private source	5	8	4	17	24%
Multiple private sources	3	2	3	8	11%
None	2	-	1	3	4%
n.a.	1	-	-	1	1%
Grand Total	**23**	**35**	**12**	**70**	**100%**

Table 2.4 Ability/Inability to irrigate

Ability to irrigate	Count	Percentage
Farmers able to irrigate	34	49%
Farmers unable to irrigate	34	49%
n.a.	2	2%

Table 2.4.1 Causes of inability to irrigate

Causes of inability to irrigate	Count	Percentage
Restrictions posed by the Consortium, among which:	24	**71%**
- *General*	*8*	
- *Lacking management and infrastructures, scarce reliability*	*7*	
- *Inadequate schedule, breakages*	*1*	
- *Inadequate schedule*	*3*	
- *breakages*	*2*	
- *Scarce or absent water supply, breakages*	*3*	
River's insufficient discharges	2	6%
Problems within the farm organization	2	6%
Dryland farming	1	3%
Absence of water supply sources	1	3%
Lack of public infrastructures	1	3%
n.s.	3	9%
Respondents unable to irrigate	**34**	**100%**

Table 2.4.2 Source of water supply and ability/inability to irrigate

Source of water supply	Unable to irrigate	Able to irrigate	n.a.	Count	Percentage
Combination public-private supply	12	12	-	24	34%
Single public source (Consortium)	13	4	-	17	25%
Single private source	4	13	-	17	25%
Multiple private sources	3	5	-	8	11%
None	2	-	1	3	4%
n.a.	-	-	1	1	1%
Grand total	**34**	**34**	**2**	**70**	**100%**

Table 2.5 Presence of water meter and body responsible for its control

Presence of water meter and body responsible for its control	Count	Percentage
No meter present	**47**	**67%**
Meter present, controlled by:	**19**	**27%**
Nobody	7	
Reclamation Consortium employee	4	
Farms employees	2	
Agronomist	1	
Public works office employee	1	
Regional Departments (Agriculture, Water and Waste) employee	1	
n.s.	3	
n.a.	**4**	**6%**

Table 2.7 Type of tariff paid and collector

Type of tariff paid and to which body/institution	Count	Percentage
No tariff paid	**21**	**30%**
Tariff paid in €/ha	**39**	**56%**
To: Consortium	35	
Consortium and Public works office	1	
Public works office	1	
Autonomous Consortium of Trapani	1	
n.s.	1	
Tariff paid in €/m3	**5**	**7%**
To: Consortium	4	
Water supply company	1	
n.a.	**5**	**7%**

Table 2.7.1 Perception on tariff's appropriateness and collector

Perception on tariff's appropriateness and tariff's collector	Count	Percentage
Tariff is not appropriate	**36**	**51%**
paid to: Consortium	31	
Public works office	1	
No tariff paid	4	
Tariff is appropriate	**13**	**19%**
paid to: Consortium	8	
Consortium and Public works office	1	
Public works office	2	
Water supply company	1	
Autonomous Consortium of Trapani	1	
No tariff paid	**17**	**24%**
n.a.	**4**	**6%**

Table 2.7.2 Reasons for tariff's inadequacy and collector

Reasons for tariff's inadequacy, referring to the collector	Count	Percentage
Tariff paid to the Consortium	**40**	**57%**
Appropriate	*8*	*12%*
Not appropriate, reasons:	*31*	*44%*
Inadequate supply (volumes; frequency)	14	
Inadequate supply (volumes; frequency), Outdated infrastructures	5	
Absent service	4	
Tariff too high compared the agricultural revenue	2	
Inadequate supply (volumes; frequency), Outdated infrastructures, Water thefts	1	
Outdated infrastructures	1	
n.s.	4	
n.a.	*1*	*1%*
Tariff paid to Consortium and Public works office	**1**	**1%**
Appropriate	*1*	
Tariff paid to Public works office	**3**	**4%**
Appropriate	*2*	*3%*
Not appropriate, reasons:	*1*	*1%*
Tariff too high compared the agricultural revenue	1	
Tariff paid to Water supply company	**1**	**1%**
Appropriate	*1*	*1%*
Autonomous Consortium of Trapani	**1**	**1%**
Appropriate	*1*	*1%*
No tariff paid (Given opinions about tariff)	**21**	**30%**
Not appropriate, reasons:	*4*	*6%*
No tariff paid	*17*	*24%*
Absent service	1	
Absent service, Tariff too high compared the agricultural revenue	1	
Inadequate supply (volumes; frequency)	1	
Inadequate supply (volumes; frequency), Scarce water quality	1	
n.a.	**3**	**5%**

Table 2.8 Restrictions applied to the water consumption

Restrictions applied to the water consumption	Count	Percentage
Yes, type of restrictions:	**25**	**36%**
Maximum water withdrawal	7	
Rotation (irrigation schedule) not in line with crops needs	6	
Priority to domestic use	5	
Communication constraints with Consortium employees	1	
Increasing fees	1	
Maximum water withdrawal, Priority to domestic use, Scarce water quality	1	
Insufficient pressure	1	
n.s.	3	
No restrictions	**30**	**43%**
n.a.	**15**	**21%**

Table 2.9 Communication level with water authorities

Communication with water managing authorities	Count	Percentage
Not enough	50	72%
Enough	8	11%
n.a.	12	17%

Table 2.10 Communication and cooperation among farmers

Communication and cooperation among farmers	Count	Percentage
Not present	44	63%
Present	19	27%
n.a.	7	10%

Table 2.11 Comments

Comments, reported according to the Consortium of belonging and the size of the farm
1 Trapani **Big-size farm** "A novel could be written about the Consortium work: we have 8 hectares located in the Consortium territory, we must pay more than 700 € per year but we are never able to irrigate"
10 Siracusa **Medium-size farm** "To pay fair tariffs, I have to irrigate during the night and on the weekend"
2 Palermo **Medium-size farm** "The quality of the service varies depending on the lot" "In Partinico, the Jato Irrigation Cooperative was an example of democratic water resource management. The water management was entrusted to a council directly elected by farmers. Today the cooperation among farmers is close to zero. The history tells that in given situations the water supply for irrigation was almost absent, inducing the collapse of the local economy!" "The required tariff is of euro per hectare. I refuse to pay on purpose, since the service does not exist" "In the past there was a good communication with the Irrigation Cooperative. There was also cooperation between farmers" "The revenue coming from the agriculture is not comparable to the efforts that a farmer has to suffer!" "When the lake is dry I have to rely only on the Consortium, which is often defaulting, you can never know when the water is going to be supply" **Small-size farm** "The only contact you get with the Consortium employees is the one at the moment of the registration for the irrigation season supply" "I get the water from the Consortium only when necessary, being the water from my well nearly always sufficient for the crops"
9 Catania **Big-size farm** "Costs are very high and the organization is terrible"

"There's not promptness in the water supply" **Medium-size farm** "According to the tariff we pay, we should have access to the water on a regular basis. Instead, there are always malfunctions or strikes of the operators" "The only interlocutor is the peripheral office in Sferro, but they never give precise and thorough answers" "The tariff is excessive. When there are prolonged service interruptions no compensation is provided" "In the districts where there is no private water supply and we must wait for the Consortium service, we are not always able to irrigate" "I can irrigate only thank to the well, since the Consortium does not guarantee anything anymore: barely one irrigation in a 5-months season. However, the payment of the whole amount of the service is required, as if it would provide the water for the entire summer. It's a shame" **Small-size farm** "Such a mediocre service"
Not served by the Consortium **Medium-size farm** "Plants have been adapted to dryland farming. They are irrigated by hand only for the first two years after seeding"
Total comments: 19

SECTION 3 – DATA ON PUBLIC IRRIGATION

Consortia; Water supply logic; Maintenance/State of public network; Communication; Service satisfaction degree; Comments

Table 3.1 Consortium of belonging

Consortium of belonging	Count	Percentage
9 Catania	21	30%
2 Palermo	16	23%
10 Siracusa	5	7%
3 Agrigento	5	7%
1 Trapani	3	4%
7 Caltagirone	1	1%
n.a.	2	3%
Not served by Consortium	17	24%
Total served by Consortia	**51**	**73%**

Table 3.2 Logic behind water supply

Logic behind public water supply	Count	% over the respondents served by Consortia
There is no clear logic	24	47%
Water is supplied following a list of reservations	10	20%
Water is supplied following a schedule planned at the outset of the irrigation season	10	20%
Water is supplied following the availability at the source	9	18%
Water is supplied upon request, following the plants' water needs	5	10%
Not known	4	8%

Table 3.2.1 Consortium of belonging and logic behind water supply

Consortium of belonging and logic behind public water supply	Count	% over the respondents served by Consortia
9 Catania	**21**	**41%**
There is no clear logic	8	
Water is supplied following a schedule planned at the outset of the irrigation season	3	
Water is supplied following a schedule planned at the outset of the irrigation season, Water is supplied following the availability at the source	3	
Water is supplied following the availability at the source	2	
Water is supplied following the availability at the source, There is no clear logic	2	
Water is supplied following a schedule planned at the outset of the irrigation season, Water is supplied following a list of reservations	1	
Water is supplied upon request, following the plants' water needs	1	
There is no clear logic, Water is supplied following the availability at the source	1	
2 Palermo	**16**	**31%**
There is no clear logic	7	
Not known	4	
Water is supplied following a list of reservations	2	
Water is supplied upon request, following the plants' water needs	2	
Water is supplied following a schedule planned at the outset of the irrigation season, Water is supplied upon request, following the plants' water needs	1	
10 Siracusa	**5**	**10%**
There is no clear logic	2	
Water is supplied following a schedule planned at the outset of the irrigation season	2	
Water is supplied following a list of reservations	1	
3 Agrigento	**5**	**10%**
There is no clear logic	2	
Water is supplied following a list of reservations	2	
Water is supplied upon request, following the plants' water needs, Water is supplied following a list of reservations	1	
1 Trapani	**3**	**6%**

There is no clear logic	1	
Water is supplied following a list of reservations	1	
Water is supplied following a list of reservations, Water is supplied following the availability at the source, There is no clear logic	1	
7 Caltagirone	**1**	**2%**
Water is supplied following a list of reservations, Water is supplied following the availability at the source	1	

Table 3.3 Maintenance of the public network

Maintenance state of the public water network	Count	% over the respondents served by Consortia
Absent	19	37%
Scarce	19	37%
Mediocre	8	16%
Good	4	8%
Perfect	1	2%

Table 3.3.1 Maintenance of the public network and Consortium of belonging

Maintenance of the public water network clustered by Consortia	Count	% over the respondents served by Consortia
Absent	**19**	**37%**
2 Palermo	7	
9 Catania	6	
10 Siracusa	3	
1 Trapani	2	
3 Agrigento	1	
Scarce	**19**	**37%**
9 Catania	10	
2 Palermo	6	
10 Siracusa	2	
3 Agrigento	1	
Mediocre	**8**	**16%**
9 Catania	3	
3 Agrigento	2	
1 Trapani	1	
2 Palermo	1	
7 Caltagirone	1	
Good	**4**	**8%**
2 Palermo	2	
3 Agrigento	1	
9 Catania	1	
Perfect	**1**	**2%**
9 Catania	1	

Table 3.4 Breakages report and Consortium of belonging

Presence of breakages (Yes/No) and types or causes, per Consortium of belonging	Count	% over the respondents served by Consortia
9 Catania	**21**	**41%**
No breakages	*2*	*10%*
Breakages:	*19*	*90%*
General damages to pipes	2	
Other: squandering (due to inadequate allocation)	1	
Breakages due to outdated pipes and lack of maintenance	11	
Other: Incomplete network	1	
n.s.	4	
2 Palermo	**16**	**31%**
No breakages	*1*	*6%*
Breakages:	*15*	*94%*
Breakages due to outdated pipes (material concrete-asbestos)	4	
General damages to pipes	3	
Breaks in the secondary network	1	
Frequent pipes' breaks, but fast reparation	1	
Frequent pipes' breaks, lacking reparation	1	
Other: squandering	1	
n.s.	4	
3 Agrigento	**5**	**10%**
Breakages:	*5*	*100%*
Breakages due to outdated pipes and lack of maintenance	3	
Breaks in the primary and secondary networks	1	
n.s.	1	
10 Siracusa	**5**	**10%**
Breakages:	*5*	*100%*
Fiberglass pipes exploded during the trial 25 years ago and never repaired	1	
Various localized losses	1	
General damages to pipes	3	
1 Trapani	**3**	**8%**
Breakages:	*3*	*100%*
Breakages due to outdated pipes and lack of maintenance	2	
Breakages due to elevated pressure within the pipes	1	
7 Caltagirone	**1**	**2%**
No breakages	*1*	*100%*

Table 3.5 Communication level between Consortium employees and farmers

Communication with Consortium employees	Count	Percentage
Not enough	**29**	**57%**
2 Palermo	10	
9 Catania	10	
10 Siracusa	5	
1 Trapani	3	
3 Agrigento	1	
Enough	**22**	**43%**
9 Catania	11	
2 Palermo	6	
3 Agrigento	4	
7 Caltagirone	1	

Table 3.6 Service satisfaction degree

Service satisfaction ranking	Count	Percentage
Absolutely no	**21**	**41%**
2 Palermo	8	
9 Catania	7	
10 Siracusa	4	
1 Trapani	2	
No	**13**	**25%**
9 Catania	6	
2 Palermo	5	
10 Siracusa	1	
Not served by Consortium	1	
On average	**12**	**24%**
9 Catania	8	
1 Trapani	1	
2 Palermo	1	
3 Agrigento	1	
7 Caltagirone	1	
Yes	**4**	**8%**
3 Agrigento	3	
2 Palermo	1	
Absolutely Yes	**1**	**2%**
2 Palermo	1	

Table 3.7 Comments

Comments on the Consortia
1 Trapani "It is longer than 20 years that they talk about reforming the operation of the Consortia, but everything keeps going bad"
10 Siracusa "Water has never been supplied"
2 Palermo "There is no real water supply" "Too much bureaucracy and too little service" "There must be a serious control" "You should be friend of the employees to benefit from the service" "My water need is ensured by a private well, only for exceptional case by the Consortium" "I've never understood the logic adopted for the water supply. Notwithstanding, I might have grasped that the strategy adopted with regard to the reparation of breakages is the closure of the irrigation unit in which the losses are present. I hope it is just a mistaken intuition!" "No strategies are considered to incentivize an efficient water consumptions according to the actual crops' needs; water is supplied following a reservation and in predetermined days (normally two or three per week)"
3 Agrigento "The local management is quite good. Unfortunately, the mechanical damages are not fixed due to lack of funds"
9 Catania "Regularly, one has to go to Sferrocavallo to notify breaks that are only fixed after months, and to ask information regarding the lacking water supply" "Is there enough communication with the Consortium operators? Yes, but only after many attempts. In addition, we receive a timetable for the water supply but often there is a lacking distribution. Therefore, they justify saying that there is no sufficient water at the source, but no compensation is given" "There are several breakages along the water network. Some pumping stations are not working, since the Consortium is debtor to the ENEL (energy company) for millions of euro. ENEL does not supply energy on credit and it imposes higher tariffs in case of lateness"
Total comments: 13

SECTION 4 – EXPERIENCE WITH WATER SCARCITY

Experience with water scarcity (Last event); Frequency; Causes (present and past); Socio-economic and environmental impacts; Adopted Measures; Problem ranking; Comments

Table 4.1 Experienced water unavailability

Experienced limited water availability	Count	Percentage
Yes	55	79%
No	12	17%
n.a.	3	4%

Table 4.1.1 Experienced water unavailability and Consortium of belonging

	Experienced limited water availability				
Consortium of belonging	Yes	No	n.a.	Count	Percentage
9 Catania	18	3	-	21	30%
2 Palermo	15	1	-	16	23%
3 Agrigento	4	1	-	5	7%
1 Trapani	3	-	-	3	4%
10 Siracusa	3	2	-	5	7%
7 Caltagirone	1	-	-	1	1%
Not Served by Consortium	9	5	3	17	24%
n.a.	2	-	-	2	3%
Grand total	**55**	**12**	**3**	**70**	**100%**

Table 4.2 Experienced water scarcity, last event

Last event	Count	Percentage
2017	1	2%
2016	30	55%
2015	2	4%
2013	2	4%
2012	1	2%
2011	1	2%
2008	1	2%
2007	1	2%
2003	1	2%
2000	1	2%
1996	1	2%
1992	1	2%
Not remembered	1	2%
n.s.	11	20%
Experienced water scarcity	**55**	**100%**

Table 4.2.1 Causes and period of last event

Experienced water scarcity and last period of occurrence	Count	Percentage
Lack of water during summer period	**6**	**11%**
2000	1	
2011	1	
2016	2	
2017	1	
n.s.	1	
Supply infrastructure breakages	**4**	**7%**
2016	4	
Consortium service disruption, Supply infrastructure breakages	**2**	**4%**
2016	2	
Consortium service disruption	**2**	**4%**
2016	1	
n.s.	1	

Water incorrectly managed, allocated to Palermo	**1**	**2%**
2016	1	
n.s.	**40**	**73%**
Experienced water scarcity	**55**	**100%**

Table 4.3 Recurring of water scarcity events

Frequency of water scarcity	Count	Percentage
Every year (irrigation season)	27	39%
Every time there is rain deficiency during winter	4	6%
Rare (not specified)	2	3%
Every 5 years	2	3%
Every 2 years	2	3%
Every 3 years	1	1%
Every 3-4 years	1	1%
Not known	1	1%
Not experienced	10	14%
n.a.	20	29%

Table 4.4 Frequency of water scarcity

Frequency of water scarcity	Count	Percentage
Temporary	28	40%
Permanent	26	37%
n.a.	16	23%

Table 4.4.1 Frequency of water scarcity event, Last event

Frequency of water scarcity	Count	Percentage
Permanent	**26**	**37%**
2016	19	
2013	1	
2008	1	
n.s.	4	
Not experienced	1	
Temporary	**28**	**40%**
2016	9	
2015	2	
2017	1	
2013	1	
2012	1	
2011	1	
2007	1	
2003	1	
2000	1	
1996	1	
1992	1	
n.s.	7	
Not experienced	1	
n.a.	**16**	**23%**

Table 4.4.2 Frequency of water scarcity events, Source of water supply

Frequency of water scarcity	Count	Percentage
Permanent	**26**	**37%**
Combination public-private supply	12	
Single public source (Consortium)	7	
Single private source	3	
Multiple private sources	2	
None	1	
n.a.	1	
Temporary	**28**	**40%**
Combination public-private supply	9	
Single public source (Consortium)	8	
Single private source	7	
Multiple private sources	4	
n.a.	**16**	**23%**

Table 4.5 Causes of water scarcity

Causes	Count	Percentage
Insufficient or badly maintained infrastructures	39	56%
Prolonged drought periods	35	50%
Problems mainly related to the management of the resource	30	43%
Overall waste of the water resource	23	33%
Limited natural availability of fresh water	14	20%
Ongoing climate change	11	16%
Priority of water use given to other uses (e.g. potable; hydropower; etc)	10	14%
Excessive salt water content	6	9%
Over-exploitation of the resource	3	4%
n.a.	4	6%

Table 4.6 Causes changes with respect to the past

Causes changes with respect to the past	Count	Percentage
Causes are now different	**12**	**17%**
Service has worsened	3	
Service has worsened, Ageing of supply infrastructures	1	
Service has worsened, Ageing of supply infrastructures, drop in economic resource	1	
Service has improved (active presence of personnel and more control on water thefts)	3	
Ageing of supply infrastructures	1	
Other: Anthropization, climate change, lobbies interests	1	
n.s.	2	
Causes are the same	**38**	**54%**
Not known	**15**	**21%**
n.a.	**5**	**7%**

Table 4.7 Socio-economic impacts of water scarcity

Socio-economic impacts	Count	Percentage
Loss of production	57	81%
Economic loss	53	76%
Conflicts for water access	19	27%
Increase in water prices	18	26%
Increase in unemployment	15	21%
Migration	12	17%
Impacts on animal and plant health	11	16%
Increase in food prices	7	10%
Impacts on human health	4	6%
Threat to food safety	2	3%
n.a.	3	4%

Table 4.8 Environmental impacts of water scarcity

Environmental impacts	Count	Percentage
Increase in soil aridity	46	66%
Drop in groundwater levels	29	41%
Draining of surface water bodies	20	29%
Loss of biodiversity	17	24%
Loss of natural habitats	12	17%
Deterioration of water quality state	10	14%
Increase in evapotranspiration	8	11%
Increase in temperatures	8	11%
n.a.	9	13%

Table 4.9 Actions undertaken to prevent water scarcity

Adopted preventive actions	Count	Percentage
Measures of water efficiency (e.g. drip irrigation)	35	50%
Rationalize water consumption	33	47%
Water harvesting (tanks; private small reservoirs)	30	43%
Change to less water demanding cultures	20	29%
Reuse of treated wastewater	2	3%
None	5	7%
n.a.	3	4%

Table 4.10 Problem seriousness ranking

Ranking of the problem	Count	Percentage
Very serious	23	33%
Serious	25	36%
Moderate/mild	13	19%
Not serious	5	7%
Absent	1	1%
n.a.	3	4%

Table 4.10.1 Perception of the problem and source of water supply

Perception of the problem, according to type of water supply source	Count	Percentage
Very serious	**23**	**33%**
Combination public-private supply	12	
Single public source (Consortium)	5	
Single private source	2	
None	2	
Multiple private sources	1	
n.a.	1	
Serious	**25**	**36%**
Single private source	9	
Combination public-private supply	8	
Single public source (Consortium)	7	
Multiple private sources	1	
Moderate/mild	**9**	**13%**
Combination public-private supply	5	
Single public source (Consortium)	4	
Single private source	2	
Multiple private sources	2	
Not serious	**5**	**7%**
Single private source	3	
Multiple private sources	1	
Single public source (Consortium)	1	
Absent	**1**	**1%**
Multiple private sources	1	
n.a.	**3**	**4%**

Table 4.11 Comments

Comments, listed according to the Consortium of belonging
1 Trapani "Since I bought the land within the Consortium area I never irrigated; the Baiata dam has never been checked for its maximum capacity and big water volumes are discharged to sea"
10 Siracusa "The last three years drought caused water scarcity in limited areas (Avola and Noto) where groundwater is very deep and water consumption is irrational, especially for horticulture"
2 Palermo "In the past, irrigation was not practiced for olive growing, expecting that olive trees are resistant to prolonged drought periods"
9 Catania "Water is put into the channels only in the late irrigation season (June/July)" "During the last 10 irrigation season, including the last one, I could irrigate only tank to the presence of the well" "The Catania Consortium experiences economic instability. It works with very scarce resources. I am afraid for the future water availability" "In the last 15 years lots of citrus groves have been abandoned with consequent migration of the farmers" "Water scarcity is a temporary problem, but it does not allow to plan a correct irrigation season"
Not served by Consortium "I have to buy water from water tanker trucks" "Although I never experienced the problem, I have undertaken actions to prevent a potential water scarcity. In case these phenomena would occur and considering the source of the water supply, water scarcity would be linked to prolonged drought periods and it could lead to a partial production loss and a consequent economic loss"
Total comments: 10

SECTION 5 – EXPERIENCE WITH DROUGHT

Experience with drought (Last event, duration, undertaken emergency measures); Frequency; Causes (present and past); Impacts; Early warning system; Problem ranking; Comments

Table 5.1 Last drought event

Last event	Count	Percentage
2017	3	4%
2016/2017	2	3%
2016	22	31%
2015/2016	3	4%
2015	6	9%
2014	3	4%
2013/2016	1	1%
2012/2017	1	1%
2009/2010	1	1%
2007	1	1%
2000/2003	1	1%
1996/2000	1	1%
1992,1996	1	1%
1990/1992	1	1%
Not known	2	3%
n.a.	21	30%

Table 5.2 Last drought duration

Duration	Count	Percentage
3 months (summer)	7	10%
4 months	6	9%
2 years	3	4%
2 months	3	4%
1 year	2	3%
4 years	2	3%
5 months	2	3%
6 months	2	3%
1 month	1	1%
10 months	1	1%
18 months	1	1%
2 months (July-August)	1	1%
2 months (May-June)	1	1%
3 years	1	1%
3 months	1	1%
3 months (Dec/Feb)	1	1%
3 months (winter)	1	1%
4 months (autumn)	1	1%
6 years	1	1%
6 months (April/Oct)	1	1%
8 months	1	1%
Not known	1	1%
n.s.	8	11%
n.a.	21	30%

Table 5.2.1 Last event, duration (most selected years)

Last event and duration	Count	Percentage
2017	**3**	**4%**
2 months	2	
n.s.	1	
2016/2017	**2**	**3%**
4 months	1	
n.s.	1	
2016	**22**	**31%**
1 year	1	
1 month	1	
18 months	1	
2 months	3	
3 months (summer)	6	
4 months	2	
5 months	1	
6 months	2	
n.s.	5	
2015/2016	**3**	**4%**
1 year	1	
3 months (December/February)	2	
2015	**6**	**9%**
10 months	1	
2 years	1	
3 months (summer)	1	
4 months	2	
8 months	1	

Table 5.3 Actions implemented to face the problem

Actions undertaken to face the problem	Count	Percentage
None	20	29%
Rationalization of water consumption	18	26%
Autonomous excavation of wells	9	13%
Autonomous excavation of wells, Rationalization of water consumption	6	9%
Extra water supply by tanker truck, Rationalization of water consumption	2	3%
None, Rationalization of water consumption	1	1%
Inter-connection between public irrigation networks, Rationalization of water consumption	1	1%
Inter-connection between public irrigation networks	1	1%
Extra water supply by tanker truck	1	1%
Autonomous excavation of wells, Rationalization of water consumption, Other: water purchase from neighbour's well	1	1%
Autonomous excavation of wells, Extra water supply by tanker truck, Rationalization of water consumption	1	1%
n.a.	9	12%

Table 5.3.1 Actions implemented to face the problem

Actions undertaken to face the problem (frequency of the answers)	Count	% over the respondents
None	21	30%
Rationalization of water consumption	30	43%
Autonomous excavation of wells	17	24%
Extra water supply by tanker truck	4	6%
Inter-connection between public irrigation networks	2	3%
Other: water purchase from neighbour's well	1	1%
n.a.	9	13%
Total ticked responses	83	

Table 5.4 Recurring of drought events

Frequency	Count	Percentage
Every year	12	17%
Every year (2-3 times)	1	1%
Every 2 years	2	3%
Every 3 years	2	3%
Every 4 years	1	1%
Every 5 years	2	3%
Every 5-6 years	1	1%
Every 15 years	2	3%
Not known	2	3%
n.a.	38	54%

Table 5.5 Frequency of drought events

Frequency	Count	Percentage
Permanent	32	46%
Temporary	28	40%
n.a.	10	14%

Table 5.6 Causes of drought

Causes of drought (frequency of the answers)	Count	% over the respondents
Prolonged lack of precipitation	61	87%
Ongoing climate change	32	46%
Overall waste of the water resource	28	40%
Intrinsic characteristic of Sicilian climate (endemic)	21	30%
Bad soil/land management	9	13%
Over-exploitation of the resource	7	10%
Atmospheric pollution	5	7%
Depends on soil characteristics (aridity)	4	6%
Over-allocation of the resource	1	1%
n.a.	3	4%
Total ticked responses	171	

Table 5.7 Causes changes with respect to the past

Causes changes with respect to the past	Count	Percentage
Causes are now different	**7**	**10%**
Management has worsened	3	
Climate change	1	
Climate change, Intensive agriculture has led to poorer soil quality	1	
n.s.	2	
Causes are the same	**37**	**53%**
Not known	**19**	**27%**
n.a.	**7**	**10%**

Table 5.8 Socio-economic impacts of drought

Socio-economic impacts	Count	% over the respondents
Loss of production	56	80%
Economic loss	52	74%
Increase in unemployment	18	26%
Increase in water prices	17	24%
Conflicts for water access	18	26%
Migration	12	17%
Impacts on animal and plant health	9	13%
Increase in food prices	5	7%
Threat to food safety	3	4%
Impacts on human health	3	4%
n.a.	7	10%
Total ticked responses	200	

Table 5.9 Environmental impacts of drought

Environmental impacts	Count	% over the respondents
Increase in soil aridity	43	61%
Drop in groundwater levels	25	36%
Draining of surface water bodies	23	33%
Increase in temperatures	17	24%
Increase in evapotranspiration	13	19%
Loss of biodiversity	13	19%
Loss of natural habitats	11	16%
Deterioration of water quality state	6	9%
n.a.	11	16%
Total ticked responses	162	

Table 5.10 Drought Early Warning System and service provider

Drought Early Warning System and service provider	Count	Percentage
Service existing, provided by	**10**	**14%**
Provided by:		
Region Sicily - Water Observatory	2	
Region Sicily - SIAS (regional agro-meteorological service)	2	
Region Sicily	2	
Region Sicily or Consortium	1	
n.s.	3	
Service not existing	**53**	**76%**
n.a.	**7**	**10%**

Table 5.11 Actions undertaken to prevent a potential future drought

Actions undertaken to prevent the problem in the future	Count	% over the respondents
Water harvesting (tanks; private small reservoirs)	25	36%
Measures of water efficiency (e.g. drip irrigation)	22	31%
Change to less water demanding cultures	22	31%
Other: change to permaculture	1	1%
None	9	13%
n.a.	8	11%
Total ticked responses	87	

Table 5.12.1 Preparedness to face a new potential drought, Farm size

	Preparedness to face a new potential drought		
Farm size	**Well-equipped**	**Not well-equipped**	**n.a.**
Big	7	15	1
Medium	7	25	3
Small	4	7	1
Grand total	**18**	**47**	**5**

Table 5.12.2 Preparedness to face a new potential drought, Age categories

	Preparedness to face a new potential drought		
Age categories	**Well-equipped**	**Not well-equipped**	**n.a.**
Less than 35	4	12	2
35-44	3	8	2
45-54	3	17	-
55-64	6	2	-
More than 65	2	8	1
Grand total	**18**	**47**	**5**

Table 5.12.3 Preparedness to face a new potential drought, Source of water supply

	Preparedness to face a new potential drought		
Source of water supply	**Well-equipped**	**Not well-equipped**	**n.a.**
Combination public-private supply	6	19	-
Single public source (Consortium)	-	16	1
Single private source	7	7	3
Multiple private sources	4	2	1
None	1	2	-
n.a.	-	1	-
Grand total	**18**	**47**	**5**

Table 5.13 Problem seriousness ranking, farmers age and farm size

Perception of the problem,	**Farm size**				
Farmers' age	**Big**	**Medium**	**Small**	**Count**	**Percentage**
Very serious				**22**	**31%**
Less than 35	1	3	-	4	
35-44	-	1	-	1	
45-54	6	3	-	9	
55-64	2	-	2	4	
More than 65	2	1	1	4	
Serious				**26**	**37%**
Less than 35	1	4	2	7	
35-44	3	3	1	7	
45-54	1	4	2	7	
55-64	-	1	-	1	
More than 65	-	3	1	4	
Moderate/mild				**4**	**6%**
Less than 35	3	2	-	5	
35-44	1	-	-	1	
45-54	-	3	1	4	
55-64	1	1	-	2	
More than 65	1	2	-	3	
Not serious				**5**	**7%**
Less than 35	-	1	-	1	
35-44	-	2	1	3	
55-64	-	-	1	1	
n.a.				**2**	**3%**

Table 5.14 Comments

Comments
"The Consortia are not efficient at all concerning the water resources management"
"My water supply source is dependent on the precipitation input, therefore water scarcity issues are directly related to drought periods"
"The drought problem has no immediate solutions. It requires a multi-years planning both at farm-level (e.g. creation of a new small-reservoir) and at the larger scale of the water system (e.g. complete piping of the public water network)" (AN: part of the water network is still made of open channels)
"The lack of management and the fact that small farmers are abandoned to their destiny are the main problems. Here we are forgotten"
"If a drought occurs in the winter, then we have water scarcity during summer"
"The squandering of the water resource at the Consortium level is the main problem"
"It is essential to rationalize the water supply and reduce the losses along the pipes"
Total comments: 7

SUBSECTION I: WATER SCARCITY AND DROUGHT, LINK AND DEFINITIONS

Table 5.a Link between water scarcity and drought phenomena

Water scarcity and drought phenomena are linked	Count	Percentage
Yes	51	73%
No	9	13%
Not known	3	4%
n.a.	7	10%

Table 5.b. Definitions of water scarcity and drought phenomena

Definition of water scarcity	Definition of drought
1. Aridity	Aridity
2. Lack of infrastructures	Lack of precipitation
3. Poor allocation by water managing authorities and tariff to excessive compared to the supplied volumes	Persistent lack of water linked to the increase in temperature, that leads to an emergency supply from artesian wells with poor water quality
4. Lack of water due to human causes	Due to natural causes
5. Condition in which the water demand exceeds the water resources availability	Temporary drop in the water availability due to climatic causes
6. Difficulty in supplying water	Lack of precipitation
7. Dependent on socio-political factors	"Will of God" (AN: referring to the aleatory character of the climate)
8. Impossibility to irrigate	Prolonged lack of precipitation
9. Unavailability of water to irrigate in the required periods	Precipitation under the yearly average
10. Insufficient amount of water for crops	Dry period due to absent precipitation
11. Insufficient water availability	Lack of precipitation
12. Insufficient total water availability	Prolonged lack of precipitation
13. Insufficient water allocation to the fields, together with poor management and operation of the water network (case specific)	Period characterized by a lack of precipitation
14. Private interests of the ones who manage the water resources	It does not exist
15. Insufficient resources	Water deficit, insufficient to aquifer replenishment
16. Water scarcity is a temporary deficit in the balance between the available water resources and the demand for human use	Drought is a temporary event in which precipitations are smaller compared the normal value for the area of interest
17. Lack of water during the demanding periods, ostensibly caused by bad management of the reservoirs	Lack of water resources caused by the actual thermo-pluvial trend
18. Limited water availability	Lack of precipitation
19. Lack of water due to drought periods, priority to other uses and bad resource management	Lack of precipitation
20. Lack of water resource for irrigation purposes	Lack of precipitation
21. Lack of water needed to satisfy the demands	Anomalous period of lack of precipitation
22. Lack of water	Lack of water
23. Lack of water due to scarce precipitation	…the consequence of scarce precipitation: since the air humidity drops, the soil moisture increasingly decreases with it
24. Lack of water resources availability	Lack of precipitation
25. Lack of precipitation…	…for a prolonged period
26. Lack of water resource	Climate problems
27. Lack of sufficient quantity	Lack or unavailability of water resources
28. Lack of a good quality product	Lack of production
29. Lack or insufficient water resources	Lack or insufficient precipitation
30. Permanent lack of water also for emergency	Absolute lack of water, which jeopardize the

irrigation	agricultural productive cycle
31. Little quantity of water, but of a good quality	Absence of water
32. Insufficient water availability compared to the crops' need	Prolonged lack of precipitation
33. Lack of water availability for irrigation purposes	Lack of precipitation
34. Lack of water resources availability	Total absence of water during crops' growing season
35. Scarce water supply	Lack of precipitation
36. Lack of water quantity	Prolonged lack of precipitation
37. Water scarcity occurs when the water demand exceeds the available resources, natural or artificial	Drought is a smaller water availability in a given period
Total answers: 37 (53%) Not given answers: 21 (30%)[62]	

SUBSECTION II: MAIN WATER-RELATED PROBLEM IN AGRICULTURE IN SICILY

Table 5.d Main issue related to water resource in agriculture

Main issue related to water resource in agriculture (frequency of the answers)	**Count**	**% over the respondents**
Missing infrastructures or bad maintenance	23	33%
Lack of a proper management of the water resource	20	29%
Frequent drought periods	10	14%
Lack of communication and coordination between users and responsible managing authorities	6	9%
Natural scarcity of fresh water	4	6%
Lack of communication and cooperation among farmers	1	1%
Lack of information among users	1	1%
n.a.	8	11%
Total ticked responses	73	

[62] Questions 5b and 5b, asking for definitions of water scarcity and drought, were included in the questionnaire after the first 12 responses.

SECTION 6 – FINANCIAL AND ADMINISTRATIVE INSTRUMENTS

Subsidies and funding; Rural Development Programme participation; Incentives for water efficient use; Other instruments; Main hindrances to water saving measures' implementation; Drought insurance; Agricultural Employment support; Awareness: EU budget and policies, info on climate change mitigation programs; Comments

Table 6.1 Subsidies/funding receiving, Farm size

Farm size	Subsidies	No subsidies	n.a	Count
Big	20	3	-	23
Medium	14	20	1	35
Small	1	11	-	12
Grand total	**35**	**34**	**1**	**70**

Table 6.1.1 Subsidies/funding receiving, Age categories

Farm size	Subsidies	No subsidies	n.a	Count
Less than 35	9	8	1	18
35-44	6	7	-	13
45-54	11	9	-	20
55-64	4	4	-	8
More than 65	5	6	-	11
Grand total	**35**	**34**	**1**	70

Table 6.1.2 Subsidies/funding receiving, Education

Education	Subsidies	No subsidies	n.a	Count	Percentage
Elementary school	2	-	-	2	3%
Secondary school	-	3	-	3	4%
High-school diploma	6	13	-	19	27%
University degree	25	13	1	39	56%
n.a.	2	5	-	7	10%
Grand total	**35**	**34**	**1**	**70**	**100%**

Table 6.1.3 Subsidies/funding receiving, Provinces

Province	Subsidies	No subsidies	n.a.	Count	Percentage
Catania	12	8	-	20	29%
Palermo	9	14	1	24	34%
Trapani	6	1	-	7	10%
Siracusa	3	3	-	6	9%
Agrigento	2	2	-	4	6%
Enna	2	3	-	5	7%
Messina	1	-	-	1	1%
n.a.	-	2	-	2	3%
Ragusa	-	1	-	1	1%
Grand total	**35**	**34**	**1**	**70**	**100%**

Table 6.1.4 Subsidies/funding receiving, Crops production

Crops	Subsidies	No subsidies	n.a.	Total count
Monoculture	13	18	-	31
Polyculture	22	16	1	39

Table 6.1.5 Subsidies/funding receiving, Crops production

Type of crop	Subsidies	No subsidies	n.a.	Subsidies	No subsidies	n.a.	Total count
Open-field horticulture	6	8	-	43%	57%	-	14
Fruit and citrus farming	19	21	1	46%	51%	2%	41
Olive growing	20	14	1	57%	40%	3%	35
Arable crops	17	7	1	68%	28%	4%	25
Viticulture	9	5	-	64%	36%	-	14
Greenhouses horticulture	-	5	-	-	100%	-	5

Table 6.1.6 Subsidies/funding receiving, Crops destination

Market destination	Subsidies	No subsidies	n.a.	Subsidies	No subsidies	n.a.	Total count
Local market	20	15	1	55%	42%	3%	36
National market	18	18	1	49%	49%	2%	37
International market	8	3	-	73%	27%	-	11
Direct sale to friends and acquaintances	6	9	1	38%	56%	6%	16
Other: sale to retailers	3	1	-	75%	25%	-	4

Table 6.1.7 Subsidies/funding receiving, Information level on climate change adaptation strategies

Information level on climate change adaptation strategies	Subsidies	No subsidies	Total count
Enough	1	3	4
Not enough	32	28	60

Table 6.1.8 Subsidies/funding receiving, Communication level with water managing authorities

Communication level	Subsidies	No subsidies	n.a.	Total count
Good	2	6	-	8
Not good	24	25	1	50

Table 6.1.9 Subsidies/funding receiving, Optimism towards future of agricultural sector

Optimism for future of agricultural sector	Subsidies	No subsidies	Total count
Yes	17	9	26
No	18	25	43

Table 6.1.10 Subsidies/funding receiving, Optimism towards young generation

Optimism towards young generation	Subsidies	No subsidies	Total count
Yes	22	20	42
No	13	14	27

Table 6.1.11 Subsidies/funding type[2]

Type of subsidy/funding	Count	Percentage
No subsidies or funding received	**34**	**49%**
Subsidies from CAP	**23**	**33%**
specified:		
Direct Payment	20	29%
Biologic Reward	3	4%
Funding from RDP	**8**	**12%**
specified:		
Biologic agriculture	4	5%
Agri-environment payments	1	1%
Direct Payment CAP & Funding from RDP	**3**	**4%**
n.s.	**1**	**1%**
n.a.	**1**	**1%**

Table 6.2 RDP participation

RDP participation	Count	Percentage
Yes	32	46%
No	37	53%
n.a.	1	1%

Table 6.2.1 Participation to RDP, Farm size

Farm size	RDP participation	No participation	n.a.	Total count
Big	17	6	-	23
Medium	15	19	1	35
Small	-	12	-	12

Table 6.2.2 Participation to RDP, Age

	RDP participation		No participation		n.a.		
Age	Part time	Full time	Part time	Full time	Part time	Full time	Total count
Less than 35	3	3	9	2	1	-	18
35-44	3	5	3	2	-	-	13
45-54	6	7	4	3	-	-	20
55-64	1	2	5		-	-	8
More than 65	1	1	2	7	-	-	11
Total	**14**	**18**	**23**	**14**	**1**	**-**	**70**

Table 6.2.3 Participation to RDP, Measures

Application to RDP invitations to tender and related measure	Count	Percentage
Never applied	**37**	**53%**
Yes, applied for measures[64]:	**32**	**46%**
4.1	4	
11	1	
11.2.1	1	
11 and 8.1	1	
112	2	
121	10	
121.3.a	1	
121 and 4.1	1	
121 and 214	1	
124	1	
214	2	
311	1	
421	1	
Other: 23 years ago, for a new irrigation system	1	
n.s.	4	
n.a.	**1**	**1%**

[2] Respondents reported "Agea" as type of subsidies. Agea is the 'Paying Agency for Agriculture in Sicily'. It is entrusted with the distribution of subsidies under the CAP (pillar I, II). Under the basic rules for financial management of the CAP, the EC is responsible for the management of the EAGF and the EAFRD. However, the Commission itself normally does not make payments to beneficiaries. According to the principle of 'shared management', this task is delegated to the Member States, who themselves work through national or regional paying agencies (in this case Agea).
Source: EC website/Agriculture/CAP funding

[3] Measures: 4.1. Investments in agricultural holdings; 8.1. Afforestation and creation of woodland; 11. Organic farming; 112. Setting up of new farmers; 121. Modernisation of agricultural holdings; 124. Cooperation for development of new products, processes and technologies in the agriculture and food sector; 214. Agri-environment payments; 311. Diversification into non-agricultural activities; 421. Implementing Cooperation Projects.

Table 6.2.4 Applied RDP measures, Age

Applied RDP measures, per age	Count	Percentage
Less than 35	**18**	**26%**
4.1	1	
112	1	
121	2	
121, 4.1	1	
124	1	
Never applied	11	
n.a.	1	
35-44	**13**	**19%**
4.1	1	
121	1	
121, 214	1	
121.3.a	1	
214	1	
421	1	
Other: Measure (1990s) 23 years ago, for a new irrigation system	1	
Never applied	5	
n.s.	1	
45-54	**20**	**29%**
4.1	2	
11, 8.1	1	
11	1	
112	1	
121	5	
214	1	
Never applied	7	
n.s.	2	
55-64	**8**	**11%**
11.2.1	1	
121	1	
Never applied	5	
n.s.	1	
More than 65	**11**	**16%**
121	1	
311	1	
Never applied	9	

Table 6.2.5 Participation to RDP, Crops production

Crops	RDP participation	No participation	n.a.	Total count
Monoculture	8	23	-	31
Polyculture	24	14	1	39

Table 6.2.6 Participation to RDP, Crops type production

Type of crop	RDP application		No application		n.a.		Total	
	Count	%	Count	%	Count	%	Count	%
Open-field horticulture	6	43%	8	57%	-	-	14	20%
Fruit and citrus farming	17	42%	23	56%	1	2%	41	59%
Olive growing	16	66%	8	31%	1	3%	35	50%
Arable crops	17	64%	7	32%	1	4%	25	36%
Viticulture	9	64%	5	36%	-	-	14	20%
Greenhouses horticulture	2	40%	3	60%	-	-	5	7%

Table 6.2.7 Participation to RDP, Crops destination

Market destination	RDP participation	No participation	n.a.	Total count
Local market	17	18	1	36
National market	22	14	1	37
International market	9	2	-	11
Direct sale to friends and acquaintances	5	10	1	16
Other: sale to retailers	1	3	-	4

Table 6.2.8 Participation to RDP by sellers to international market, Farm size, Applied measures

RDP measure application among farmers who sell to international market	Count	%
Farmers selling to international market	**9**	**100%**
Big-size farm	**6**	**67%**
Fruit and citrus farming; Measure 121.3.a	1	
Fruit and citrus farming, Olive growing, Arable crops; Measure 121	2	
Olive growing, Viticulture; Measure 121	1	
Viticulture; Measure 421	1	
n.s.	1	
Medium-size farm	**3**	**33%**
Fruit and citrus farming, Olive growing; Measure 124, Measure (1990s)	2	
Greenhouses horticulture; Measure 121	1	

Table 6.2.9 Participation to RDP, Information level on climate change adaptation strategies

Information level on climate change adaptation strategies	RDP participation	No participation	Total count
Enough	1	3	4
Not enough	29	31	60

Table 6.2.10 Participation to RDP, Communication level with water managing authorities

Communication level	RDP participation	No participation	n.a.	Total count
Good	2	6	-	8
Not good	22	27	1	50

Table 6.2.11 Participation to RDP, Optimism towards future of agricultural sector

Optimism for future of agricultural sector	RDP participation	No participation	Total count
Yes	15	11	26
No	17	26	43

Table 6.2.12 Participation to RDP, Optimism towards young generation

Optimism towards young generations	RDP participation	No participation	Total count
Yes	22	20	42
No	10	17	27

Table 6.3 Available incentives for resource-efficient use

Available incentives for resource-efficient use	Count	Percentage
Yes	**14**	**20%**
RDP	7	
RDP (Measure 214) and (Measure 4.1)	2	
Other: not correctly informed, probably funds for reconstruction of reservoirs and for realization of high-efficiency systems	1	
Other: For the creation of rainwater harvesting ponds	1	
n.s.	3	
No incentives available	**50**	**71%**
Not known	**1**	**1%**
n.a.	**5**	**7%**

Table 6.4 Other available instruments to support water efficiency in agriculture

Other instrument to support a water efficient use in agriculture	Count	Percentage
Other instruments are present	**8**	**11%**
Banks	1	
PO-FESR	1	
Privatising the Consortia (water management service)	1	
RDP	3	
Private resources	1	
n.s.	1	
No other instruments known	**56**	**80%**
n.a.	**6**	**9%**

Table 6.5 Main obstacles for the implementation of water saving measures

Main obstacles for the implementation of water saving measures (frequency of the answers)	Count	% over the respondents
Lack of planning by responsible authorities	37	53%
Administrative	35	50%
Economic	33	47%
Scarce inclination of farmers to adopt changes in the traditional practices	22	31%
Technical	17	24%
Lobbies interests	11	16%
Other: scarce information, lack of education programs for farmers	2	3%
n.a.	5	7%
Total ticked responses	162	

Table 6.6 Drought insurance application, Farm size

Farm size	Insured	Not insured	n.a.	Count	Percentage
Big-size farm	2	21		23	33%
Medium-size farm	3	31	1	35	50%
Small-size farm	-	12		12	17%
Grand total	**5**	**64**	**1**	**70**	**100%**

Table 6.6.1 Drought insurance applicants (5) and characteristics

Farm size, Age	Count	Province	Education	Occupation	Farmed crops	Sale	Irrigated area (ha)	Source of water
Medium farms	**3**							
45-54	1	Palermo	University degree	Part time farmer	Open-field horticulture, Fruit and citrus farming, Olive growing	Local market, Direct sales	11	Single private source
55-64	1	Catania	University degree	Full time farmer	Fruit and citrus farming	National market	4	Single private source
More than 65	1	Catania	Primary school	Full time farmer	Fruit and citrus farming	Local market	n.a.	Single public source (Consortium)
Big farms	**2**							
45-54	2	Catania	High school diploma	Full time farmer	Fruit and citrus farming, Olive growing	Local market, National market	40	Combination public-private supply
					Open-field horticulture, Fruit and citrus farming, Olive growing, Arable crops	National market	100	Multiple private sources

Table 6.7 Awareness on the EU budget available for climate change adaptation objectives, Farm size

Awareness on EU budget intended for climate change adaptation objectives	Count	Percentage
Yes	**20**	**29%**
Big farm	8	
Medium	9	
Small farm	3	
No	**48**	**69%**
n.a.	**2**	**3%**

Table 6.8 Applications to funding programme with climate change adaptation objectives

Application to funding programmes for climate change adaptation objectives	Count	Percentage
Yes	**13**	**19%**
Big farm	**6**	
Less than 35	1	
35-44	2	
45-54	3	
Medium	**5**	
Less than 35	1	
35-44	1	
45-54	3	
Small farm	**2**	
45-54	2	
No	**53**	**76%**
n.a.	**4**	**6%**

Table 6.8.1 Awareness on EU budget for climate change related actions and related applications

Awareness on budget for CC objectives and applications to funding programmes	Farm size			Count	Percentage
	Big	Medium	Small		
Taken into account for funding application	**6**	**5**	**2**	**13**	**19%**
Not aware of EU budget for CC	2	1	1	4	6%
Aware	4	4	1	9	13%
Not taken into account for funding application	**15**	**28**	**10**	**53**	**76%**
Not aware of EU budget for CC	11	23	8	42	60%
Aware	4	5	2	11	16%
n.a.	**2**	**2**	**-**	**4**	**6%**
Grand total	**23**	**35**	**12**	**70**	**100%**

Table 6.9 Availability of information on water related-measures to adapt to climate change

Is there enough information available on water-related measures to adapt to climate change?	Count	Percentage
Yes	**4**	**6%**
Less than 35, Medium-size farm	2	
45-54, Medium-size farm	1	
More than 65, Small size farm	1	
No	**60**	**86%**
n.a.	**6**	**9%**

Table 6.9.1 Availability of information on water related-measures to adapt to climate change, Crops production

Farm size	CC information level			Count	Percentage
	Not enough	Good	n.a		
Monoculture	25	3	3	31	44%
Polyculture	35	1	3	39	56%
Grand total	**60**	**4**	**6**	**70**	**100%**

Table 6.10 Awareness on water scarcity and drought policies, Age categories, Farm size

Do you know the COM(2007)414 and the 2012 review?	Count	Percentage
Yes	**7**	**10%**
Less than 35	**3**	
Medium	2	
Small	1	
45-54	**3**	
Big	1	
Medium	1	
Small	1	
More than 65	**1**	
Small	1	
No	**58**	**83%**
n.a.	**5**	**7%**

Table 6.11 Regional policy support, Age categories, Farm size

Regional policy supports the agricultural employment	Count	Percentage
Yes	**2**	**3%**
Less than 35, Big-size farm	1	
35-44, Big-size farm	1	
No	**67**	**96%**
n.a.	**1**	**1%**

Table 6.12 European policy support, Age categories, Farm size

European policy supports the agricultural employment	Farm size			Count	Percentage
	Big	Medium	Small		
Yes				**17**	**24%**
Less than 35	3	4	-	7	
35-44	1	-	-	1	
45-54	2	3	2	7	
55-64	-	-	1	1	
More than 65	-	1	-	1	
No				**51**	**73%**
Less than 35	2	5	2	9	
35-44	4	6	2	12	
45-54	5	7	1	13	
55-64	3	2	2	7	
More than 65	3	5	2	10	
Not known				**1**	**1%**
n.a.				**1**	**2%**

Table 6.13 Comments

Comments
"I have applied for the measure 4.1 for the current year 2017. Rankings are not ready yet"
"There are RDP measures available to change or install a new irrigation system. However, the administration procedures require more effort than to pay by yourself for it"
"Regional policies do not sufficiently support the agricultural employment: the return to the EC of several million of euro, available for different measures of the RDP2007-13, is the proof"
Total comments: 3

SECTION 7 – FUTURE EXPECTATIONS

Frequency of future events; Reliability on current water source; Measures to cope with water scarcity; Future investments; Tariff; Optimism toward agricultural future; Trust in future generation; Comments

Table 7.1 Future frequency of water scarcity events

Future frequency of water scarcity events	Count	Percentage
Less frequent	2	3%
No change	14	20%
More frequent	52	74%
n.a.	2	3%

Table 7.1.2 Future frequency of drought events

Future frequency of drought events	Count	Percentage
Less frequent	1	1%
No change	10	14%
More frequent	56	80%
n.a.	3	4%

Table 7.1.3 Future frequency of water scarcity events, Definition of water scarcity

Future frequency of water scarcity events	Water scarcity definition	Count	Percentage
Less frequent		**2**	**13%**
	"Water scarcity occurs when the water demand exceeds the available resources, natural or artificial"	1	
	n.a.	1	
No change		**14**	**88%**
	"Dependent on socio-political factors"	1	
	"Lack of water during the demanding periods, ostensibly caused by bad management of the reservoirs"	1	
	"Lack or insufficient water resources"	1	
	"Little quantity of water, but of a good quality"	1	
	"Poor allocation by water managing authorities and tariff to excessive compared to the supplied volumes"	1	
	"Scarce water supply"	1	
	n.a.	8	
Grand Total		**16**	**100%**

Table 7.1.4 Future frequency of drought events, Definition of drought

Future frequency of drought events	Drought definition	Count	Percentage
Less frequent		**1**	**9%**
	n.a.	1	
No change		**10**	**91%**
	"Absence of water"	1	
	"Due to natural causes"	1	
	"Lack or insufficient precipitation"	1	
	"Persistent lack of water linked to the increase in temperature, that leads to an emergency supply from artesian wells with poor water quality"	1	
	n.a.	6	
Grand Total		**11**	**100%**

Table 7.1.5 Future frequency of water scarcity events, Source of water supply

Future frequency of water scarcity events	Source of water supply	Count	Percentage
Less frequent		**2**	**13%**
	Multiple private sources	1	
	Single public source (Consortium)	1	
No change		**14**	**88%**
	Combination public-private supply	5	
	Multiple private sources	2	
	None	1	
	Single private source	3	
	Single public source (Consortium)	3	
Grand Total		**16**	**100%**

Table 7.1.5 Future frequency of drought events, Source of water supply

Future frequency of drought events	Source of water supply	Count	Percentage
Less frequent		**1**	**9%**
	Single public source (Consortium)	1	
No change		**10**	**91%**
	Combination public-private supply	4	
	Multiple private sources	1	
	None	1	
	Single private source	4	
Grand Total		**11**	**100%**

Table 7.1.6 Future frequency of water scarcity events, Ability/inability to irrigate

Future frequency of water scarcity events	Ability/inability to irrigate	Count	Percentage
Less frequent		**2**	**13%**
	Able	2	
No change		**14**	**88%**
	Able	8	
	Unable	5	
	n.a.	1	
Grand Total		**16**	**100%**

Table 7.1.7 Future frequency of drought events, Ability/inability to irrigate

Future frequency of drought events	Ability/inability to irrigate	Count	Percentage
Less frequent		**1**	**9%**
	Able	1	
No change		**10**	**91%**
	Able	7	
	Unable	2	
	n.a.	1	
Grand Total		**11**	**100%**

Table 7.1.8 Future frequency of water scarcity events, Reliability on current water source

Future frequency of water scarcity events	Reliability on current water supply	Count	Percentage
Less frequent		**2**	**13%**
	No	2	
No change		**14**	**88%**
	No	2	
	Yes	11	
	n.a.	1	
Grand Total		**16**	**100%**

Table 7.1.9 Future frequency of drought events, Reliability on current water source

Future frequency of drought events	Reliability on current water supply	Count	Percentage
Less frequent		**1**	**9%**
	No	1	
No change		**10**	**91%**
	Yes	9	
	n.a.	1	
Grand Total		**11**	**100%**

Table 7.1.10 Future frequency of water scarcity events, Optimism towards future of agriculture

Future frequency of water scarcity events	Optimism towards future of agriculture sector	Count	Percentage
Less frequent		**2**	**13%**
	No	2	
No change		**14**	**88%**
	No	8	
	Yes	6	
Grand Total		**16**	**100%**

Table 7.1.11 Future frequency of drought events, Optimism towards future of agriculture sector

Future frequency of drought events	Optimism towards future of agriculture sector	Count	Percentage
Less frequent		**1**	**9%**
	No	1	
No change		**10**	**91%**
	No	4	
	Yes	6	
Grand Total		**11**	**100%**

Table 7.2 Reliability on current water source, Future frequency of water scarcity events

	Water scarcity events in the future				
Reliability on current water source	**Less frequent**	**No change**	**More frequent**	**n.a.**	**Total**
Yes	-	11	31	-	42
No	2	2	20	1	25
n.a.	-	1	1	1	3
Grand Total	**2**	**14**	**52**	**2**	**70**

Table 7.2.1 Reliability on current water source, Future frequency of drought events

	Drought events in the future				
Reliability on current water source	**Less frequent**	**No change**	**More frequent**	**n.a.**	**Total**
Yes	-	9	31	2	42
No	1	-	24	-	25
n.a.	-	1	1	1	3
Grand Total	**1**	**10**	**56**	**3**	**70**

Table 7.2.2 Reliability on current water source, Source of water supply

	Reliability on current water source for the future			
Current water supply source	**No**	**Yes**	**n.a**	**Total**
Combination public-private supply	9	15	-	24
Single public source (Consortium)	10	7	-	17
Single private source	2	14	1	17
Multiple private sources	2	6	-	8
None	1	-	2	3
n.a.	1	-	-	1
Grand Total	**25**	**42**	**3**	**70**

Table 7.3 Measures needed to face water scarcity in agriculture

Measures necessary to face water scarcity in agriculture: (frequency of the answers)	Count	% over the respondents
Increase the implementation of water efficient measures for irrigation	42	60%
Guarantee a proper, reliable and equitable water supply	36	51%
Improve technical skills of farmers and managing authorities	34	49%
Increase transparency on the management of water for irrigation	32	46%
Reuse treated wastewater for irrigation purposes	28	40%
Improve the monitoring system and the collection of data regarding availability, demand and use of the water resource.	22	31%
Improve the dialogue among the responsible bodies and the farmers	22	31%
Change attitude among the institutions and the managing authorities	19	27%
Set incentive prices on the water consumption	13	19%
Make water consumption policies more restrictive	8	11%
n.a.	3	4%
Total ticked responses	259	

Table 7.4 Future investments objectives

Future investments should be directed to (frequency of the answers)	Coui	% over the respondents
To modernize the existing infrastructures	49	70%
To create new water infrastructures	43	61%
To foster the research on climate and technical innovation	34	49%
To promote the farmers' participation in educational and scientific innovation events	25	36%
For the institutional reconstruction of the water managing authorities	22	31%
n.a.	3	4%
Total ticked responses	176	

Table 7.5 Willingness to pay a potential (new/higher) tariff, Age categories

Willingness to pay a water tariff	Count	Percentage
Yes	**40**	**57%**
Less than 35	13	
35-44	6	
45-54	12	
55-64	6	
More than 65	3	
No	**25**	**36%**
Less than 35	3	
35-44	6	
45-54	8	
55-64	1	
More than 65	7	
n.a.	**5**	**7%**

Table 7.5.1 Willingness to pay a potential (new/higher) tariff, Farm size

	Farm size				
Willingness to pay a water tariff	Big	Medium	Small	Count	Percentage
Yes	12	20	8	**40**	**57%**
No	9	13	3	**25**	**36%**
n.a.	2	2	1	**5**	**7%**
Grand Total	**23**	**35**	**12**	**70**	**100%**

Table 7.6 Optimism towards future of agricultural sector

Optimism towards the future of agricultural sector	Count	Percentage
Yes	26	37%
No	43	61%
n.a.	1	1%

Table 7.6.1 Optimism towards future of agricultural sector, Age categories
Add percentages

	Optimism toward future of agriculture			
Age group	Yes	No	n.a.	Count
Less than 35	9	8	1	18
35-44	7	6	-	13
45-54	6	14	-	20
55-64	3	5	-	8
More than 65	1	10	-	11
Total	**26**	**43**	**1**	**70**

Table 7.6.2 Optimism towards future of agricultural sector, Education

	Optimism toward future of agriculture			
Education	Yes	No	n.a.	Count
Elementary school	-	2	-	2
Secondary school	-	3	-	3
High-school diploma	9	10	-	19
University degree	16	22	1	39
n.a.	1	6	-	7
Total	**26**	**43**	**1**	**70**

Table 7.6.3 Optimism towards future of agricultural sector, Farm size

	Optimism toward future of agriculture			
Farm size	Yes	No	n.a.	Count
Big-size farm	10	13	-	23
Medium-size farm	11	23	1	35
Small-size farm	5	7	-	12
Grand Total	**26**	**43**	**1**	**70**

Table 7.6.4 Optimism towards future of agricultural sector, Occupation

	Optimism toward future of agriculture			
Employment	Yes	No	n.a.	Count
Full-time	12	20	-	32
Part-time	14	23	1	38
Grand Total	**26**	**43**	**1**	**70**

Table 7.6.5 Optimism towards future of agricultural sector, Type of farmed crops

	Optimism toward future of agriculture							% over the
Crops	No	%	Yes	%	n.a.	%	Count	respondents
Monoculture	19	59%	12	38%	1	3%	32	46%
Polyculture	24	63%	14	37%	-	-	38	54%
Open field horticulture	11	79%	3	21%	-	-	14	20%
Viticulture	10	71%	4	29%	-	-	14	20%
Fruit and citrus	24	60%	16	40%	-	-	40	57%
Olive growing	20	57%	14	40%	1	3%	35	50%
Arable crops	12	50%	12	50%	-	-	24	34%
Greenhouses horticulture	3	60%	2	40%	-	-	5	7%

Table 7.6.6 Optimism towards future of agricultural sector, Crops destination

Market	Optimism toward future of agriculture No	%	Yes	%	n.a.	%	Count	Percentage
Local market	23	64%	12	33%	1	3%	36	51%
National market	20	54%	16	43%	1	3%	37	53%
International market	4	36%	7	64%	-	-	11	16%
Direct sales	9	56%	6	38%	1	6%	16	23%
Other	3	75%	1	25%	-	-	4	6%

Table 7.6.7 Optimism towards future of agricultural sector, Subsidies/funding receiving

Subsidies/funding receiving	Optimism toward future of agriculture Yes	No	n.a.	Count
Yes	17	18	-	35
No	9	25	-	34
n.a.	-	-	1	1
Grand Total	**26**	**43**	**1**	**70**

Table 7.6.8 Optimism towards future of agricultural sector, Type of received subsidies

Type of subsidies	Optimism toward future of agriculture Yes	No	n.a.	Count	% over the respondents
CAP	10	13	-	23	33%
CAP, RDP	1	2	-	3	4%
RDP	6	2	-	8	11%
No subsidies received	9	25	-	34	49%
n.s.	-	1	-	1	1%
n.a.	-	-	1	1	1%
Grand Total	**26**	**43**	**1**	**70**	**100%**

Table 7.6.9 Optimism towards future of agricultural sector, Regional policy support

Regional policy support	Optimism toward future of agriculture Yes	No	n.a.	Count	% over the respondents
Yes	2	-	-	2	3%
No	24	43	-	67	96%
n.a.	-	-	1	1	1%
Grand Total	**26**	**43**	**1**	**70**	**199%**

Table 7.6.10 Optimism towards future of agricultural sector, European policy support

European policy support	Optimism toward future of agriculture Yes	No	n.a.	Count	% over the respondents
Yes	10	7	-	17	24%
No	16	35	-	51	73%
Not known	-	1	-	1	1%
n.a.	-	-	1	1	1%
Grand Total	**26**	**43**	**1**	**70**	**100%**

Table 7.6.11 Optimism towards future of agricultural sector, Climate change adaptation budget awareness

Awareness on European budget for climate change	Optimism toward future of agriculture Yes	No	n.a.	Count	% over the respondents
Yes	10	10	-	20	29%
No	16	32	-	48	69%
n.a.	-	1	1	2	2%
Grand Total	**26**	**43**	**1**	**70**	**100%**

Table 7.6.12 Optimism towards future of agricultural sector, Reliability on current water source

Reliability on current water source	Optimism toward future of agriculture			Count	% over the respondents
	Yes	No	n.a.		
Yes	19	23	-	42	60%
No	5	20	-	25	36%
n.a.	2	-	1	3	4%
Grand Total	**26**	**43**	**1**	**70**	**100%**

Table 7.7 Optimism towards new generations, Age categories

Age group	Optimism toward new generations			Count
	Yes	No	n.a.	
Less than 35	12	5	1	18
35-44	12	1	-	13
45-54	10	10	-	20
55-64	4	4	-	8
More than 65	4	7	-	11
Total	**42**	**27**	**1**	**70**

Table 7.7.1 Optimism towards new generations, Education

Education	Optimism toward new generation			Count
	Yes	No	n.a.	
Elementary school	-	2	-	2
Secondary school	1	2	-	3
High-school diploma	12	7	-	19
University degree	25	13	1	39
n.a.	4	3	-	7
Total	**42**	**27**	**1**	**70**

Table 7.7.2 Optimism towards new generations, Occupation

Employment	Optimism toward new generations			Count
	Yes	No	n.a.	
Full-time	17	15	-	32
Part-time	25	12	1	38
Grand Total	**42**	**27**	**1**	**70**

Table 7.7.3 Optimism towards new generations, Farm size

Farm size	Optimism toward new generations			Count
	Yes	No	n.a.	
Big-size farm	13	10	-	23
Medium-size farm	23	11	1	35
Small-size farm	6	6	-	12
Grand Total	**42**	**27**	**1**	**70**

Table 7.7.4 Optimism towards new generations, Type of farmed crops

Crops	Optimism toward new generations						Count	% over the respondents
	No	%	Yes	%	n.a.	%		
Monoculture	13	42%	18	58%	-	-	31	46%
Polyculture	14	36%	24	62%	1	3%	39	54%
Open field horticulture	9	64%	5	36%	-	-	14	20%
Viticulture	6	43%	8	57%	-	-	14	20%
Fruit and citrus	14	34%	26	63%	1	3%	41	59%
Olive growing	10	29%	24	69%	1	2%	35	50%
Arable crops	9	38%	15	62%	-	-	24	34%
Greenhouses horticulture	4	80%	1	20%	-	-	5	7%

Table 7.7.5 Optimism towards new generations, Crops destination

	Optimism toward new generations							
Market	**No**	**%**	**Yes**	**%**	**n.a.**	**%**	**Count**	**Percentage**
Local market	18	50%	17	47%	1	3%	36	51%
National market	12	32%	24	65%	1	3%	37	53%
International market	2	18%	9	82%	-	-	11	16%
Direct sales	5	31%	10	63%	1	6%	16	23%
Other	1	25%	3	75%	-	-	4	6%

Table 7.7.6 Optimism towards new generations, Type of received subsidies

	Optimism toward new generations				
Type of subsidies	**Yes**	**No**	**n.a.**	**Count**	**% over the respondents**
CAP	13	10	-	23	33%
CAP, RDP	2	1	-	3	4%
RDP	7	1	-	8	11%
No subsidies received	20	14	-	34	49%
n.s.	-	1	-	1	1%
n.a.	-	-	1	1	1%
Grand Total	**42**	**27**	**1**	**70**	**100%**

Table 7.7.8 Optimism towards new generations, Regional policy support

Regional policy support	Optimism toward new generations				
	Yes	**No**	**n.a.**	**Count**	**% over the respondents**
Yes	2	-	-	2	3%
No	40	27	-	67	96%
n.a.	-	-	1	1	1%
Grand Total	**42**	**27**	**1**	**70**	**199%**

Table 7.7.10 Optimism towards new generations, European policy support

European policy support	Optimism toward new generations				
	Yes	**No**	**n.a.**	**Count**	**% over the respondents**
Yes	14	3	-	17	24%
No	27	24	-	51	73%
Not known	1	-	-	1	1%
n.a.	-	-	1	1	1%
Grand Total	**42**	**27**	**1**	**70**	**100%**

Table 7.7.11 Optimism towards new generations, Climate change adaptation budget awareness

Awareness on European budget for climate change	Optimism toward new generations				
	Yes	**No**	**n.a.**	**Count**	**% over the respondents**
Yes	14	6	-	20	29%
No	27	21	-	48	69%
n.a.	1	-	1	2	2%
Grand Total	**42**	**27**	**1**	**70**	**100%**

Table 7.7.12 Optimism towards new generations, Reliability on current water source

Reliability on current water source	Optimism toward new generations				
	Yes	**No**	**n.a.**	**Count**	**% over the respondents**
Yes	27	15	-	42	60%
No	13	12	-	25	36%
n.a.	2	-	1	3	4%
Grand Total	**42**	**27**	**1**	**70**	**100%**

3.4. WS-D definitions analysis

Analysis of the answers to Subsection I of the questionnaire.
This section reports the analysis carried out to assess the definitions given for water scarcity and drought events by the questionnaire respondents, specifically to question 5.b and 5.c, in order to investigate on the presence of shared perceptions.

First, the agreed definitions for water scarcity and drought by the European Commission (EC, 2007)[65] and FAO (2012)[66] are considered. Such definitions are assigned to codes and then compared to the answers given by the respondents. When the answers match with the agreed definitions, the same codes are applied. Finally, recurring perceptions on water scarcity and drought phenomena are highlighted and discussed.

Definitions of water scarcity
Water scarcity is defined by the EC as "long-term water imbalances, combining low water availability with a level of water demand exceeding the supply capacity of the natural system", and it occurs where there are insufficient water resources to satisfy long-term average requirements.
FAO[2] gives the general definition as "an excess of water demand over available supply". More exhaustively, it describes it as an "imbalance between supply and demand of freshwater in a specified territorial domain, as a result of a high rate of demand compared with available supply, under prevailing institutional arrangements (both resource 'pricing' and retail charging arrangements) and infrastructural conditions". This definition explicitly includes causes related to the human interference with the water cycle. The FAO report acknowledges water scarcity as to be functional to natural hydrological variability, but more so "to prevailing economic policy, planning and management approaches and the capacity of societies to anticipate changing levels of supply or demand". It identifies three dimensions of water scarcity, depending on the physical water availability, the level of infrastructures and the institutional capacity. These three dimensions are reported in Table IV and are used for the analysis of the answers from the respondents, assigned to codes 1 to 3. Key words are italicized.
Code '1' includes the definition used by the EC, as well as the general definition and the first of the three dimensions of water scarcity given by FAO.

Table IV. Water scarcity definitions used in the analysis of the questionnaire answers and corresponding codes

Agreed definitions of water scarcity:	By:	CODE
- Long-term water *imbalances*, combining low water availability with a level of water *demand* exceeding the *supply* capacity of the natural system,	EC	
- Scarcity in availability of water of acceptable *quality* with respect to aggregated *demand*, in the simple case of *physical water shortage*;	FAO	1
- More generally: excess of water *demand* over available *supply*	FAO	
- Scarcity due to lack of adequate *infrastructure*, irrespective of the level of water resources, because of financial, technical or other constraints	FAO	2
- Scarcity in access to water services, because of the failure of *institutions* (including legal rights) in place to ensure reliable, secure and equitable supply of water to users	FAO	3

Definitions of drought
Many drought definitions can be found in the literature, referring to a rain deficit over different time periods, to measured impacts such as water level drop in reservoirs and aquifers, loss in crops production, etc. The EC gives an overall definition of drought as a "temporary decrease of the average water availability due to e.g. rainfall deficiency". It specifies that drought can occur in both high and low rainfall areas and in any seasons. It also acknowledges that "drought impacts are increased when it occurs in a region with low or poorly managed water resources, resulting in imbalances between water demands and the supply capacity of the natural system", introducing a link between water scarcity and drought phenomena.

[65] Water Scarcity and Droughts, Second Interim report (June 2007). DG Environment, European Commission http://ec.europa.eu/environment/water/quantity/about.htm
[66] FAO, 2012. Coping with water scarcity. An action framework for agriculture and food security. ISBN 978-92-5-107304-9. Available at: http://www.fao.org/docrep/016/i3015e/i3015e.pdf

FAO[67] gives the definition of drought as "an extended period - a season, a year, or several years - of deficient precipitation compared to the statistical multi-year average for a region that results in water shortage for some activity, group, or environmental sector". More specifically, a drought can be defined according to meteorological, agricultural, hydrological, and socio-economic criteria. Such definitions are used for the present analysis and reported in Table V, with the corresponding assigned codes. In this case, the EC definition is assigned to the same code as for meteorological drought (A).

Table V, Drought definitions used in the analysis of the questionnaire answers and corresponding codes

Agreed definitions of drought:	**By:**	**CODE**
- *Temporary* decrease of the average *water availability* due to e.g. *rainfall* deficiency. - *Meteorological drought* is a measure of the departure of *precipitation* from long-term normal in a given area.	EC FAO	A
- *Agricultural drought* refers to situations where the amount of *soil moisture* is no longer sufficient to meet the needs of a particular *crop* at a particular time. This case is typically evident after meteorological drought but before a hydrological drought.	FAO	B
- *Hydrological drought* occurs when *surface and subsurface water* supplies are deficient	FAO	C
- *Socioeconomic drought* occurs when physical water shortages (reduced precipitation and related water availability) begin to affect *human activities*[68]	FAO	D

Analysis: Codes assignment

The definitions given by the respondents are compared to the agreed definitions reported in Tables IV and V. When the questionnaire responses match with one or more of the agreed definitions, the same code is assigned.

Other two codes are used in the following cases:

- Code 'G', general: the given definition is very general, e.g. "lack of water"; no clear difference is seen in the identification of water scarcity and drought events;
- Code 'O', other: a different definition, other than the ones reported in the tables, is used.

The assigned codes for each answer are reported in Table VI below.

In the next section, the codes frequency and the recurring couples of codes for the two phenomena are analysed and discussed.

[67] http://www.fao.org/docrep/017/aq191e/aq191e.pdf; NDMC, 2008; UNISDR (reference)

[68] This form of drought associates human activities with elements of meteorological, agricultural, and hydrological drought.

Table VI. Questionnaire answers and assigned codes

	Definition of water scarcity	Code	Definition of drought	Code
1.	Aridity	O	Aridity	O
2.	Lack of infrastructures	2	Lack of precipitation	A
3.	Poor allocation by water managing authorities and tariff to excessive compared to the supplied volumes	3	Persistent lack of water linked to the increase in temperature, that leads to an emergency supply from artesian wells with poor water quality	O
4.	Lack of water due to human causes	1	Due to natural causes	A
5.	Condition in which the water demand exceeds the water resources availability	1	Temporary drop in the water availability due to climatic causes	A
6.	Difficulty in supplying water	3	Lack of precipitation	A
7.	Dependent on socio-political factors	3	"Will of God"	O
8.	Impossibility to irrigate	1	Prolonged lack of precipitation	A
9.	Unavailability of water to irrigate in the required periods	1	Precipitation under the yearly average	A
10.	Insufficient amount of water for crops	1	Dry period due to absent precipitation	A
11.	Insufficient water availability	G	Lack of precipitation	A
12.	Insufficient total water availability	G	Prolonged lack of precipitation	A
13.	Insufficient water allocation to the fields, together with poor management and operation of the water network (case specific)	3	Period characterized by a lack of precipitation	A
14.	Private interests of the ones who manage the water resources	3	It does not exist	O
15.	Insufficient resources	G	Water deficit, insufficient to aquifer replenishment	C
16.	Water scarcity is a temporary deficit in the balance between the available water resources and the demand for human use	1	Drought is a temporary event in which precipitations are smaller compared the normal value for the area of interest	A
17.	Lack of water during the demanding periods, ostensibly caused by bad management of the reservoirs	3	Lack of water resources caused by the actual thermo-pluvial trend	A
18.	Limited water availability	G	Lack of precipitation	A
19.	Lack of water due to drought periods, priority to other uses and bad resource management	3	Lack of precipitation	A
20.	Lack of water resource for irrigation purposes	1	Lack of precipitation	A
21.	Lack of water needed to satisfy the demands	1	Anomalous period of lack of precipitation	A
22.	Lack of water	G	Lack of water	G
23.	Lack of water due to scarce precipitation	A	…the consequence of scarce precipitation: since the air humidity drops, the soil moisture increasingly decreases with it	B
24.	Lack of water resources availability	G	Lack of precipitation	A
25.	Lack of precipitation…	A	…for a prolonged period	A
26.	Lack of water resource	G	Climate problems	G
27.	Lack of sufficient quantity	G	Lack or unavailability of water resources	G
28.	Lack of a good quality product	O	Lack of production	O
29.	Lack or insufficient water resources	G	Lack or insufficient precipitation	A
30.	Permanent lack of water also for emergency irrigation	G	Absolute lack of water, which jeopardize the agricultural productive cycle	G
31.	Little quantity of water, but of a good quality	O	Absence of water	G
32.	Insufficient water availability compared to the crops' need	1	Prolonged lack of precipitation	A
33.	Lack of water availability for irrigation purposes	1	Lack of precipitation	A
34.	Lack of water resources availability	G	Total absence of water during crops' growing season	G
35.	Scarce water supply	3	Lack of precipitation	A
36.	Lack of water quantity	G	Prolonged lack of precipitation	A
37.	Water scarcity occurs when the water demand exceeds the available resources, natural or artificial	1	Drought is a smaller water availability in a given period	A
	Total answers: 37 (53%); Not given answers: 21 (30%)[69]			

[69] Questions 5a and 5b in the questionnaire, asking for the present definitions, were added after the first 12 responses.

Responses analysis and discussion:

The respondents' definitions for water scarcity and drought are multi-faced and their interpretation may be very broad. They are compared to the agreed definitions by means of key words and the concepts contained in the latter. For specific cases, codes are assigned with the following logic:

- Code '1' is given when the respondents identifies the lack of water referring to a specific purpose, e.g. irrigation, which represents the water demand.
- Code 'A' is assigned when the respondents refer to lack or prolonged lack of precipitation, acknowledging the climate component stated in the agreed definitions under Code A.
- Code 'G', as above introduced, is used for general answers, in which the respondents do not refer to any type of demand (in the case of water scarcity definition) or climatic variable (for drought), neither to causes. General answers are e.g. 'lack of water resources' or 'lack of water availability', 'climate problems'.

Combination of codes that would match the agreed definitions by the EC and FAO both for water scarcity and drought are represented by the coupling of code 1, 2 or 3 for water scarcity with code A, B, C or D for drought.
Tables VII, VIII and IX below report the frequency of each code for both definitions, and the resulting combinations.

In total, 37 farmers gave definitions, amounting to 53% of the respondents to the questionnaire. A first classification shows that the majority of the respondents (54%) gave a definition for water scarcity in line with the agreed ones (1, 2 or 3). The remaining part either acknowledges water scarcity as a general lack of water (G, 11%), equivalent to drought (A, 5%), or it gives another definition (O, 11%). As for drought, almost two thirds of the respondents (73%) identify it with one of the agreed definitions (A, B or C), while the remaining give either a general definition (G, 11%) or others (O, 16%).

Looking at the combinations of the codes, three main groups are identified:

- Group 1: Interpretations of both water scarcity and drought acceptably conform to the agreed definitions by the EC and FAO. This group is made up by the codes combinations 1-A, 2-A, 3-A; it amounts to 46% of the given responses.
- Group 2: No significant difference is seen in the perception of water scarcity and drought. Codes combinations for this group are A-A, A-B, G-A, G-B, G-C, amounting to 27% of the given answers. Also, the codes combination G-G can be included to this group, corresponding to general definitions with no specific description of domains or causes. This case accounts for 8% of the responses, leading to 35% the total count for group 2.
- Group 3: It consists of codes combination including other definitions (O), far differing from the agreed ones. Combinations are: 3-O, O-G, O-O. This group amount to 19% of the given answers.

Diverse respondents' variables are analysed to represent the groups. As shown in Table X, farm size (as well as the other general details of the respondents – tables are omitted to restrict the number of pages) is not significantly characterizing the identified groups.
More interesting features are reported in Tables XI, XII and XIII.
For all the groups, the majority acknowledges a link between water scarcity and drought.
As far as concerns the source of water supply, the majority of Group 1 (59%) is served by the public network. This fact concretely introduces the human component in the water supply and availability issues, leading the respondents to distinguish water scarcity as to be a social construct while drought climate-determined. To the contrary, who is served by private sources from the natural water cycle (aquifer, rivers, rain-fed ponds) has more difficulty recognizing the different phenomena. This is the case for Group 2, in which the 46% is only supplied by private sources. In addition, 3 of the 5 respondents that rely on both public and private water supply, reported in the comments to use only their private source (well), increasing to 69% the group of respondents that rely only on the private source and don't fully perceive the difference between water scarcity and drought phenomena.

Table VII. Frequency of codes for water scarcity

Water scarcity codes	Count	Percentage
1	11	30%
2	1	3%
A	2	5%
G	11	30%
3	8	22%
O	4	11%
Total answers	**37**	**100%**

Table VIII. Frequency of codes for drought

Drought codes	Count	Percentage
A	24	65%
B	2	5%
C	1	3%
G	4	11%
O	6	16%
Total answers	**37**	**100%**

Table IX. Frequency of codes couples for water scarcity and drought definitions

Combination water scarcity – drought codes	Count	Percentage
1 – A	11	30%
2 – A	1	3%
A – A	1	3%
A – B	1	3%
G – A	6	16%
G – B	1	3%
G – C	1	3%
G – G	3	8%
3 – A	5	14%
3 – O	3	8%
O – G	1	3%
O – O	3	8%
Total answers	**37**	**100%**

Table X. Codes combination and farm size (not really characterizing)

Codes combination	Big	Medium	Small	Total Count	Percentage
1 – A	4	6	1	**11**	**30%**
2 – A	-	-	1	**1**	**3%**
3 – A	1	3	1	**5**	**14%**
A – A	-	1	-	**1**	**3%**
A – B	1	-	-	**1**	**3%**
G – A	1	4	1	**6**	**16%**
G – B	1	-	-	**1**	**3%**
G – C	-	-	1	**1**	**3%**
G – G	-	3	-	**3**	**8%**
3 – O	1	2	-	**3**	**8%**
O – G	-	-	1	**1**	**3%**
O – O	3	-	-	**3**	**8%**
Total answers	**12**	**19**	**6**	**37**	**100%**

Table XI. Link between water scarcity and drought events:

	Link between water scarcity and drought				
Codes combination	**Yes**	**No**	**Not known**	**Count**	**Percentage**
1 – A	8	3	-	11	30%
2 – A	1	-	-	1	3%
3 – A	3	1	1	5	14%
Total Group 1	12	4	1	**17**	**46%**
A – A	1	-	-	1	3%
A – B	1	-	-	1	3%
G – A	5	1	-	6	16%
G – B	1	-	-	1	3%
G – C	1	-	-	1	3%
G – G	1	1	1	3	8%
Total Group 2	10	2	1	**13**	**35%**
3 – O	2	1	-	3	8%
O – G	1	-	-	1	3%
O – O	3	-	-	3	8%
Total Group 3	6	1	-	**7**	**19%**
Total answers	**28**	**7**	**2**	**37**	**100%**

Table XII. Codes combination and source of water supply

Codes combination and source of water supply	Count	Percentage
1 – A	**11**	**30%**
Single private source	3	
Single public source (Consortium)	3	
Combination public-private supply	2	
Multiple private sources	2	
n.a.	1	
2 – A	**1**	**3%**
None	1	
3 – A	**5**	**14%**
Single public source (Consortium)	3	
Combination public-private supply	2	
A – A	**1**	**3%**
Combination public-private supply	1	
A – B	**1**	**3%**
Combination public-private supply	1	
G – A	**6**	**16%**
Combination public-private supply	2	
Single private source	2	
Multiple private sources	1	
Single public source (Consortium)	1	
G – B	**1**	**3%**
None	1	
G – C	**1**	**3%**
Single private source	1	
G – G	**3**	**8%**
Single private source	2	
Combination public-private supply	1	
3 – O	**3**	**8%**
Combination public-private supply	2	
Single public source (Consortium)	1	
O – G	**1**	**3%**
Multiple private sources	1	
O – O	**3**	**8%**
Single private source	2	
Combination public-private supply	1	
Total answers	**37**	**100%**

Table XIII. Codes combination and source of water supply clustered per group

Codes combination and source of water supply	Count	Percentage
Group 1	**17**	**46%**
Single public source (Consortium)	6	
Combination public-private supply	4	
Single private source	3	
Multiple private sources	2	
None	1	
n.a.	1	
Group 2	**13**	**35%**
Combination public-private supply	5	
Single private source	5	
Multiple private sources	1	
Single public source (Consortium)	1	
None	1	
Group 3	**7**	**19%**
Combination public-private supply	3	
Single private source	2	
Multiple private sources	1	
Single public source (Consortium)	1	
Total answers	**37**	**100%**

3.5. Interviews with farmers: guide and transcripts

The interviews with farmers followed a semi-structured format, articulated in different themes retracing the questionnaire sections. The main aims of these interviews were to deepen knowledge on the agricultural background and its issues, especially related to the water resources, and to improve the questionnaire form. Thus, conversations have been led with flexibility, to allow the addition of other relevant matters to the questionnaire and following interviews.

In total, six farmers were interviewed. The interview guide is summarized below (Figure b.), divided into 5 major themes with the most relevant probed information. Probing questions are highlighted in each interview transcript.

Figure b. Farmers' interview guide

Interview Guide, Farmers

Presentation and introduction of the research

Theme 1. General details
Age; Education; Province; Farm size; Crops production and destination

Theme 2. Data on irrigation/public irrigation
Irrigation techniques; Source of water supply; Water metering; Public water supply operation; Perceptions

Theme 3. Experience with water scarcity and drought
Experience with limited water availability; Causes and impacts; Drought occurrence; Early warning systems; Adaptation measures; Main water related problem

Theme 4. Administrative/Financial instruments
Subsidies; Funding; Incentives; Water and climate programs; Regional and European policies

Theme 5. Future expectations and changes
Water scarcity and drought events in the future; Strategies to cope with water scarcity and drought; Opinions on future agriculture

Concluding & Thank

Interview transcripts

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Annex IV. Other stakeholders

This Annex presents the main themes that have emerged from the interviews. In total, excluding the six interviews with farmers that are reported and discussed in Annex III, 28 people have been involved in 20 interviews among public and private institutions at local, regional and international level. The stakeholders are defined according to their category of belonging (public/private sector; research; regulation; etc.) in Annex II*, Stakeholders description.* Table XIV below shows the interviewees category, role and expertise. Moreover, the attendance to three events on the theme of water resources management allowed to gather additional relevant information, in particular from speeches of stakeholders that were more difficult to reach, e.g. National Ministries officers; Assessors of Regional Departments. The events are presented later in this Annex in Section 4.3 *Events;* the most interesting speeches are transcribed and reported in the same section.

Findings from the events are integrated to those of the interviews, to present a more comprehensive picture of the interaction between different levels, local to regional, national and international. Thus, the next Section 4.1. *Themes* clusters and discusses the recurring topics that have emerged.

Table XIV. Actors' categories, role and expertise

Category	Group/Organization/Institution	Interviewees: role and expertise
Public; research and education	University of Palermo Faculty of Agriculture, Food and Forestry Sciences	Associate professor, specialized in water resources management, irrigation and drainage, agrarian economy
	University of Palermo Faculty of Civil, Environmental, Aerospace and Materials Engineering	- Researcher in the field of water policy and water resources management, draft of RBMP; - Associate professor of water resources management, ex director of various public-private consultancies and member of the Experts Committee of the Ministry of the Environment, active in the field of water policies; - Associate professor specialized in water infrastructures, hydrological and meteorological analysis.
	University of Catania, Faculty of Civil Engineering and Architecture	Professor from the hydrology section, fellow of the European Drought Centre and the European Water Resources Association
Public; research and consultancy	Inter-University National Consortium for Atmosphere and Hydrosphere Physics (CINFAI) Agricultural and Agrarian Economy Research Council (CREA)	Researcher in the field of drought monitoring and meteorological analysis Researcher on the field of agriculture; tools and methods for the integration of policies for water resources protection
Public; water resources regulation and planning; monitoring activity; water supply service	Region Sicily; Regional Department of Energy and Services for Public Utility; Department of Water and Waste: - Service 1: Management and Implementation of the Integrated Water Management - Service 2: Water Observatory - Service 3: Planning and Regulation of Water Uses - Service 4: Management of water infrastructures	- S1: Officer from the board of directors; - S2: Two officers, decision makers in the Palermo headquarters. - S3: Officer from the Operative Unit 2, 'Planning of the water resources in Sicily - S4: Engineer from the operative unit 2 'Territorial coordination of West Sicily', responsible for the operation, monitoring and maintenance of the reservoirs systems
Public; regulations and planning in the agricultural sector	Region Sicily; Regional Department of Agriculture, Rural Development and Mediterranean Fisheries – Department of Agriculture: Service 5	- Officer from Operative Unit 5: Territorial assessment and management of the risks in agriculture, SIAS (Sicilian Agro-meteorological Information System). - Officer from Operative Unit 6: Territorial Informational Systems, Cartography, Broadband connection spread in agriculture
	Service 11 'Inspectorate of Agriculture of Palermo', Operative Unit 16: Municipal office for the agriculture in the district of Partinico	- Officer and agronomist
	Regional Department of Agriculture, Rural Development and Mediterranean Fisheries – Department of Agriculture of Rural and Territorial Development	- Director of the former Department of the Infrastructural Works for Agriculture; ex-special commissioner of the former Agricultural Development Agency (ESA) now winding up, and of various Reclamation Consortia
Public sector; water resources planning and supply; monitoring	Reclamation Consortium of Palermo and Catania – Land Reclamation Authorities	- In Palermo, Employee and agronomist of the land estate registry was interviewed. - In Catania, Appointed agronomist for the irrigation network and Engineer responsible for the infrastructures operation.
Public-private; water supply	Siciliacque Jsc	Responsible engineer for the monitoring of the systems operation
Public sector; Water policy	European Commission DG Environment (DG ENV)	Policy officer works at Unit C1 – Clean Water; groundwater, environmental indicators, water scarcity and drought issues.
Climate policy	European Commission DG Climate (DG CLIMA)	Two policy officers from Units A3 – Adaptation Unit; mainstreaming climate change adaptation strategy among the different policy areas
Agricultural policy	European Commission DG Agriculture (DG AGRI)	
Water users	Farmers & Agronomist	Six farmers from small, medium and big farms; An agronomist

4.1. Themes

In total 20 interviews were carried out, excluding the interviews with farmers. Speeches of other influential people are recorded during attended events and coded together with the interviews. Themes that have emerged from the interviews' analysis are here reported, gathering the shared opinions and the contrasting ones, to reconstruct the territorial situation and the stakeholders points of view. The statements provided in each section don't want to give a fixed interpretation of the reality, they rather represent the summary of the interviews findings. Table XV summarizes the number of interviews per each category of stakeholders. Number of mentions for each theme and sub-theme is reported in Table XVI. Additionally, themes are ordered to retrace the structure of the questionnaire to farmers (see Annex III).

Table XV. Categories of interviewees

Category	**Interviewees' organization/institution**	**# of interviews per category (+ speakers during attended events)**
Researchers	CINFAI; CREA; UNIPA	3
Professors	UNIPA; UNICT	4
Regional departments (RG) officers	Department of Water and Waste	3 (+2 speakers during events #1 and #2)
	Department for Agriculture	3 (+2 speakers during event #3)
Reclamation Consortia employees	Reclamation Consortia of Catania and Palermo	2
EC policy officers	DG ENV; DG CLIMA; DG AGRI	3
Consultants	Private agronomist; Water supply company (Engineering companies)	2 (+3 speakers during events #1 and #2)
National ministries (NM) officers	MATTM; MIT	(2 speakers during event #1 and #2)
Farmworkers trade unionist (TU)	CGIL-FLAI	(2 speakers during event #3)
Farmers association (FA) representative	CIA Sicilia	(1 speaker during event #3)
Citizens representatives	Activist	(1 speaker during event #1)

Table XVI. Themes and sub-themes emerged from the interviews analysis

Theme	**Subtheme**	**# of interviewees and speakers mentioning the subtheme and their category**										
		Total	Professors	Researchers	Regional officers	Consortia employees	National Ministries officers	EC officers	Farmworkers trade unionists	Farmers representatives	Consultants	Citizens representatives
		6	4	3	10	2	2	3	2	1	5	1
1. Farms characteristics & farmers habits	Fragmentation of land ownership and land abandonment	6	2	-	2	1	-	-	1	-	-	-
	Little cooperation among farmers	4	2	-	1	1	-	-	-	-	-	-
	Private water supply and illegal behaviours	7	1	1	2	2	-	-	1	-	-	-
	Excessive irrigation	3	1	2	-	-	-	-	-	-	-	-
	Soil conditions affecting water consumptions	4	-	1	1	-	-	2	-	-	-	-
	Lack of awareness	5	1	-	1	-	-	2	1	-	-	-
2. Reclamation Consortia	Reforming administration	14	2	1	6	2	-	-	2	1	-	-
	Poor management of water resources	8	1	-	5	2	-	-	-	-	-	-
3. Regional administration	Missing District Authority and lack of planning	22	4	3	5	2	2	1	2	-	2	1
	Hindered data sharing and heterogeneous dataset	9	1	1	2	-	1	3	-	-	1	-
4. Water Scarcity and Drought	Definition of water scarcity	13	4	2	4	2	-	-	-	-	1	-
	Definition of drought	12	3	3	4	1	-	1	-	-	1	-
	Climate change perception	5	2	-	-	1	-	2	-	-	-	-
	WS-D management strategies	24	4	2	7	2	1	2	1	-	5	-
	Insurance against drought	7	-	2	2	1	-	2	-	-	-	-
	Water reuse	7	1	2	3	-	-	1	-	-	-	-
5. Policies	Policies and practice, gaps	11	3	2	2	1	-	3	-	-	-	-
	Participation process	8	1	2	-	1	1	3	-	-	-	-
	Addressing water quantity issues in environmental law	6	1	1	2	-	-	2	-	-	-	-
6. Financial Instruments	National funding	11	3	1	3	2	1	2	1	-	-	-
	European funding	11	1	2	2	2	-	3	-	-	1	-
	EU budget for climate change-related objectives	5	-	1	1	-	1	2	-	-	-	-
	Ex-ante conditionality: a. Monitoring water volumes in agriculture	11	1	2	4	1	-	3	-	-	-	-
	b. Tariff for water consumption and environmental costs	10	2	2	3	1	-	1	-	-	1	-

Theme 1. Farms characteristics & farmers habits

Fragmentation of land ownerships and land abandonment (number of mentions: 5)

As reported by a researcher of agrarian economy, the 'fragmentation of land ownerships' is that phenomenon consisting on the fractioning of an estate in individual units. Such units are so small that they are not capable to form an autonomous business and provide the full time farmer with sufficient income for him and his family subsistence. The resulting holdings are often too little remunerative. This situation is acknowledged by many interviewees: researchers, Regional Departments' officers and Consortium's employees, who state the difficulty of identifying the owners of the different plots.

The fractioning of the land is a consequence last-century agrarian reform, which parcelled the latifundium and successively reassigned the portions to former farmhands. The today's resulting small farms have generally fewer resources, compared to medium and big farms, to sell to big markets, as this would entail taking part to the production chain: buying packages, renting warehouses, labelling, transports, etc. In other words, it is more difficult for small farms to sustain competitiveness.

This, summed to an ongoing market crisis, reduced profits and high costs especially related to energy consumption, are pointed as causes of land abandonment. The agriculture is considered disadvantaged and the interest of young people for the farming activity is dropping. Combined to land abandonment, migration phenomenon is reported.

As a consequence, small farming holdings are gradually decreasing, while the number and the extension of big farms are enlarging. This feature is also reported by the Istat statistics for the last decades (see Annex III). Big farming business are also supported by the Rural Development Programme, being easier for them to access to funding for improving the production chain, modernizing the farms, etc. (see eligibility criteria Table III, Annex III, Section 3.1; further discussed below in Theme 4)

Little cooperation among farmers

Little inclination to associate and a prevalent individualistic approach of farmers are reported unanimously by the interviewees. This feature is recognized as cultural, characterizing the social fabric. The perceived absence of associations and cooperatives contributes to limit the access to economic and knowledge resources. In a landscape characterized by many entities, the limited communication and cooperation worsen a development scenario for such small realities.

Private water supply and illegal behaviours

According to the Istat report, two forms of irrigation are present in equal percentage: collective (50%) managed by the Consortia, and private (50%) from wells and ponds. Sometimes those are combined. Yet, the interviewees from Regional Departments underline that illegal self-supply by farmers, through undeclared private wells, is not taken into account in the percentages. Moreover, the Regional data of water uses does not match with the registered concessions for water withdrawal.

Illegal water withdrawal by wells and by links to public irrigation systems (Figure c.) are widespread phenomena. Over-exploitation of groundwater leads to salinity intrusion and water quality deterioration. Researchers point out the need to understand the micro-scale choices that lead farmers to self-supply by digging wells or recurring to illegal connections. The reason could be researched in the inefficiency of the public supply, high costs and lack of awareness. Assessments on these features have been done during the analysis of the questionnaire responses (Annex III). Knowing the reasons for illegal abstraction is important in order to conceive focused measures to tackle the problem, since unregistered and over-exploitation of water resources negatively affects the water balance, making difficult to actually monitor and quantify water uses. The same researchers from CREA and University of Palermo feature the farmers as both victims and guilty party: on one hand, their needs are not heard by managing authorities; on the other hand, they also don't want to pay for the service and the organized crime is high. In addition to unlicensed groundwater abstraction and water thefts from the public network, other denounced illegal actions carried out by farmers include stealing pipe materials and faking efficient irrigation systems to get funding from the Region or pay less.

To make this worse, a 'code of silence' is also common among the farmers: illegalities are not reported to the public offices and often ignored.

Figure c. Example of illegal connections to public water network in the area of Gela. The illegal withdrawal rate amounted to 30 l/s per connection. Source, regional newspaper http://www.quotidianodigela.it/images/luglio2016/allacci.jpg

Excessive irrigation

Even if the percentage of implementation of water-efficient irrigation techniques in agriculture (drip irrigation, sprinklers) is above the national value, excessive irrigation is still a common practice in Sicily. Regional departments and researchers explain that for most of the Sicilian crops large volumes of irrigation are not needed. Irrigation is carried out for improving the yield, for emergency cases and to cope with growing climate variability. However, this adds to a cultural "paradigm of the excess", following which farmers irrigate more than what is needed, considering it better for the plants. Wastes of water occur through frequent and surface irrigation. Consortium employees consider water consumptions independent from the size of the farms. Nonetheless, they explain that big farming businesses are likely to optimize the resource, implementing best practices and reducing the waste.

Soil conditions affecting water consumptions

Farming experts revert the opinion that big farming businesses optimize the water consumptions by referring to the quality of the soil. In their opinion, also shared by the interviewed European policy officer at DG ENV, big farming follows an agro-industrial form of management, with greater and more harmful application of fertilizers and pesticides. This deteriorates the soil fertility, decreasing the capacity of soil to absorb water; consequently, larger volumes of water are needed. However, this argument would require a deeper assessment. The agronomists generally state that small farms are more sustainable in terms of soil conditions.
Implementing organic farming would help improving the characteristics of the soil. However, as stated by researchers on agrarian economy at CREA and University of Palermo, the action should be integral, to avoid isolated organic farms being target of insects and diseases, eventually affecting the production of who opted for a more sustainable farming. Unanimously, it is recognized that best practices have been developed but their application is scarce due to financial and administration constraints.

Lack of awareness

Lack of awareness among farmers, on the topic of water, agricultural and climate policies, is reported by the interviewees. Especially, the fact that farmers oppose to pay for the water consumption is recognized as a wrong attitude. On the other hand, resource managers are blamed to lack sensitivity towards the needs of the farmers. To increase the implementation of means available to farmers, the Regional Department of Agriculture attempts to involve farmers in information and educational days and give technical assistance through its peripheral offices.
Contrary to this view of insufficiently aware farmers, during the attended event #3, the General Director of FLAI CGIL stated that, when big water infrastructures were constructed in the 60s, farmers were aware not only of the value of water as a public good to be protected, but also as driver of development for the territory. In his opinion, this awareness would keep existing among farmers, who in turn blame the inefficiency of the public management as cause of water scarcity in agriculture, limiting the development of the farming activity.

Theme 2. Reclamation Consortia

Reforming administration

During the event #3 focused on the role of the reclamation in Sicily, the historical background of the Consortia was illustrated. The Reclamation Consortia arose in Sicily, as in the rest of Italy, at the end of the 19th century, with the Single Act of 1933. In the Region there were several Irrigation Consortia already established. 11 new bodies almost corresponding to the provincial borders were defined. In addition to confirming the tasks related

to maintenance, operation and management of irrigation and reclamation works, Reclamation Consortia were entrusted with responsibilities on environmental protection and water resources defence.
At present, a new reform merges the Consortia, from 11 to 2. Yet, in practice nothing has changed. The 11 offices keep existing, corresponding to the provincial administrative borders and not to the river basins. This represents a first limit to a comprehensive management of the water resources. The fact that the unification into two structures does not happen is explained by a consultant for the Ministry of the Environment as due to the conservative character of the Italian population, which blames the existing arrangements but is reluctant to apply new laws and regulations.
Trade unionists call for the application of the new reform, thus for the creation of two new entities that would not carry old debts, disputes and poor management. They ask the Region to safeguard the employment levels, as well as provide training of the staff to improve their efficiency.
As for the financing of the Consortia, the Region does not provide them a funding anymore, thus it is important that every farmer will pay the water at a fair price. On its behalf, the new structures have to ensure transparent and legal management of the water service, necessary conditions to restore the central role of the agriculture. Moreover, they can act as a guide to promote the association of farmers.

Poor management of water resources

The inefficient management carried out by the Consortia is unanimously acknowledged, also by the same Consortia employees, who blame the lack of financial resources and administrative barriers as constraints to carry on infrastructural and non-structural works.
Researchers on irrigation and water resources management and officers at the Regional Department of Agriculture report that the water supply is carried out with inconsistent logic[70], the pricing policy is not appropriate[71] and that the fares for the farmers keep increasing. The internal organization of the Consortia has no productive end goal, nor collective interest, it has rather a political interest and is based on informal agreements in the form of patronage. Regional Departments denounce that staff recruitment is done by private networking, not based on expertise, thus determining a lack of technical skills; in addition, data exchange is complicated by poor cooperation.
Another important feature is that farmers are not part of the Consortia, as they were instead in the old Irrigation Cooperatives. They are less represented and their needs less heard, since no participatory management is done. In practice, farmers passed from directly managing the resource to refer to a new structure for their water supply. A lacking water resources management at local level is reflected into missing maintenance and poor state of the infrastructures. As reported by the Regional Department of Water and Waste for the case of Palermo, the water resources for irrigation purposes are under-utilized, that is the Reclamation Consortium withdraws less water than the existing concession. This is due to the incomplete and leaking networks that don't allow a proper water supply.
To alleviate the administrative problems, special commissioners are established. Yet, former commissioners have been guided by political interests and had no expertise in terms of water resources. The need to monitor and assist the work of the Consortia is acknowledged by both Regional Departments of Water and Waste and of Agriculture. To this end, Classification Plans presenting the Consortium operational planning would be expected by law. These plans should include updates of the methodology to calculate the irrigation benefits and budget analysis. In practice, they are not fully implemented or inexistent, as also acknowledged by the same Consortia offices.
On their behalf, the interviewed Consortia employee (Catania and Palermo) affirm that the service is improving and many projects, before unimplemented, have started. Bureaucratic and economical barriers have worsened the Consortia operation over time. Especially regarding financial barriers, the Consortia have so far relied on Regional financing. The Consortium of Catania reported a delay in the publication of the Regional budget, negatively affecting their investments planning. They blame a time divergence between the need for investments and availability of economic resources, stating that "funds and labour are not allocated promptly". Finally, given the absence of the Classification Plans, Consortia offices wait for the Region to send instructions, decide concessions and the measures to be adopted. A new reform, however, has seen the interruption of public regional financing to the Reclamation Consortia, which will have to rely only on internal takings.

[70] Schedules are not in line with crops needs
[71] In €/hectare of farmed crop, instead of €/m3 of water used

Theme 3. Public administration – delay/inefficiency – data sharing

Missing River Basin District Authority and lack of planning

The Region Sicily was established in 1946 and entrusted with exclusive competence in agriculture and forestry, land reclamation, support to the agricultural and industrial production.

The legislative autonomy of the Region is identified by researchers and consultants as the cause of inefficiency and delay in the decision making. At the basis of the problem there would be a decentralized system with a multitude of stakeholders involved in the water sector. These are often conflicting and the distribution of the responsibilities is unclear. Following the WFD and respective Italian transposition, a River Basin District Authority should have been established to coordinate the stakeholders in the complex water governance. However, the special statute of the Region makes the transposition and implementation of regulation more flexible and the District Authority was never established. The tasks of the District Authority have therefore been distributed among various Departments and Services of the Region Sicily (Department of Water and Waste; Environment). The absence of a centralized coordination is unanimously acknowledge by the interviewees as a limiting factor. Moreover, according to researchers and consultants for the National Ministry of Environment, it would negatively affect (especially referring to the WFD guidelines): poor monitoring of water resources; inconsistency of collected data; delay in the publication of RBMP and its update; consequent barrier to access European funding; delay in the implementation of corrective measures.

Interviewed Professors at the University of Palermo explain the lack of governance due to fragmented competences as to be also historically determined: a series of reforms have rearranged the water governing system many times, determining a decentralization of powers and creating confusion in the competences. This is accompanied by cultural attitudes as localisms, which obstacle any homogenization and centralization of the service management. The fact that administrative choices follow political timescale and that reforms keep rearranging the various administrations feed the delay in decision-making and measures implementations.

On their behalf, officers at the Regional Department of Water and Waste acknowledge the internal lack of planning, blaming the fact that expertise is not balanced: “administrative procedures have little to do with technical problems”. Moreover, they accuse a reactive approach to problems (see Theme 4 and 5) as to be an Italian feature. According to this reasoning, the initial delay of the national government in transposing European directive and regulations in turn determines the delay at regional level. They attribute the responsibility to establish the District Authority to the central government, asking for more support and supervision. Plus, they also recognized the negative influence of the Sicilian cultural inheritance, characterized by a strong individualism and lack of association. Finally, shortage of financing is complained even for the ordinary maintenance of the infrastructures. The tardive approach of the Regional Departments is also noted by the Consortia employees, who identify in the political class the origin of their problem. They blame the missing expertise and capacity to take the opportunities and translate them into long-term projects aimed at the development of the territory. Concerning this, they refer to the available European funding that is not being implemented for lack of decision-making power, lack of skills, and leading personal interests and benefits.

However, professors and consultants stress that human resources are available, thus technique and knowledge; the real constraints are represented by lack of organization and governance, showed in the constant act of delegating responsibilities and request for help on matters related to water, waste etc. In conclusion, very interesting results the speech by an activist for the “Italian movements for water”, during the attended event #2. The speaker denounced a stake in the water resources management since 2009: the Regional Government is negligent, then the National Government assigns a Commissioner to the Regional Departments and this process keeps repeating. The staff is unqualified and many projects are not implemented, even if approved. This makes useless the availability of funds.

Hindered data sharing and heterogeneous dataset

The complex system made up of multiple stakeholders reveals its hindered functioning through the lack of data sharing. University and Regional departments blame the Consortia to not providing data. Regional Departments blame each other to do the same. Similarly, the National Government blames the Regional Government to not supply the required documentation. Data sharing is at the basis of collaboration, thus important requirement to improve the resources management. On its behalf, the University has a central role in studying, evaluating and assessing phenomena as water scarcity and drought, and coming up with best solutions. The lack of available local data limits the application of university research on the territory. University departments report many solicitations to the Consortia to get data on consumptions and plots arrangement, and to the Region to get permissions to start pilot areas and test the studies. Researchers, a consultant for the National Ministry and

the officers from National Ministries of Environment and of Infrastructures and Transport recognize the data provided by the Regional Departments as to be highly heterogeneous and incomplete, and that there is a urgent need to integrate the existing ones. This is confirmed by a regional infrastructures' engineer, who reports the lack of a common informative system for big water infrastructures as e.g. dams and aqueducts. Infrastructures are managed by different bodies and a coherent and common system would aim at improving knowledge, management and maintenance.
At a bigger scale, European policy officers underline the value of exchanging knowledge and data and share the experiences, especially on matters related to resources protection, climate change adaptation and mitigation strategies. In this context, the role of the University is very valuable as holder of scientific knowledge.

Theme 4. Water scarcity and drought

Water scarcity definition
Researchers, professors and consultants recognize the presence of water scarcity issues due to lack of planning and management. This is reflected into the bad state of infrastructures and poor allocation systems, in a landscape of strong competition between uses, especially domestic and agriculture sectors. Regarding the latter, water scarcity is worsened by wastes in the used irrigation volumes and illegality. Water quality is also a limiting factor to water availability, given the high number of polluted water bodies. In turn, good quality water is less available to users and water prices increase due to the needed treatments. Water scarcity issues in agriculture are more permanent, while in the cities are more sporadic since determined by breakages along the water networks, generally promptly repaired.
A consultant for the Ministry of the Environment, ex-director of two big water companies, points out that resources availability is overestimated. This is due to the fact that decisions are taken "around a table" with little contact with the reality: losses and illegalities are not taken into account when counting and allocating the resource. Interviewed hydrologists recognize that worsening climate conditions as recurring drought events can also increase water scarcity. On their behalf, the Regional Departments appointed for water allocation state that water scarcity would not exist, given the existing infrastructure and the available resources, sufficient to meet the demands. Drought is in this case the pressure and threat that affects water availability. There would be instead a shortage of water of a good quality and at a cheap price. In their opinion, agriculture complains a lack of water in terms of "potential surface", that is "not all the surface that could be irrigated is used due to missing water networks, and fields are shrinking". Yet, they acknowledge that the distribution network should be strengthened, since some resources are left unused. However, water scarcity would not be considered a limiting factor to the development of the territory by the Regional Department of Water and Waste. In response to this, researchers explain that the amount of water resources is indeed sufficient to meet demands, but the water governance is malfunctioning, arising problems in the actual supply. Looking at local level, users rightly feel water scarcity when, opening the tap or the hose, water does not flow. In this case, the problem is not the availability but the management and state of infrastructures, as explained by professors at the University of Palermo.
The interviewees at the Reclamation Consortia also acknowledge water scarcity in the fields due to outdated infrastructures and consequent breakages. The irrigation networks were built 50 to 70 years ago and never renewed. They consider themselves prompt in repairing point break; however, the underground network is difficult to monitor and maintain and not enough economic resources are available to complete the missing parts of the network or to carry out renovation work (e.g. part of the irrigation network in Catania is still made up of open-channels, increasing the waste of the resource). They also identify bureaucratic barriers: structural works are a matter of public law, since they depends on tenders and contracts, which take a long time and are driven by political interests.
Moreover, the employees state themselves unavailable to supply water to farmers when this comes from polluted water bodies. Cases of algae proliferation in the reservoirs have impeded the water supply. They resignedly admit that water resources have been decreasing not only due the bad state of the infrastructures, but also under adverse climate conditions.

Drought definition
Drought is unanimously recognized by the interviewees as a recurring problem affecting water availability. Droughts are part of the semiarid climate of Sicily. As stated by a researcher in water resources management, drought is a temporary phenomenon that occurs when precipitations are far lower than the average value. To the contrary, water scarcity is a permanent condition related to the Sicilian climate as well: the dry season, which goes from May to October, has already a very low value of precipitation, that makes Sicily a water scarce

Region in such period. According to researchers and consultants, drought severity depends on the state of the infrastructures. Many reservoirs are poorly maintained and not capable to reach the maximum storage for safety reasons. This lowers their storage capacity and, in case of drought, minimum levels are easily reached. Thus, risk of high-impacting droughts is also related to the ageing of the infrastructures and in turn to the lack of management and planning. The Regional Departments stress the fact that drought is not considered as a natural disaster, rather as an adverse atmospheric event, being feature of the Sicilian climate. Characterizing drought is important to define strategies and tools to cope with it, as explained in the following paragraphs (Theme 5, 6).

Climate change perception

Interviewees at the Regional Department and Consortia acknowledge the big pressure of climate change on intensifying the severity and frequency of water scarcity and drought events. They also refer to the increasing risk of desertification if the soil is not kept fertile. However, two professors and researchers consider themselves sceptical about the occurring of the phenomenon and they rather refer to a cyclic nature of the climate. However, they support the "story of the climate change" (quote) as to be an incentive to good actions, as water saving and efficiency measures are good for the environment and for the community.

Water scarcity and drought management

The interviews at the Regional Departments allowed to retrieve important information on the organization of the water resources management. Water allocation schemes are agreed upon twice per year, during technical think tanks in which water managing authorities and users representatives participate. Water is allocated based on the actual availability and the demands, following a Strategic Plan drafted by law. Reservoirs have a multiyear planning (2 years minimum) to take into account future demands, this would entail a long-term planning approach, however structural and maintenance problems make it more complex. Dams are structurally controlled twice a year. Each month a bulletin is published by Service 2, Water Observatory, Dep. Water and Waste, containing the hydrological balance of each dam.

The general reactive approach in terms of poor planning and emergency dealing with water crises is acknowledged by all the interviewed. A professor and consultant for the MATTM classifies the Sicilian approach to problems as a reactivity of a lower value, that would instead require a clear, transparent, responsible and capable structure to carry out a proper management of the water resources. The mismanagement is again explained as due to the confused and conflicting water governance. A researcher at CREA points out such reactivity as to be a characteristic of Sicily, while the WFD and any adaptation strategy require a proactive approach. A new Observatory on the water uses with a control room for drought events is being established at the Regional level, this would be part of a policy alignment for rearranging the water governance, since it would have coordinating responsibilities, aimed at a proactive approach. However, researchers blame it as to be a façade of an inconsistent structure, since regional data are missing and administration procedures require long times.

In case of water shortage, some emergency measures are applied: first, the supply is reduced according to priorities. The domestic use is prioritized, and restrictions are first put to the irrigation use. At agricultural level, ordinances are issued to irrigate only the most water demanding crops and, by the Consortia, maximizing interconnections between different irrigation systems, reducing pressure in the networks and fixing rotation schedules. As explained by researchers on the water sector and Consortia employees, since the supply priority is given to the domestic use and agriculture is the first sector to be cut off, farmers are increasingly switching to private supply to increase their resilience to water scarcity and drought events. In addition to that, researchers on farming explain that water is never supply on time at the beginning of the irrigation season, increasing the mistrusting of farmers towards the public service and stimulating them to find other ways of self-supplying.

In case of severe drought, Reclamation Consortia reported to have implemented non-structural actions as well, as monitoring of the water uses reinforced with controls and repression of illegalities. However, the employees also stated that, as happened for the 1993 severe drought[72] that caused the depletion of some reservoirs, undertaken measures were more symbolic than efficient: they served to show farmers that the Consortium was doing its best; yet, supplied volumes were paltry. During that event, the crops have managed to survive thanks to their intrinsic resilience. An agronomy researcher denounces that too limited investments have been made on researching how to make sustainable agriculture, but only on increasing production to a profit end. By knowing the characteristics of soil and climate, drought resilient crops varieties could be selected.

[72] A more recent drought has occurred in the summer 2017. Interviews were collected on March-April 2017.

It is unanimously reported that measures taken to cope with drought or reduce the farms' vulnerability are very little and no strategies are planned in advance. Hydrology experts highlight that drought events develop slowly, in a long time, leaving a lot of space to take preventive actions to mitigate the impacts. Instead, the institutions wait till the worst crisis to start measures. The need for planning is therefore certain, and this should be done by hydrological monitoring combined with the analysis of water demand and uses. Regarding the hydrological monitoring, a monthly drought bulletin was developed in the context of an INTERREG project in 2004-05. Its publication is handled by the Service 2 of the Water Observatory, Regional Department of Water and Waste; it stopped in 2007 to start again in December 2016[73]. The Water Observatory recognizes the bulletin as a good tool for policy making guidance. As stated by a researcher at CINFAI, for drought analysis it is essential that hydrological data monitoring must be constant and homogeneous over the territory, given the spatial and temporal variability of drought phenomena.
Special focus is put on the management of the dams. In fact, a poor maintenance of these infrastructures largely jeopardizes the water availability, thus increasing the Regional vulnerability to water scarcity and drought phenomena. As reported during the event #2 by the Director of the Service 4 Water Infrastructures, of the Department of Water and Waste, different issues affect the dams: technical-operational; environmental; administrative. Many of the problems originated during the planning phase of the dams and have been dragged. When there are structural criticalities, the National Service of the Dams imposes restriction on the storage capacity. This, summed to the sedimentation, results in a limited capacity of the reservoirs. Various maintenance works are financed to combat the causes and restore the optimal reservoir conditions: restoring and/or improving the hydraulic capacity and the drainage system; restoring the full operation of the discharge facilities; structural recovery of the operational structures; banks and slopes reinforcement. However, this works encounter economic and operational barriers. The officer from the National Ministry of Infrastructures identifies the sedimentation within the dam to be a major problem, since this can cause clogging of the bottom discharge pipe. The capacity lost due to sediment filling amounts to 105.5 Mm3 in Sicily. Out of the 1.15 billion of m3 of potential storage capacity, 750 Mm3 represents the actual capacity. During the attended event #3, the Assessor for the Agriculture identified the same urgent need of maintaining the dams. Those were built during the 50s and the 60s and, by today, documents and tests for the structures operation are missing. In addition, such big infrastructures still need to be equipped with proper water networks.

Insurance

The Service 5 of the Regional Department of Agriculture is appointed for the planning of strategies to cope with risks in agriculture, including drought. As stated during the interview at this Service, the Department is trying to encourage farmers to apply for insurances against drought. This would allow them to get compensation if the event occurs and thus protect their income. However, the interviewees recognize more and more limited economic resources also to provide compensations. In addition, it is up to the farmer whether to apply or not and the clauses depend on the credit agencies. Farmers perceptions and application to the insurance have already been discussed in Annex III. Cancelling the farmers' annual fees to the Consortia in case of missing supply due to drought events would be an option similar to the insurance concept but made available by the public sector. This happened during the 2001 drought as reported by the Consortium of Catania employees. However, the green light for the cancellation has to come from an Agricultural Advisory Council and follow difficult bureaucratic procedures.
This theme was assessed also during interviews at the European Commission. The DG CLIMA, which mainstreams the climate change adaptation strategy among the different policy fields, also promotes the application to drought insurance. The insurance is economy-based tool and it wants to ensure the income security, avoiding big economic losses due to drought events to farmers. In the risk management, insurances are a very conservative tool. What would be recommendable is a parametrical setup: an insurance dependent on a triggering value, based on the severity of the event.
In addition, linking different insurance funds would help reallocating the economic resources in case funds for compensation result reduced. Yet, the insurance does not diminish the risk of drought, thus it does not represent an adaptation strategy. However, different tools could be used to combine the two: e.g. when subsidizing the insurance, farmers could be required to take drought preventive actions as eligibility criterion.

Water reuse

Another way of making an efficient use of the water resource would be reusing treated wastewater for irrigation purposes. This option, conceived at a big scale, encounters many hindrances in Sicily. Researchers and employees at the Regional Departments explain that costs are too excessive, not only in terms of

[73] Recent bulletins available at: http://www.osservatorioacque.it/?cmd=article&id=118&tpl=default

treatment infrastructures, but also for pumping. In fact, big metropolitan areas are placed along the coasts, while agriculture mainly takes place upstream, in the hilly areas. The potentiality of Sicily for water reuse would be high, however the costs would fall back to the farmers, who could not afford it. As stated by the Consortia employees, pilot areas for applying water reuse have been started, however regulatory requirements are an issue that make these applications isolated, far from being a common practice. Regulations of minimum requirements to use treated wastewater are under discussions and an assessment of Water Reuse for different purposes is ongoing at the DG Environment. A relevant concern emerged during the interviews is the case of untreated wastewater discharges, presented as alarming: Sicily is now facing a considerable infraction by the EU for not being in compliance with wastewater discharges. The interviewed functionary at the Service 1 of the Department of Water and Waste, IWRM, affirms that all the attention and effort is paid to find a solution to the case. Consultants explain that water treatment plants are either absent or improperly working, maintenance is lacking and economic resources not available. In a shared opinion, this represents a priority to be faced before conceiving water reuse at big scale.

Theme 5. National legislation, European policies and directives

Policies and practice, gaps

The physical distance between Sicily and the EU offices in Brussels is reported by professors and officers at the Regional Departments. Such distance would be manifested in the misrepresentation of the Sicilian needs, far different from those on the Northern Countries. In this context, the distance assumes a more social character, being determined by a weak dialogue between Sicilian representatives at EU level and policy officers. “The EU is too distant to be a real motor”, a consultant for the Ministry of the Environment states. The interviewee explains that the funds that are made available don’t fit the local reality and the outcomes of their implementation are not properly evaluated; in his words “money and situations are disassembled”.

Part of the responsibility is also self-ascribed by the Regional Departments’ officers, who admit the inattention toward European guidelines and the need to adapt to them. They again quote the “physical distance” that makes it difficult, for Sicilians, to remember their EU citizenship.

Yet, according to the same officers and researchers of the Palermo University, the major gap would occur in the transposition of EU directives and policies to the national legislation. The State is blamed for its inefficient way to delegate to the Regions the implementation of the latter. Evaluation of the implementation is not carried out appropriately and the State would have “launched a deconstruction without imposing a reconstruction”. The State-Region gap is also acknowledged by other consultants and professors, who report a loss of contact with the regional reality and a disregard of the issues at the local scale.

The existing governance has a multilevel feature: not only responsibilities are distributed ‘horizontally’, but legislation procedures take place ‘vertically’, encompassing local, regional, national and international levels. The interaction between levels should work under the principle of subsidiarity, as affirmed by researchers in the field of water management. That is, problems at one level, e.g. local, should be handled and solved by the administration at the level right above, e.g. regional, and so on, without losing sight of regulations and each level’s need. However, this subsidiarity concept is not applied and gaps are created due to missing communication and representation.

Supporting their role, researchers state that scientific evidence must be at the basis of policies and legislation, to better fit the measures and actions to the territorial differences. A researcher at CINFAI explains that drought has a high spatial variability and, as a matter of fact, it cannot be solved with legislation. Yet, integration of technical expertise in the legal framework can help tackling the related issues. Unanimously, the interviewees at regional level believe that European directives want to create homogeneity over European countries, which instead contain large diversities, both in terms of climate characteristics and socio-economic aspects. Common standards are difficult to find and diversities must be promoted to support the regional realities.

Policies are considered by the interviewees at research institutes as dictating revolutionary changes to very complex internal systems, therefore making the adaptation process hard. Implementing legislation has many interpretation difficulties, as stated by functionaries of the Regional Department of Water and Waste. They consider policies as to be a very powerful and stimulating tool, yet the required rearrangement of the territorial organization is full of complexities.

The interviewed policy officer at the DG Environment acknowledges these matters. As reported for the case of the WFD, at the moment of its issue the EEA had already estimated that not all the water bodies could reach the objectives for 2015 due to: difficulties in the implementation process; high costs; complex integration with

other existing policies. Delays in the implementation of RBMPs and PoMs are reported by many MSs. The DG Environment is currently working on strategies to optimize the implementation process.

Participation process (users involvement; Region-State; Region-EU; State-EU; EU-EU)

Following the above findings, it already appears how participation in the legislative process plays a very crucial role. Participation involves all the governance level, including users. Researchers on the water resources management point out the need to involve water users, that is farmers, in the decision making and to zoom in the small scale realities. Enhancing participation would help defeating the educational barriers. The latter are identifies by the interviewed researchers, professors and consultants as to be the first obstacle to the development and implementation of fitting policies and directives. In their opinion, the major change to undertake to safeguard water resources must be behavioural. A shift towards a sustainable behaviour should be uniform and homogeneous. As just reported, the State is blamed to have lost contact with the local scale. Yet, as stated by the officer for the Ministry of the Environment during the attended event #1, the role of the Ministry is that of supervising the Region's operation. The officer states that the Ministry has achieved a good result in the collaboration with the Regions to comply with EC directives, in particular referring to the WFD, and an alignment between European and National legislation has been reached. The Ministry claims itself always available to listen the Regional needs and answer any question and asks the Region to be more active in the dialogue and in a step-by-step collaboration. A tight collaboration would allow to adapt to European legislation and improve the governance of water resources at the regional and local level, thus improving the quality of the environment. Achieving convergence between the Region and the National Government is a necessity demanded by the European Commission. The guidelines for a working governance call for participation of all the actors involved and their collaboration.

A lack of dialogue between European and Regional political representatives is also pointed out by researchers, Consortia and Regional employees. Following their opinion, the fact that EU policies are more consistent with Northern realities depends on a poor participation of Italian representatives and delegates in the decision-making meetings; thus that Italian requests have never been well represented. This contrasts with what reported by the DG Environment's policy office, as far as concerns the WFD: the directive was formulated with the great participation of the Ministries from the MSs and the District Authorities. Temporary working groups with representatives from the different Countries take part to the meetings. The Water Director of Italy, under the Ministry of the Environment, is active in a specific working group. Bilateral meetings with MSs are also held to promote a better communication. However, the officer also reports that the Italian monitoring plan was not carried out completely and for some districts data series is lacking. The DG's capacity of coordinating is limited and in this case the real gap is again between the State and the Region. The MSs participate with the DGs to the policy process. The DGs try to reach out the stakeholders launching public consultations. It is up to the Region to take effort for being involved. As stated by the policy officer: "the Region Sicily could contact us anytime. It could send a petition to ask for a bilateral meeting". Other tools available are: the permanent representation of each MS in Brussels; the Committee of the Regions, whose function is to raise the voice of the Region on EU processes, even reaching the European Parliament. Water is an issue included in the agenda of the Committee, which also gives recommendations to the Regions.

Coordination and participation between sectors and departments is an issue within the same European Commission as well. For this, sectoral dialogues are established both at political and technical level. As for the latter, the working group Water-Agriculture represents a good dialogue commitment between the DGs AGRI and the DG ENV. Similarly, the DG CLIMA is working on mainstreaming the climate change adaptation strategy among the various policy sectors: water; agriculture; environment etc. It coordinates meeting to ensure the policy coherence in terms of climate change adaptation, having arranged a dashboard evaluation system to discuss whether a strategy element is good or not. Nonetheless, as reported by the interviewed policy officers at DG CLIMA, the follow up is more challenging: since each DG leads its own sector, it is difficult from a capacity point of view and in terms of specific competences, especially referring to the budgets, to ensure a proper implementation of the recommended strategies. Finally, they highlight that the European Commission focuses on National level, but also tries to reach Region and to a certain extent also some municipalities. They also point out the Committee of the Regions as a good tool to represent the interest of the European Regions.

Addressing water quantitative issues in environmental laws

The primary legal instrument targeting water resources is the WFD, which mainly focuses on the quality state of European water bodies. As reported by a researcher of the University of Palermo, water quality has been the main target at EU level, being the crucial element for developed countries. In the past, investments have been

done for water infrastructures to ensure a quantitative supply. Yet, quantitative issues are still relevant, jeopardized by inadequate management and maintenance of the infrastructures: losses are high and structural problems are threatening water quantity availability. Water quantity requirements are not explicitly addressed in the WFD, as well as for binding regulations on drought management. According to drought experts at the Universities of Catania and Palermo, this depends on the misrepresentation of Southern Countries at EU level, especially during decision-making processes. Indeed, Southern Countries are the ones that so far have felt the burden of water scarcity and drought more than other European areas. Different is the view of the interviewed researcher at CREA, who states that the existing WFD would be sufficient to safeguard water resources also quantitatively, if fully implemented. The directive would be exhaustive in terms of water reuse, efficiency and best practices. It includes the requirements for water pricing and introduction of cost recovery principle that indirectly target water quantity. Moreover, the introduction of new regulations or directives, e.g. a Drought Directive, is not desirable, as legislative procedures are burdensome; in addition, drought phenomena have a big spatial and temporal variability and the severity depends on local characteristics (soil, climate, socio-economic aspects, etc.); thus, common standards are difficult to set. New requirements could be included, however, in already existing legislation.
The fact that quantitative issues are less represented in the WFD is also confirmed by a policy officer at DG ENV directly involved in the monitoring of the directive's implementation. The interviewee explains that, during the directive's developing phase, there has been a strong opposition to include water quantity and drought management requirements by countries that considered it not needed. To the contrary, MSs that were interested, since more affected by the problems, did not have much voice. However, climate change is increasingly posing a pressure to the Northern Countries as well and more new studies have been financed on the issue; in particular, cooperation with the DG CLIMA is increased to reflect on the integration of climate change, water scarcity and drought topics during the review of the WFD, which will start in 2019. Yet, the current focus of the DG ENV is on the monitoring of the directive implementation state, evaluating the updates of the RBMPs. Regarding a potential Drought Directive, similarly to the researcher at CREA, the policy officer affirms that there's no need for a new directive and that the current legislation would be sufficient to quantitatively safeguard the water resources, if fully applied. Indeed, the WFD requires water bodies to achieve a good ecological status and, to this end, enough quantity for indicators to be good is at the basis. Not to forget, over-abstraction issues and water demands are explicitly discussed and taken into account.
However, there are some constraints to the full implementation acknowledged by the same DG: financial constraints are reported by many MSs; environment is not a political priority; establishing an efficient governance system is complex; long times are needed to achieve the results in physical terms, since there are certain pollutants that may persist in the water bodies more than 60 to 100 years.
An impact assessment of the directive is ongoing, in order to see whether something could be changed or not. Yet, no major changes are expected.

Theme 6. Financial instruments

National funding

Most of the big water infrastructures present in Sicily (dams, aqueducts, irrigation networks) were funded by the Fund for the South, 50 to 70 years ago. The interviewees at the Regional level (researchers, consultants, officers) recall to the Fund as to be highly effective, being a guide for the Regional development. In particular, as reported by a consultant for the Ministry of the Environment, the Fund had a strong technical structure, compact and cohesive. It was made up of a group of engineers led by a non-engineer; it was partly funded by the World Bank, by that time IBRD, that ensured controls on the expenditures. It provided not only technical but also decision-making support for administration, aimed at territorial development. The presence of such funding subject was crucial for a correct and transparent implementation of the projects. As the consultant follows, today the Regions are too small or unable to be a third party, since they don't fulfil their administrative tasks and endure this condition of being unable. As example, the interviewee lists the presence of available funds: Structural Funds for Development and Cohesion, Treaty for the South, and it reports the absence of any expenditures planning.
The presence of specific national funding instruments destined to water infrastructures maintenance or for coping with adverse atmospheric events, as drought, are assessed. The officers from the Regional Departments of Water and Waste and of Agriculture reports the availability of funds for dams' structural maintenance works from the National Dams Plan and from the Pact for Sicily. The National Ministry of Infrastructures provides financing instruments to secure the reservoirs. However, the officer claim that the funds are for hydraulic works within the reservoir, while maintenance is also required in the upstream and downstream reaches.

Other funding from the Operative Programme under the European Regional Development Fund are available for reservoirs for drinking uses only. Thus, the available funding for maintenance is considered smaller than the possibilities of the Region, determining economic constraints. Consortia employees report the same issue, stating that funding are not tailored to their needs, that is maintenance. Concerning drought events, the regional officer of the Water and Waste Department explains that since drought is not considered a natural disaster in the national regulation, Regions cannot apply for Solidarity Funds until the emergency state is declared.
On behalf of the National Government, during the attended event #1, the officer of the Ministry of the Environment remembers that the State provides financial instruments to the South through the Cohesion Policy, especially aimed at technically assisting the Region to streamline the operation of the multilevel governance.

European funding

European Structural and Investment Funds represent a crucial instrument for the region Sicily. In particular, the most mentioned instruments are funded by the EAFRD and the ERDF. The EAFRD focuses on resolving particular challenges in the rural areas and finances the RDP, II pillar of the CAP; while the ERDF promotes balanced regional development, contributing to measures fostering competitiveness, employment and territorial cooperation. Their disbursement are subordinated to the so-called 'ex-ante conditionalities': these are requirements set in the *Partnership Agreement* between the MSs and the EC that the Regions have to fulfil to get access to the funds. Ex-ante conditionalities are already introduced in Chapter 3.1. The last two paragraphs of this section focus on this theme.
Interviewees have different opinions on the different available instruments. Participation to projects funded by the EU, as the INTERREG (ERDF) and those under the LIFE program (financed by DG ENV) are considered very valuable by researchers and policy officers. Especially, drought experts explain how the INTERREG projects enhanced the synergy and the productivity between universities and water bodies in the theme of drought monitoring and management. Yet, they point out the lacking continuity in the investment to develop tools, and the "somewhat suspended" support to research in environmental matters. The role and involvement of the University has also changed over the different funding planning: the interviewee at CINFAI reports that Universities are not included anymore in the INTERREG projects and have limited access to structural funds.
Additionally to the INTERREGs, The Regional Department of Agriculture officers, Service 5 and 6, point out the LIFE program as to be a very good tool, as they are currently involve in the project "Adapt2Clima" to exchange experiences between in terms of best practices in agriculture to adapt to climate change. According to their opinion and to the interviewed researchers and professors, the strong point of this type of projects is the collaboration between Mediterranean Regions on similar affecting issues. The interviewed policy officer at DG ENV reports that the LIFE program gives grants to projects set up by NGOs, farmers associations and Regions. Yet, the interviewee also specifies that the DG Environment has limited funding opportunities. Other instruments are nonetheless available to share expertise between the different level of governance on the implementation of EU environmental law and policy, as the tool "Peer to Peer"[74].
Another important acknowledged instrument is the CAP with its two pillars: Pillar I, of which the direct payments are part, and Pillar II, the Rural Development Policy. The Department of Agriculture refer to these two instruments available to farmers to support their agricultural activity. In particular, under the RDP, farmers can apply to measure 4.1, to implement efficient irrigation systems, and to measure 10, the so called "Agro-climate-environmental measure" that aims at targeting climate change effects in agriculture by implementing best-practices. The Department of Agriculture recognizes the new structure of the RDP organized into six action priorities, as to be more flexible to the Regional needs, thus more effective. The procedure for its preparation requires however lots of efforts and it took almost a year to draft the current 2014-20 RDP.
Researchers and professors refer to the individual capacity of the holdings to apply and receive the funding. According to them, the majority of the farmers in Sicily don't have the full capacity or do not fulfil eligibility criteria set to apply to the measures. For this reason, the RDP would not represent an incentive to an inclusive development of the territory: it creates isolated cases of improvement and the farmers who get funding improve their business for their individual interest. In addition, the Region delays the publication of invitations to tenders and motivates the delay due to the difficulty of managing the high number of applications. This negatively affect the available time for farmers to complete the application procedure. Regarding the objectives of the measures, researchers believe that more attention should be put to improving the existing

[74] http://ec.europa.eu/environment/eir/p2p/index_en.htm

infrastructures. This opinion is also shared by the interviewed employees at the Consortia of Palermo and Catania that state the need for funding to be tailored to the real needs, that is, maintenance.
The researcher at CREA explains that farmers could benefit from the RDP both directly and indirectly: the National RDP finances measures only for public bodies, such as the Consortia, which could improve the irrigation networks, infrastructures and agricultural technologies, thus farmers indirectly benefit from the improvements; the Regional RDP is directly intended for farmers. However, the researcher signals the ex-ante conditionalities that still have to be fulfilled prior to have access to the funds.
The peripheral offices of the Department of Agriculture work in close contact with the farmers. The interviewed officer in the province of Palermo reports the same issues already highlighted by researchers and professors, also shared by the employees of the Reclamation Consortia: RDP application procedures are too difficult for small realities, that have a more limited access economic resources. The Regional Department that drafts the RDP does not represent the needs of the area: e.g. this is displayed by the fact that farms with 10 or 100 hectares participate to the same measures, but they have different resources and needs. Thus, a mismatch is created between the Regional Programs and the farmers resources: the applications are size-selective, time demanding and costly, compared to what the farmers get; eligibility criteria are very binding. Finally, the officer identifies the association between small farmers into cooperatives as to be the only way to compete in the RDP selections and in the market sales. However, the little propensity of farmers to associate is reported and already discussed in the first paragraph of this section and in Annex III.
On their behalf, the employees at the Reclamation Consortia give the responsibility of increasing farmers knowledge on the RDP measures to the Regional Departments, especially to the provincial officers. They claim that it depends on the capability of the single office to make use of funds and inform farmers enough. As far as concerns the availability of funding for public bodies, they blame the application requirements to be too limiting and that management and maintenance are not funded enough by Europe.
As for the direct payments under the CAP, the interviewee at CREA reports that these are easier for farmers to access, resulting more effective in terms of use. This view is not shared by the officer at the peripheral office of the Department of Agriculture, who claims the payments to be ridiculous compared to the farms' expenses.
The point of view of the European Commission was also assessed. Specifically, officers at the DG CLIMA report that, in line with the other interviewees opinion, bureaucratic procedure of implementation for the CAP an RDP are difficult; for the next CAP reform, post-2020, a simplification of the bureaucratic burden is expected. The allocation of the CAP funding according to farms size was also discussed. As reported by the fac-sheet published by the DG AGRI, it resulted that most of the CAP budget allocation goes to small size farms. However, no difference is specified between the Pillar I and II, for which more information is required.
Concerning the eligibility criteria, the EU sets a framework, but it is up to the National and Regional governments to set their own criteria in order to adapt to local needs. The Commission can see what comes out in terms of implementation and observe what are the option taken on board or not. Strict requirements are represented by the direct obligations set in the Partnership Agreement that have to be addresses by the Member State. As for the funding on maintenance, this should come from National and Regional budgets. Yet, the RDP offers opportunities to modernize the farms.

<u>European budget for climate change-related objectives</u>

As already introduced, 20% of the European budget is specifically aimed at tackling climate change effects. This is acknowledged by the officers at the Regional Department of Agriculture, who report that adaptation and mitigation are the main approaches to climate change, as instructed by the EU. They explain that national strategies are shaped in line with European objectives, according to financing availability, showing that economic resources are the key to drive changes. The mitigation actions they report included in the RDP are: measures to limit CO_2 emissions using less polluting machineries, increasing carbon sink in the soil, using renewable energies, planting woods and increasing evergreen plants areas. Measures of adaptation encompass the adoption of best practices, especially at holding levels: improving irrigation efficiency not only quantitative but also qualitative for environmental protection; prevent salinity intrusion by detecting groundwater over-abstraction in coastal areas.
Researchers at the University of Palermo, CREA and employees at the Reclamation Consortia state that the use of the European budget motivated with climate-related objectives depends on the capacity of the farmer to take it into account or not. Thus, it is also related to the farmers' information level on this subject and the available opportunities. Farmers' awareness and application to measures motivated with climate-related objectives are assessed in the analysis of questionnaire responses (Annex III)

The attended event #1 represented a parallel project to the National Operative Programme "Governance". As reported by the officer of the Ministry of the Environment, the aims of the project also encompass the compliance of the RBMPs with the inclusion of the National Strategy for Climate Change Adaptation. This is however not done yet by Region Sicily.
The interviewees at the DG CLIMA explain that the European strategy to adapt to climate change aims at mainstreaming the different policy sectors to ensure coherence between the various regulations and instruments. Binding elements of the strategy include specific conditionalities, to meet prior the access to funds, that would increase the adaptation towards climate change effects. For instance, this is the case for the "greening" of the CAP, which requires compulsory elements prior to apply. Under their recommendation, this could be also applied to the WFD. Moreover, the EU encourages the draft of a National Adaptation Strategy at the level of MSs, that is desired but not binding.
To conclude on the uptake by the Region Sicily of the National Strategy to Adapt to Climate Change, very relevant is the denounce by an activist from the "Movements for Water" during the attended event #1. The speaker reports the missing green measures aimed at mitigating climate change and the missing measures to establish a circular economy. She also refers to the ignored recommendation of the EC to make the RBMP climate proof.

Ex-ante conditionality

As reported by the researcher at CREA, the ex-ante conditionality that the Region has still to fulfil to get the European funds disbursed, in order to finance the Regional RDP, are two: a) monitoring the water uses in agriculture and b) establishing incentive prices for the water consumption, which takes into account the environmental costs. A third conditionality would be the approval of the updated RBMP within December 2016, already fulfilled. The ex-ante conditionalities are agreed upon by the MS and the EC, in the so-called Partnership Agreement. Then, the duty to fulfil with them is delegated to the Region. The researcher at CREA reports that the need to monitor the water uses and set appropriate water tariffs including the environmental costs has to be met by the Consortia.
The interviewed officers at the Regional Department of Water and Waste and of Agriculture pass the problem of meeting the requirements to the National level. In their opinion, the conditionalities have first to be fulfilled by the State, where the implementation problems start. With regard to the conditionality of approving the updated RBMP before the end of 2016, the regional officers admit that without the deadline the draft would have not been completed per time, given the scarce propensity to a strategic approach.

Monitoring water volumes in agriculture

During the attended event #1 a great attention was paid to the need of improving the monitoring activity in the Sicilian District. The WFD requires, among others, monitoring of the water bodies. According to an engineer working for Sogesid Jsc, the company that contributed to the draft of the Sicilian RBMP, monitoring is the weakest part of the WFD implementation by the Region Sicily.
Similarly, researchers state that monitoring and controls are missing. The quantification of the water uses in agriculture can be carried out either by actual monitoring of the water consumptions by placing water meters, or by implementing estimation models. Regarding the former, water meters are nearly absent and, where placed, controls are missing or counterfeit. Having water meters would also allow to set a tariff on the actual water consumptions. However, monitoring activities are made more complex by the widespread illegal abstractions and water thefts (see Theme 1).
As for estimation methods, the researcher at CREA explains that it is task of the Region to organize an information system for the simulation of the hydrological balance of the District. The district Observatory on the water uses that is being established would take up this task. The officer at the Regional Department of Water and Waste reports that the Service 2 is implementing a new system for monitoring the irrigation uses, by combining data from the Consortia with regional water budget estimation. The end is to transmit the data to the SIGRIAN system to comply with the conditionality. Appropriate monitoring tools have missed so far, not only water meters, but also remote sensing is not homogeneously used.

Tariff for water consumption and environmental costs

Setting an adequate tariff for the water consumptions in agriculture requires the application of the cost recovery principle. As specified by the interviewed policy officer at the DG ENV, the tariff method requested by the WFD expects a full recovery of investment and operational costs, aiming at giving a value to water. During the attended event #1, the RBMP working group presented a thorough picture: irrigation is the most important

use in the district, but the costs recovery is applicable only for collective use, which amounts to a little more than 15% of the total irrigation uses. Considering the total costs of the services, including the personnel, the average cost of the supplied water is 0.42 €/m3. 50% of the holdings (per number) and the 50% (per irrigated surface) pays the irrigation water based on the consumption, while 30% (per number) and 35% (per irrigated surface) pays based on a surface criterion. The remaining part, 21,5% and 14%, pays the water based on a non-specified criterion. As concerns the costs of the resources (Ministerial Decree 39 of 24/02/2015), they are described as the costs of the missing opportunities for other users, consequent to the over exploitation of the resources, over their capacity of renovation. This has to take into account: the water availability based on space and time; present and future demands; renovation of the resource and its quality; economic social and environmental effects producible by the different uses. The cost of the resource then exists only if the alternative on the water use produces an economic value higher than the present use, and it is quantified by the deviation that the present uses determine. The costs of the resource are linked to water allocation inefficiency, between sectors and in time. The quantification of these costs entails the definition of optimal allocation scenarios and the evaluation of the deviation of the current scenarios from the optimal. Examples of practices that determine the costs of the resources are: leakages in the water networks; inefficient irrigation methods; unbalance in the allocation among different uses. In Sicily, the allocation inefficiency is mainly due to the high losses in the water network, both in the urban and rural areas. The irrigation practices adopted in Sicily are instead more efficient compared to the rest of the national territory: 41% in Sicily, 17,5% the Italian average (Istat, 2010).

The interviewees' opinions concerning the actual tariff system are agreeing: the pricing policy operated by the Consortia is inadequate and must be revising. The tariff should depend on the actual consumption, not based on the crops type. Moreover, it should include incentives.
Moreover, ensuring that everybody pays is essential. As the Assessor for the Agriculture explains during the attended event #3, water is an essential resource for the development of the agricultural sector, but its services has to be paid by everybody, in order to make the same services work. Ha calls the Consortia to operate a serious monitoring plan and carry out surveillance.
However, as stated by a Regional officer for Agriculture, prior to set a tariff, water volumes have to be quantified; then, prices can be established including incentives and environmental costs. The latter should come from national guidelines for the Regions. The policy officer at the DG ENV reports that a recent National Decree was issued by the Italian State, to monitor the water uses for irrigation and define the environmental costs. This document was also provided during the interview at CREA.
Finally, explicit recommendations are given by the DG ENV policy officer. Water in agriculture is either undervalued or highly subsidized, modernization and water-related services are not paid by the direct users, although the requirements of the WFD, farmers pay very little and over-abstraction of water is frequent. Therefore, the interviewee recommends to try avoiding environmental subsidies and instead improving the tariff system, the transparency and tools as the greening.

Needs for improvement
Many needs and recommendations were given during the interviews on the different themes. To allow an easier consultation, Table XVII below reports the various advise organized per stakeholders categories and discussed topic.

Table XVII. Needs for improvement stated by interviewees

	At farms level	Reclamation Consortia	Regional Administration	Water scarcity and drought management	Financial instruments
Researchers and Professors	Implement best practices (monitoring water status of the plants; reducing consumptions); improve education to trigger a behavioural change towards sustainability; bypass the problem of the fragmentation of land ownerships by encouraging association	Focus on environmental quality and maintenance; monitoring water volumes and change tariff from €/ha to €/m3; combat illegalities; Consortia have to be reorganized to reduce costs for inefficient management	Define responsibilities; improve coordination; establishing a District Authority; data sharing; information systems; enhance collaboration with local universities;	Monitoring the water volumes; set minimum ecological flows; set an appropriate tariff including environmental costs and incentive prices; speed up the adaptation process; implement adaptation and mitigation measures; increase awareness and participation; focus in land defence and fair water supply	Invest on improving existing infrastructures and building new ones; invest in education programs; funding has to be allocated on time and according to the real needs;
Consultants	Help small realities and restore centrality to the social fabric; encourage university research application in local farms, to implement best practices and train farmers;	Listen to farmer' needs; include projects on the social sphere for local welfare, together with environmental protection	Appoint a Commissioner from the National Government, not from regional offices, who stays at least for 10 years; apply subsidiarity principle: support enhanced within adjacent levels; improve collaboration with scientific community; improve transparency; the State must mediate and supervise the Regional operation; establishing a District Authority; involve farmers community in decision-making;	Set an appropriate tariff; pay attention to soils conditions would improve an efficient water use; implement national legislation properly to overcome the fragmentation in the water governance and achieve efficient management; shift to a proactive approach by improving planning; restore good environmental conditions for water bodies	Invest on sustainability research to help small farmers; increase participation of private bodies and create an economy of scale, to give an impulse to the resources management for launching projects based on expertise and professionalism; tenders have to give longer concessions to appointed authorities, long enough to perform investments
Regional Department Officers	Train farmers; improve infrastructure maintenance; involvement of farmers in decision-making processes; incentivize farmers associations;	Improve monitoring of the consumptions (public and private) ; include farmers in the decision-making; train farmers; shift to public interest and not to individual gain; improve infrastructures maintenance and new constructions	Adapt a long term planning that allows a proactive approach; facilitate access to small farmers to the market and to RDP measures; create support systems for farmers; increase stakeholders and public participation to create synergy; limit political talks and continuous institution rearrangements in the water management;	Proactive approach to issues; Monitoring of the water uses; improve maintenance of the infrastructures; create the condition to shift towards a sustainable approach to the environment, enhancing awareness;	Invest on water governance strengthening programs, on infrastructures maintenance; encourage farmers to apply to drought insurance; increase the number of supplied farmers by upgrade the water networks and the increase the number of paying subjects by introducing more strict controls and conditionality;
Consortia employees		Extinguish the burdens of illegalities	Publish regional budget per time	Re-think supply system by making more use of gravity (reduce energy costs)	Prioritize maintenance works
National Ministries officers			Improve monitoring; comply with ex-ante conditionalities; establish a District Authority	Improve monitoring	
European policy officers	Increase capacity building of local communities to implement best practice techniques	Enhance control and combat illegalities; make farmers pay	Make more effort in implementing WFD according to the requirements; enhance public participation and knowledge exchange	Set an appropriate tariff including environmental costs; Implement best practices, especially water reuse; adopt a risk management in case of drought, even conservative through the use of insurances; set climate-change adaptation conditionality prior to give funds	Modernization of the infrastructures should be prioritized over building more; do not subsidize or undervalue water use in agriculture but apply cost recovery principle; encourage farmers to apply to drought insurance;

4.2. Interviews with other stakeholders: guide and transcripts

In total, 20 interviews were carried out with the stakeholders, excluding farmers, following a semi-structured format. A specific guide (Figure d.) was prepared for each interview, based on the stakeholder category and role. Generally, the interviews focused on six themes, which are reported in the box below with examples of sub-topic. Specific probing questions for each interview are reported in the transcripts. Main aims of these interviews were to: deepen the understanding of WS&D events among the stakeholders in the Region; address current issues in the arrangement of the water management, especially referring to WS&D phenomena; identify National and European laws, policies and instruments of relevance; conceive future scenarios of improvement by asking for recommendations.

Figure d. Interview guide for stakeholders other than farmers

Interview Guide, Stakeholders - general

Presentation and introduction of the research

Theme 1. General details - background

Background of the stakeholder organization/category; role of the interviewee

Theme 2. Water scarcity and drought

Definition of WS&D; implemented strategies to cope with them; local perceptions vs institutional knowledge; climate change impacts

Theme 3. Current arrangement of water management

Current structure of the WRM; other involved stakeholders; weak and strong points of the current management; implementation of strategies for climate change adaptation

Theme 4. National and EU law and policy

Current regulations of relevance; Implementation state of EU law; ex-ante conditionalities; EU policy awareness; gaps between policy and practice; participation processes in the water governance

Theme 5. Financial instruments

Financing instruments of relevance; CAP and RDP; Subsidies; Tariff system in agriculture; environmental costs and incentive prices; budget for climate change-related objectives

Theme 6. Future expectations and recommendations

Water scarcity and drought events in the future; Strategies to be implemented; Perception on future of agricultural sector; Addressing investments for the future; How to overcome the identified issues in the water management and gaps between policy and practice

Interviews transcripts

OMITTED FOR PRIVACY REASON

4.3. Events

The contents of the three attended events are summarized in Table XVIII below. Relevant speeches and presentations are listed per each event. These are integrated to the analysis of the interviews. Full transcripts of the most relevant speeches are following reported.

Table XVIII. Attended events

Attended event	**Theme**	**Roles and categories of relevant speakers and role**
1. Workshop: *Water Managing Authorities Strengthening Project*	Workshop on the Sicilian River Basin Management Plan. The workshop is part of the 'Water Managing Authorities Strengthening Project' of the Sicilian District, included in the National Operation Program 2007-13 'Governance and Technical Assistance', funded by the European Regional Development Fund (ERDF). Various speakers from private-public bodies presented technical and administrative issues related to the regional water resources state and management.	- Officer at the Ministry of the Environment (MATTM), Directorate General for the Sustainable Development, Environmental Damage and Relationship with European Union and International Agencies (SVI) - Sicilian RBMP working group, Sogesid Jsc. - Director of the Service 2 'Water Observatory', Regional Department of Water and Waste.
2. Seminar: *Dams in Sicily. Update of the hydrological studies, compliance with drainage facilities and structural maintenance works*	The seminar is organized by the Professional Association of Engineers in collaboration with the Italian Hydrotecnique Association. It debates the state, operation and maintenance of the dams in Sicily. Cover topics encompass: compliance of discharges facilities, safety of the dams, designing and constructing dams.	- Director of Service 4 'Management of Water Infrastructures', Department of Water and Waste, Region Sicily - Director of Service 4 'Dams Technical Service', National Ministry of Infrastructures and Transports.
3. Public debate: *Reclamation: resources and investments available to the agricultural competitiveness, to the environmental and territorial requalification*	Organized by the Agroindustry Workers Federation (FLAI), branch of the Italian General Confederation of Labour (CGIL), the event is a public meeting involving various institutional stakeholders. Discussed themes encompasses the role of the water resources for the rural development; ongoing agricultural reforms and Rural Development Programme; importance of supporting farms on the market competitiveness.	- Secretary-General FLAI CGIL Palermo and Italian Secretary-General - Special Commissioner Reclamation Consortium Of West Sicily, Director of Service 4 'Management of Water Infrastructures' of the Regional Department of Water and Waste - General Director of Regional Department for the Rural Development and the Territory; - Assessor of the Department of Agriculture, Rural Development and Mediterranean Fishery; - President of Cia Sicily (Farmers Association)

Transcripts of the relevant speeches

EVENT 1.
22 MARCH 2017, WORLD WATER DAY, WATER MANAGING AUTHORITIES STRENGTHENING PROJECT

Opening:
Prof. Arch. M.Carta, University of Palermo:
The relationship between man and the environment cannot be overlooked, there is a need for an integrated and multidisciplinary vision. When it comes to water, one cannot handle the environmental, territorial, economic, political, energy sphere, and leave them unconnected.
As the UN MDGs demonstrate: 17 Sustainable Development Goals. There is no goal that can be isolated from the others. We don't need to improve, rather rethink our relationship with water in proactive and constructive attitudes. Proactive: to protect ourselves from disastrous events that water can bring (floods, hydrogeological disruption, droughts); and constructive: to restore the right value to water, as an instrument of economic and social development. These are also the goals of DICAM.

Ir. Granata, Director of the Water Observatory, Service 2 of the Department of Water and Waste:
The Regional Department of Water and Waste and the Water Observatory have experienced a profound crisis till 2015, when an enlightened meeting was held, which focused on the principle of subsidiarity (prioritizing local authorities), with the help of the Ministry and Sogesid Jsc, to undertake a recovery path. The Ministerial decree of 27October 2016 approved the new RBMP. The councillor and the ministry politically contributed supporting the recovery from structural criticisms, to achieve the approval of the new plan.

Ir. Infantino, Manager of the Staff Unit ARPA:
We provided support activities to the Region Sicily for the update of the RBMP. The path to fulfil the plan's goals was troubled, both in terms of times and methods. The troubled path has also been experienced internally by ARPA, which is now coming out from a difficult five-year period. The end of this difficult journey occurred two years ago with art. 58 of the 2015 financial law, which issued ad hoc provisions for a definite source of funding and less restrictions to the staff recruitment. At ARPA there are 250 staff units: the need to strengthen our agency is strong. Institutional tasks are pressing and heavy.
In addition, the Region has delays on all environmental fields, not just related to water, just think that 75% of EU infringements are registered in Sicily and especially in agriculture, but also in terms of waste, air quality, asbestos, smells, impacts of industrial areas. ARPA's activities are supportive to regional authorities, but it is difficult. How difficult it is the task of monitoring and controlling!
We would need another regulatory measure to free the agency from constraints such as lack of funds and staff.
With the 132/2016, converted into law on January 14, 2017, ARPAs become SNPA, no longer Regional Agency but National Environmental Protection System. The legislator's choice was aimed at creating homogeneous controls at national level. It is a very positive change.
There are various activities in place to improve monitoring activities: tomorrow and the day after we will meet with the president and vice president of ISPRA, to define the LELTA Index (Environmental Systems Minimum Levels). This activity also enjoys the support from Sogesid Jsc.

Sorce, Officer of the Ministry of Environment:
This project was made possible thanks to the collaboration of the Ministry (for funding), the ARPA and Sogesid Jsc, the in-house providing company chosen by the Ministry of the Environment.
The project is born from this enlightened encounter. The Ministry of the Environment has considered it a necessity to achieve the goal of convergence, also demanded by the European Commission.
The EC and the Italian Government signed a Partnership Agreement, which set ex ante conditionality for access to the distribution of structural funds for the implementation of the Operational Program 2014-20 under the European regional development fund (ERDF), in the Sicily region.
The governance calls for the participation of all the actors involved. Only with the collaboration you can get results. Resources can only be used properly if there is a collaboration. This transitional period, between the 2007-13 and 2014-20 programmes, does not make it easy: we are in, having to close the old planning and start a new one. In Italy it was difficult to secure the expenditures already in the middle of the first period, now we have to think about the first and also the second.

This Project is parallel to National Operation Programme 'Governance', to use the national resources for project implementation. The aims encompass the compliance of the RBMP, the inclusion of the National strategy for climate change adaptation.
However, the ex-ante conditionality of POR Sicilia has not yet been met.
The regulations go from the EC to the Regions: The Ministry of the Environment (MATTM) has achieved a good result in the collaboration with the Regions, to comply with EC directives: since a year and a half there is the RBMP approved. This is an alignment between the European and National legislations.
A project that is about governance is a successful project. The MATTM is available to listen to the needs, to answer any question: we must be positive that something tangible can be done, through a short-term approach, we achieve something and we start again towards another small goal. A step-by-step approach. We can adapt to European legislation and improve the governance of water resources at the regional and local level, thus improving the quality of the environment.

Prof. Mazzola, University of Palermo:
Since 2010 there has been a stop in the RBMP. The typical approach of the South Italy is of an emergency type, things are done only if there is an emergency.
The Structural Funds, for Development and Cohesion, and the Treaty for the South provide the resources for future expenditures. There is, however, no expenses planning.
They are now appointing a national commissioner for the infractions on the untreated discharges, both for those under procedure (around 160) and already condemned. The penalty is about 400 million euros plus a fine of 350'000 euros per day for all days of infringement.
As a Minister of the South I would like to make a call: There is only one year, we would like to change direction without delegating and surrogates, rather proving that there is the competence. There is no lack of capacity or human resource. What are the real constraints? The organizational ones. There is a lack of organization and governance. Not a lack of technique or knowledge.

Ir. Pineschi, Sogesid Jsc: ***Presentation: The RBMP in the new planning cycle***
Note: the presentation gives an overview of the RBMP in the European and national framework.
The Sicilian engagement is very high: we stay in front of the EC to say that there is also Sicily!
The Partnership Agreement 2014-20 has seen the definition of *ex-ante conditionality* concerning the water sector in Sicily:
- Update the RBMP
- Send information to WISE in time
These, to have European funds disbursed.
In Wise there is also the Annex 0 for everything that has not been done. We do not leave anything omitted.
The project was executed by an agreement between the MATTM and the Sogesid with final date on 2015, extended until March 2017.
The main objectives of the project were to:
- Implement Directive 2000/60 by 2015. There has been a delay in implementation, so:
- Avoid sentences (avoid litigation)
- Meet ex-ante conditionality
- Strengthen the RBMP
Italy in the EU regulatory plan is green (AN: in the EC website, WFD implementation state. Green colour stands for compliance with RBMP approval), but it's just a colour. The problems are big and big. The story is more complex.
First of all, let's start looking at how is the district born:
The Italian hydrographic network outlines the of water bodies and identifies the basins, thus it identifies the *district* as the management and administrative entity of these subjects
The regional basins were already defined by the decree 183/89. The Sicilian district coincides with the Region. This should make the management simpler, there are no excuses for transboundary problems in the district governance, no overlapping administrative responsibilities, in theory!
Then comes the WFD and sets deadlines:

- In 2003: (Art 2) identify districts and entrust management to authority. It never happened in Sicily.
- 2004: (art5) analysis of the district; Analysis of anthropic and economic impact. Characterization is at the basis of the RBMP! Today it's 2017 and we're still late with a full characterization! We need to monitor!

- Then, set the environmental objectives, along with: the resources management, technical and economic coherence and consistency; public Participation; themes integration; For this last point, we do not make a new plan, but a coordinating plan!
- In 2006 we needed to make the monitoring activities effectively implemented.
- In 2008-09: conclude the first PoMs and the RBMP (Art 11 and 13)

And finally achieve a good state in 2015, then update the plan and start the new planning cycle.

I would like to focus on the word *management*: it refers to "government", it is a governmental, a coordinating plan. Is composed by: a cognitive phase; strategic phase; planning and implementation phase.
In our legislation, transposed 152/06, the third part is the WFD transposition and it is very confused.
The RBMP is a piece of the Basin Plan, it is a part of a bigger plan.
Next to the WFD, there is the Floods Directive, 2007/60, not by chance it has the same number. For the Floods Management Plan, Sicily is still defaulting, it is not accomplished, the administrative procedure is still ongoing.
The RBMP has a logical approach to the district planning: setting goals; surveying state of water bodies; analysing gaps; draft PoMs; make an exemption schemes to see what may be exempt from the goal;
If the last step is not fulfilled, there is a limitation in the previous steps. We have identified what is limited, for Sicily, it is the second step: survey of the state of the water bodies. There is lack of control, a lacking monitoring. The EC sees that pieces are missing!
The directive is innovative in the field of monitoring: it includes chemical and ecological status.
The state of the art in the implementation of the WFD and the RBMP at national level concerns:
- The introduction of a district governance, and Sicily misses a district authority!
- Other elements in the A*ction Plan*, with 12 tasks identified by the EC and adopted by Regional working groups. The tasks include e-flow definition, PoMs agriculture, economic analysis etc. etc.
Sicily is in now stuck at the ford: going ahead or drowning?

Prof. Mazzola, University of Palermo
Comment on the presentation: The RBMP should be a feasible plan. It must also identify the financial resources to make the measures possible. I wonder: is it a feasible plan?

Abita, ARPA
Note: the presentation gives an overview of the ecological and chemical status of the regional water bodies, as reported in the RBMP.
The ARPA data reported dates back to 2015, prior to the stipulation of the agreement with the Department of Water and Waste. By 2015 the good state for water bodies is not reached.
Monitoring is by law entrusted to ARPA, it was also the case for the 2010 RBMP.
The holds all the competences for environmental monitoring. Sicily monitoring is available on our website in the form of reports.
In Sicily there are 256 water bodies. Of there, 71 are salty rivers and they are excluded by ministerial decree from monitoring, as there are no biological indicators to define their qualitative status. Then, leaving out the negligible ones, the count drops to 180 bodies to be monitored. Finally, following the ISPRA guidelines 116/2014, we have identified a network of 74 water bodies. Of these, 37 are monitored. 11 are in good ecological status. 50% don't achieve a status more than sufficient. The chemical status is often good; the ecological status is more negative due to the biologic indicators.
-More info on water bodies characterization, not reported-
The reservoirs monitoring network counts 34 water bodies. In 2015, 8 reservoirs have been monitored: no one has achieved good ecological status, but it is sufficient for all. The poor values are due to untreated and agricultural discharges: point and diffuse sources. Regarding chemical state: 50% of reservoirs are in a non-good status due to presence of metals.
The groundwater bodies are of fundamental importance given the difficulty of water renewal and dilution of contaminants. 77 have been identified in the 2010 RBMP, increased by 5 in 2014. We monitor the 82 bodies with stations placed in tunnels, wells and springs. Sampling and quality assessment are frequent. It results that 31% is in the "bad state" category, of which 22% is for human consumption, and 69% is "good". Groundwater bodies have to be more protected!

Ir. C. Arena, University of Palermo and Working Group Sogesid Jsc. ***Presentation: Technical aspects of the new RMBP: Analysis of Pressures and Impacts, Economic Analysis and further aspects.***

The economic analysis, art.9 of Directive 60/2000 aims at defining tools for management and planning to achieve the Directive's objectives. There are two fundamental elements:

- Principle of costs recovery of the water services, including the three cost components: finance, environment and resources
- A justification of the exemptions (derogations and extensions) from the objectives.

The economic analysis in the new update of the RBMP (2016) has seen an organizational and institutional rearrangement of the water services. In the agricultural sector in this 5 years-time it occurred:

- The institution of a unique special commissioner office for all the Sicilian Reclamation Consortia;
- For nine out of the eleven Consortia, the adoption of the so-called Classification Plans, already expected by a regional law in 1995 and again solicited in 2007. The Plan should include an update of the methodology to calculate the irrigation benefits and the allocation of the management costs. These methodologies are not yet adopted.
- Change on the regional financing of the Consortia (Regional Law 13/2014) with obligation of economic balance within 2020 (Regional Law 09/2015).

The water uses in the Region amount to:

- Civil: 528 Mm3/year
- Agriculture: 823.1 Mm3/year (of which 130 Mm3/year of collective irrigation)
- Industry: 132 Mm3/year

Regarding the costs recovery for agriculture, the tariff method expects a full recovery of investment and operational costs. Among the uses in the district, the irrigation use is the most important, but the costs recovery is applicable only for collective use, which amounts to a little more than 15% of the total irrigation uses. The analysis refers to 2010 data and it was carries out only referring to the irrigation service. The costs for the personnel represent in average the 75% of the costs for the irrigation service. Other costs (materials, daily maintenance, etc.) covers the remaining 25%. Considering the total costs of the services, including the personnel, the average cost of the supplied water is 0.42 €/m3. 48.5% of the holdings (per number) and the 50% (per irrigated surface) pays the irrigation water based on the consumption, while 30% (per number) and 35% (per irrigated surface) pays based on a surface criterion. The remaining part, 21,5% and 14%, pays the water based on a non-specified criterion, since it was not communicated during the surveying activity.

As concerns the costs of the resources (Ministerial Decree 39 of 24/02/2015), they are described as the costs of the missing opportunities for other users, consequent to the over exploitation of the resources, over their capacity of renovation. This has to take into account: the water availability based on space and time; present and future demands; renovation of the resource and its quality; economic social and environmental effects producible by the different uses. The cost of the resource then exists only if the alternative on the water use produces an economic value higher than the present use, and it is quantified by the deviation (subtraction or unavailability of the resource) that the present uses determine.

The costs of the resource are linked to water allocation inefficiency, between sectors and in time. The quantification of these costs entails the definition of optimal allocation scenarios and the evaluation of the deviation of the current scenarios from the optimal. Examples of practices that determine the costs of the resources are:

- Leakages in the water networks
- Inefficient irrigation methods
- Unbalance in the allocation among different uses

In Sicily, the allocation inefficiency is mainly due to the high losses in the water network, both in the urban and rural areas. The irrigation practices adopted in Sicily are instead more efficient compared to the rest of the national territory: 41% in Sicily, 17,5% the Italian average – Istat data 2010.

The economic analysis also reports the costs for the implementation of the measures aimed at achieving the WFD objectives. Sources of planning and financing are, in case of agriculture, the RDP 2014-20 and the Development and Cohesion Fund. Measures are classified following the WFD guideline as 21 key type measures (KTM). Of relevance for the planning of the Sicilian District in the agricultural sector:

KTM 2 and 3: Reduction of pollution from nutrients and pesticides of agricultural origin

KTM 8: Water efficiency in different sectors

Ir. Granata, Director Service 2 Water Observatory, Regional Department of Water and Waste. ***Presentation: the RBMP implementation: perspectives and criticalities***

The updated PoMs contain the same measures as the previous plan, plus there is an evolution: it makes a hierarchy of the measures water body by water body. The RDP 2014-20 has a new planning and new resources.
For the achievement of environmental objectives, 6 categories of priorities are defined, with sub-measures and actions they amount to approximately 100 measures (divided by type: structural, management etc etc).
These measures have been reorganized for a total of 26 KTMs.
The RBMP includes pressure analysis, monitoring and measures.
The term management (management plan) wants to overcome the vision of a fixed action line and instead embraces a territorial planning system run by a complex governance.
Many elements represent this complexity: more than 100 measures, complex system, circular feedback process and new planning cycles as set by the EC.
It must be admitted that without the deadline and the conditionality of completing the plan for the disbursement of funds we would not have completed the draft. We do not have a propensity to a strategic approach, we have succeeded because we were forced. Instead, it is necessary to change our action line towards a proactive approach. A strategic approach identifies the criticalities and the priorities, implements a continuous monitoring process and makes an analysis of the measures efficiency.
There are several criticalities to face: not only intrinsic but also systemic. Intrinsic criticalities are represented by a high number of actions, a complex planning system, a high number of stakeholders. Cultural and systemic criticalities involve: a vision of planning as a hierarchical, regulatory, with an indefinite temporal deadline.
A major issue in our planning is that it has an indefinite time limit: there is no deadline. Instead, a conditionality is useful to make us work: an example, I do not give you the funds for the South unless you first make the water resource planning.
We have to change vision and switch to a multidisciplinary and integrated approach, with a district level governance. We have to go from an emergency policy to ordinary prevention, which takes into account future generations. We have to ensure a better integration between various levels of planning, instituting and reinforcing the collaboration within the different planning processes. We have to ensure horizontal and vertical integration at the same time. Each administration has to take its responsibilities to implement the policies. We need to improve our knowledge framework, monitoring and planning, to ensure promptness in the realization of the projects. Yet, public participation is essential. The *River Contracts* are useful tools in this: they are helpful to define and implement integrated planning tools at district and sub-basin levels; they are strategic planning instruments for the defence and proper management of the water resources, contributing to the local development. They include the participation and involvement of local institutions, public and private subjects, to define objectives, strategies, actions and competences. As said during the second World Water Forum in 2000, the River Contract allows to adopt a system of rules in which criteria of public utility, economic yield, environmental sustainability act in equal way in search of efficient solution for the requalification of a river basin. (A river contract encompasses: a knowledge framework and a strategic framework; the evaluation of projects, policies and actions; the bodies of institutional management)
Why do not you combine everything in one process? And do wait until the last compulsory 6 months!
It is also useful to speed up regulatory procedures, further streamlining the regulatory process.

Prof. Mazzola, University of Palermo

It is not possible to continue with constant requests for delegation and help on matters related to water, waste etc. Where the administration does not work, nothing can work
Many say that a second Fund for the South would be worthwhile. The first one was born with a strong technical structure, compact and cohesive. It was partly funded by the World Bank that provided expenditures' supervision.
Then with the Marshall Plan, most of the funds were allocated for the reconstruction of the funds. The State had to report to the World Bank. The funding subject (WB) was far away. The Regions today are either too small or unable to secure a third party, which does not fulfil the administrative tasks and endures on this condition of being unable.

Sorce, officer at the Ministry of the Environment

The MATTM works with a collaboration of intents to overcome criticality with the most suitable tools.
The PON Governance 2014-20 is about environmental matter. It is national, it covers all the Regions.

The Region's needs are heard by MATTM, which evaluates a short-term collaboration with Regional offices. MATTM operates on a sustainable development line. Provides financial instruments through a Cohesion Policy and Multilevel Governance. Technical assistance is always provided.

Ir. Lo Bello, ex-director Water Observatory
The stakeholders and public participation is fundamental in the territory. There is a need for a change of mentality, a different approach to the environment. In the Valley of Simeto we are starting from a participatory representation, to develop more awareness within and about the territory. Meetings are needed, even the mayors do not know the RBMP. Let's make a comparison with the most advanced region in this: Emilia Romagna. Sicily has a billion euros allocated to fix the water treatment plants, yet projects do not start. The Emilia Romagna has lower tariffs than Sicily, but these cover the environmental costs. Let's stop asking for resources when we do not know how to use those we already have!
Even today we have had the demonstration: political participation has been unseen: the assessors did not show up.

A. Leto, activist in the Forum for Water as Common Goods
Since 2009 there is a stake in water resource management. The regional government is defaulting then the national government assigns a commissioner to the regional government and so on.
The funds allocated to the municipality are always the same ones that have been put into circulation.
The staff is not qualified, how can it make plans? Approved projects are placed in the drawer, never implemented.
The law's articles are not taken and operated by the Regional President Crocetta and the Counsellor Contraffatto.
They are playing for time. There is a ticket between State and Region. A concentric attack to public water management and a profit on water supporting its privatization.
Where are the measures to mitigate climate change? They don't appear anywhere. Where the green measures? The circular economy? Is there a chapter in the RBMP?
The European Commission requires the plan to be climate change proof. It does not identify a unique technology but it favours the tendency to be climate proof.

Ir. Pineschi, concludes:
The appeal of today is that we need to change our point of view, according to what Granata and Sorce said.
There is a need for a district authority. We need a light provision to set up a referring subject for the national and European level about all these topics. We need a new planning.

EVENT 2.
26 APRIL 2017, DAMS IN SICILY, UPDATE OF THE HYDROLOGICAL STUDIES, COMPLIANCE OF DRAINAGE FACILITIES AND STRUCTURAL MAINTENANCE WORKS

Seminar organized by the Italian Hydrotecnique Association in collaboration with the Professional Association of Engineers.

Ir. Greco, Director of Service 4 ' Water Infrastructures', Regional Department of Water and Waste. ***Presentation: Current situation and perspectives of maintenance works of the Sicilian dams.***

Our service is appointed for the management of the dams and the related infrastructures. We elaborate studies and projects to improve and reinforce the managed infrastructures, we carry our monitoring and assist the Consortia to plan and realize irrigation works, we handle the relationship with the National Directorate-General for the Dams and provide technical-administrative coordination of the project for the reservoirs management.

In total, there are 41 dams in operation in Sicily, for a total volume of 1'129Mmc, plus three unfinished dams and 2 temporary out of operation. Among the 41 in operation, 19 are normally working, 8 have applied a capacity restriction, while 14 are experimental reservoirs.

24 reservoirs are managed by the Service 4, amounting to 578 Mm3, representing half of the total Regional volume. These are divided among the territorial coordination of West, Central and East Sicily. Many of them are for mixed use, combining irrigation and drinking purposes. The irrigation use represents the 62% (108Mm3), while drinking use is 38% (66Mm3). This data comes from the Service 1, responsible for the allocation of the water resources. [For the Lake Poma: 12Mm3 for irrigation; 27 for drinking water].

Different issues affect the dams: technical-operational; environmental; administrative. Many of the problems originated during the planning phase and have been dragged. When there are structural criticalities, the National Service of the Dams imposes restriction on the storage capacity. This, summed to the sedimentation, results in a limited capacity of the reservoirs.

Many maintenance works are financed to combat the causes and restore the optimal reservoir conditions. Different typologies of works are planned: restoring and/or improving the hydraulic capacity and the drainage system; restoring the full operation of the discharge facilities; Structural recovery of the operational structures; banks and slopes reinforcement.

Very relevant are the administrative criticalities. The Region Sicily is not used to manage this service. Laws and communications are regulated by administrative procedures that have little to do with technical problems. In winter we often store more water that what it is allowed by the National Dams Service. We do it because urban areas downstream the dams often experience flooding. But it is dangerous. Fortunately nothing has never happened. The problem is that the responsibility of the engineer is entrusted to the Region. Our politics cares about water only when there is a water shortage or there is the need to balance the human resources. We need to rationalize the distribution of the staff units over the territory, to plan on time the personnel replacement, given their high average age. Moreover, economic resources are not sufficient to cover the costs of the personnel, of the management and of the electric consumption. This burdens the Region. The money destined to the Consortia have been used for the operation of the dams. Moreover, the economic resources have diminished: for 17 dams managed in 2010 we had allocated 9.5 million euros; in 2016 we manage 24 dams and we only have 3.1 million available. We need more personnel to place on the dams monitoring and control operation.

For the maintenance works, the funds come from the National Dams Plan (Resolution CIPE 26/2016), from the Pact for Sicily (Resolution CIPE 25/2016), and from the Operational Plan ERDF (ERDF – Resolution 267/2015). In total they amount to 135,70 million euros.

To conclude, we need a holistic and interdisciplinary vision of the 'dam' concept. Many neglected factors over the realization and operational process of the infrastructure have to gain a central role. The dam represents the hub of the system environment-infrastructure-territory, it is essential for the territory development and protection and for the restitution of the water resources to the citizens and the environment. This entails the understanding of a new and different governing authority, led by the regional administration, that has to coordinate and efficiently plan, giving adequate economic and human resources to the protection of a complex and fragile system, fundamental for the territory and for the population.

I wish that the politics attention will go to the water resource. Within the Department of Water and Waste, who handles water matters is not active or influent in the political scene, while who is working on the waste sector raises his voice.

Ir. Catalano, National Ministry of Infrastructures and Transport, Directorate General of dams and water and electric infrastructures ***Presentation: Control of the dams in operation in Sicily (presentation not available)***
Our task is to control the dams in operation. We are a technical body of the national government, for the structural monitoring of the dams. Relevant changes that have recently occurred is that funding comes from the national government to the Region for infrastructures management, rather than political events. Now, we don't focus anymore in the development of new infrastructures because the strategy has changed: there is no interest anymore and also difficulty in building new infrastructures. In Sicily, there are in total 38 reservoirs in operation. These are interconnected naturally and artificially, allowing a better and more efficient allocation.
By law, two times per year we make inspections and write a report. A major problem is represented by sedimentation within the dam, that can cause the clogging of the bottom discharge pipe. Moreover, the filling with sediments reduces the storage capacity of the dams. The capacity lost due to sediment filling amounts to 105.5 Mm3 in Sicily. Out of the 1.15 billion of m3 of potential storage capacity, 750 Mm3 represents the actual capacity.
It is so complex to reinstate the normal operation of a dam. For the Ancipa dam: 4 tenders, plus 2 projects, plus a special commissioner were needed!
There are also dimensioning problems. Project discharges are not the same of those recorded. In Sicily, floods are managed by the Civil Protection, there is no regulation yet in the matter of floods safety.
- *Examples of regional dams structural problems; presentation not available* -
Concluding with some considerations: the knowledge degree on the regional dams is incomplete, especially regarding the planning of the maintenance works; there is the need of an accurate management of the dams in the territorial and environmental context; the delays of the Region Sicily in the compliance with the regulation could have a fatal result during the next flood events.

Ir. Speciale
The topic 'dams' returned again central in Sicily. We don't have any informative system that is common for the different managing bodies of the dams. There are many managing subjects. A coherent and common system would be aimed at improving knowledge, management and maintenance of the reservoirs.
In the Italian Dams Registry the data don't correspond to the ones available by the Region Sicily, Service 4. Information is heterogeneous and this obstacles an efficient management. A Dam Information Management System (DIMS) is essential for a correct knowledge, evaluative and operational level.
Regarding the sedimentation issue, the handling of the sediments is problematic, how do you dispose the sediments? Moreover, the problem is not only within the reservoir but also in the upstream reaches. What is generally missing is a maintenance approach. Before to do new things, we should maintain what is existing.

Ir. Greco
We need synergic works. There is a need of collaboration with the Department of Agriculture and with whom is managing the basin. The problem is felt: there is a need of coordinating the works on the dams and within the basins. There are continuous reforms, replacement of councillors, different representatives have to understand the situations and what to do. Moreover, the waste matters have priority over the water, that goes in a subordinate position.
In 2015, the Department of Water and Waste has called for a technical task force between various department to involve different subjects to give opinions in management and planning matters. Designers were invited to review the studies. Now, we are planning to call for another task force. The Department of Water and Waste is a structure established by the Region Presidency, but there is no Assessor present. It is absurd. There is the need for an adjustment from the formal point of view. We have presented our management plan and we hope that these can be approved as soon as possible. The fact that directors rotate among the different services and many reforms follow each other don't help the implementation of projects, nor the quickness and the efficiency of the administration.

EVENT 3.
27 APRIL 2017, RECLAMATION: RESOURCES AND INVESTMENTS AVAILABLE TO THE AGRICULTURAL COMPETITIVENESS, TO THE ENVIRONMENTAL AND TERRITORIAL REQUALIFICATION

Public debate organized by the Agroindustry Workers Federation (Farmworkers: branch of the Italian General Confederation of Labour – CGIL FLAI) Palermo

Tonino Russo, Secretary-General FLAI CGIL Palermo - Speech
Fifty-two years ago, on February 27, 1963, after dozens of complaints and mobilizations led by Danilo Dolci and his collaborators, the construction of the dam on the River Jato began.
Completely completed after just five years, it became - together with a democratic Consortium that managed the water resource - one of the symbols of the battle for improving the living conditions of the people of western Sicily and the commitment against the mafia influence on the territory.
Dolci undertook a series of nonviolent struggles, among which several hunger strikes. In November 1955, he began the protest that raised the problem of the Jato dam: during his research, Danilo had discovered that, to improve the agricultural and economic situation in the area, a project had been discussed for many years, but was buried in some ministerial office: a dam on the river Jato. The Fund for the South authorized the construction of the dam on the ninth day of fasting. The dam Jato, with a capacity of 72.5 Mm3, is still in operation, its water is used for drinking purposes by the municipalities of Terrasini, Cinisi and the western area of Palermo. Already then, there was awareness not only of the fact that water is a public good that needs to be protected, but also that it represents a great opportunity for development and protection of the territory, especially for the agricultural sector. Thanks to the construction of the dam and the establishment of the Jato Irrigation Consortium, it was possible to realize all the works necessary to make the territory efficient to the production and the social development.
The Reclamation Consortia arose in Sicily, as in the rest of Italy, at the end of the 19th century. The arrival of Single Act of 1933, establishing the Reclamation Consortia, found in Sicily several already constituted Consortia, according to the rules in force by then and operating in the different sectors of the Reclamation.
In Sicily, after the end of World War II, the problem of the transition from the latifundium and the farm hands to small farmers took place in a completely *new institutional setting*. In fact, in 1946, the Sicilian Region was established, to which was granted exclusive competence in agriculture; matters on agriculture and forestry, land reclamation, support to the agricultural production (along with industrial production) and the promotion, distribution and defence of agricultural products were entrusted to the legislative power of the Regional Assembly, "within the limits of the constitutional laws of the State and without prejudice to the agricultural and industrial reforms deliberated by the Constituent of Italian people ".
The *agricultural reform*, in its two components of a) parcelling of the latifundium and consequent land assignments and b) technical assistance to farmers, was managed by the Regional Department for Agriculture and Forestry, which in the early years collaborated with the existing Reclamation Consortia and with the Sicilian Latifundium Colonization Authority. The latter, in 1950, has assumed the name of the Agency for Agrarian Reform in Sicily (ERAS). In these years, more than forty trade-unionists were killed by the Mafia and the latifundium owners. They were battling to enforce the Gullo law, which recognized to the co-operative farmers the right to obtain concession of the uncultivated and poorly cultivated lands. That represented a major transformation for a region where three-quarters of farm workers did not own any plot of land or possessed so little to be considered poor.
In the 60s, in Sicily, 30 Reclamation Consortia are counted in the census. It is right at that time that the activities of the Consortia, also thanks to the financial aid of the Fund for the South, become significant:
- dams, irrigation networks, roads, electric lines, rural aqueducts, hydraulic works, reforestation, production facilities, marketing facilities, all works that have contributed to a profound transformation of agricultural land and to the formation of large, medium and small holdings that have established in the production process.
The law stipulates that the management of irrigation area built pursuant to this regulatory provision may be entrusted to the Agrarian Reform Agency in Sicily (ERAS) or to the Reclamation Consortia. The construction and management of large collective irrigation networks was carried out by the ESA (Agricultural Development Agency) and the Reclamation Consortiums: from 1961 to 1992 they realized 14 dams. In the 1980s, distribution networks were made of asbestos-cement pipes; today the Consortia have replaced the old open channels with pressurized pipes.
In total there are about 16 collective irrigation systems, accounting for a total irrigation area of 164’000 hectares, of which some 80’000 are irrigated. Of such systems, 7 are located in western Sicily and 9 in the

eastern. Many originated as Consortia for Road Construction, others are involved in the construction of rural aqueducts as well as other hydraulic and forestry facilities.
In 1995 with the regional law no. 45, the Sicilian territory is divided into 11 districts, to which correspond eleven Reclamation Consortia, replacing the pre-existing ones.
The law, in addition to confirming the tasks related to maintenance, operation and management of irrigation and reclamation works, has given the Consortia responsibilities on environmental protection and water resources defence. The state of the reclamation work is different in the various districts, this is due to the difficulties of the problems faced, the burden that comes from the territories, the study and the research that is carried out, and above all the financial availability to which the Consortia have, in addition to efficiency, transparency, dynamism and prudence of the single Consortia in the use of the financial resources.
The main purpose of these bodies is to provide a territorial supply corresponding to the specific water needs for agriculture. Sicily, which is about 26'000 square kilometres, has an estimated agricultural area of about 16'000 sq. Km. The ratio between total area and cultivated land is equal to 61% of the territory. A very good percentage compared with the national rate of 49%. In such landscape, the central role of the Reclamation Consortia (Article 2, Law 36/94) must be recognized as "a rational management of available water resources in agriculture, including treated wastewater for the development of agricultural productions, for the environmental protection and the enhancement of the territory. In eastern Sicily, there are about 243 thousand hectares, of which about 90'000 are involved in irrigation. While in western Sicily there is an area of about 84,000 hectares, of which about 40,000 are irrigated. In Sicily there are 2'194 employees of Consortia of which 1159 with a permanent contract, 338 employees with 151 working days per year, 162 with 101 days and 535 with 51 days guarantee. Today the Sicilian Consortia cost over 60 million euros for the fulfilment of their duties. They have a public funding of about 45 million, about the 80% of their cost; while, from the activities they carried out, they invoice (missing data – however, negligible compared to the 45 million of public funding).
From these economic data, it is clear that without the public support the Sicilian Consortia make it alone and that the many disputes over time, especially regarding the poor management of some of them, have led to the condition of almost bankruptcy. The Reclamation Consortium 2 Palermo is one of the most virtuous in Sicily. In recent years, thanks to the clever and good management by the new Director and the Commissioner, it has reduced the disputes, increased the revenue, and restored the fundamental principles of legality within it. In fact, I think this is the only one in line with the payment of salaries to the staff.
Within Palermo's province, the irrigated area amount to 3'300 ha, but the potential supplied area is 16'130 hectares. Areas and the water withdrawal from the dams are: Gargia Dam: supplies 1'750 ha approximately and the water withdrawals is about 1 million cubic meters; Poma: 7'150 hectares, 8 million cubic meters; Rosamarina: about 7'230 hectares, about 20 million cubic meters; for a total water consumption for irrigation of 29 million cubic meters of water.
In 2016, approximately 6'000 contracts were signed for total takings of about 1,600,000 euros. Nonetheless, there is much work to be done, more efficient and transparent services must be provided to farmers, thus completely extinguishing the burdens of illegality. Everyone has to pay less, an old slogan says. In my opinion, some twists of the past need to be corrected. For example, I think it is necessary to introduce fair water tariffs: water from the dam of Mario Francese is sold to Siciliacque to 0.04 cents, that in turn sells it to the users for more than one euro, while farmers pay irrigation water 0.15 cents per m3.
Since 1992, the boards of directors have not been renewed and they keep going with appointed Commissioners. Indeed, this is currently a sub-sector that does not renew, but Consortia are the true connoisseurs of the area, to which farmers often go to know the vocations of the land and gain useful advice, they are a central and strategic element for agriculture. The association model of the Consortia could also extend to other activities: agricultural divulgation, promotion of the territory, marketing of products.
At present there is a reform that merges the Consortia from 11 to 2. We hope not only that jobs will be safeguarded and employment levels kept, but we also hope for the training of staff, aimed at their efficiency. In our view, this has to occur with the creation of two new subjects that do not carry the debts, the disputes and the poor management of the old Consortia, otherwise there is a risk of creating two new structures already with great difficulty. For these reasons, we think that Consortia cannot continue to be carriages of people without expertise, but they must have a serious management, everyone has to pay the water at a fair price. Consortia must become real providers of agriculture services. This is of interest to all, and above all to farmers, since public, transparent and legal management is the necessary condition for restoring to the agriculture the central role that this sector deserves in the economic landscape of our region. Indeed, in the places where the Consortia have not been established, the water resource is still managed by mafia powers and the crime. This is not the case in Partinico since the dam was built and thanks to the battles of Danilo Dolci and many farmers,

peasants and trade unionists who, together with him, have fought against the Mafia for the work and the development of this territory.
For the things we have said, we still think that politics has to do its job, that is to create the conditions for implementing a project, a vision of how we can develop and consolidate the agricultural sector in Sicily, even making use of the funds by the RDP. There are PRD planning problems with the Consortia that need to be solved. We live in a land where there are great excellences, but also great contradictions. Where some of our products have very low prices, just think about grain or grape, and where competition is unfair. A land where labour contracts are often not respected and where in some areas there is the shameful shadow of the "caporalato" (foreman who exploits workers). There is a need to create the conditions for investing in development; the land not allocated yet after the agrarian reform has to be given to young people, allowing them to invest in a project that valorises the vocations of the area and creates the conditions for the supply chain to end with the market sale; as the Dam took water away from the control of the mafia, there is a need to take away from the mafia also the trade of our agricultural products, which are bought from the farmers for a very low price and resold ten times more expensive on the large distribution chain. The Mafia is managing the markets and decides the prices. Here Consortia can play a central role, as we have said, to provide and guarantee services but also to guide and promote and act as a glue for the associated farmers, so that a territory can develop and emancipate through the labour (employment).
For these reasons, CGIL has promoted referendums on the vouchers and on the responsibilities linked to the tenders, to reach a new universal rights chart for workers. Ever since the trade-unionists were killed for workers' emancipation, we believe that there cannot be any quality-product without a quality-work and there cannot be any dignity of an individual without a respectable job that makes him noble.

Special Commissioner of Reclamation Consortium West Sicily, Ir. Greco
The projects are there. Regarding the water availability, it is essential to deepen the argument: the water volumes of the Poma reservoir are destined both to agriculture and drinking purposes. The Region has the task of supervising the AMAP in order to allow for the supply on the East side. The technical task force of Service 1 and 4 of the Department of Water and Waste, decides how to split the water volumes across Sicily. A temporary connection (for 400 l/s) for the Scillato aqueduct is made to lighten the withdrawal pressure from the Poma reservoir. For 2017: volumes are sufficient for irrigation. Additional 15Mm3 were taken from the Poma for Palermo in 2016. Therefore, the competition with the potable use is high and this is already a complex problem to manage.

Ir. Di Trapani, Director of Dep. Of Rural Development
Since three months I am the general director of the department. We set up the management and operation strategies within the agricultural sector, to ensure coherence between the National RDP and the Regional RDP.
In 2006, a regional regulation gave the possibility to employ workers for more days than the guarantee.
The Law no. 14 has changed the financing to the Consortia. Before, they were funded by the Region. From 2012, we don't transfer money to them anymore. In 2015 a new planning has been asked. The Consortia have to draft the "Classification Plan". They were first approved in 2012, but implementation has not taken place yet. They are losing their value. The National RDP contains measures to finance the Consortia. We agree with them the water withdrawal concessions. They have to define programmes and management of the irrigation areas.

Assessor to the Dep. Of Agriculture, A. Cracolici
The sector of the Consortia is a sick one. Out of the 200'000 hectares of potential irrigation surface, only a third is supplied. The agriculture has in the past a marginal role. It has no economic role like this in the future. We need to revaluate the agriculture. We mistreated it. During the 50s and 60s great investments have been made for big infrastructures as dams and aqueducts. They were big tenders that lasted 50-60 years. After 60 years, documents and tests to the structures are missing. Dams were built, but not enough networks. The existing ones are outdated, crumbling. The role of the Consortia was first to guarantee water supply, according to the availability, and give it for free as much as possible.
This doesn't work. Cases were reported in which the Consortia employees were installing illegal networks. The internal work of the Consortia has to be monitored and assisted. But reforming the system is not easy.
The important things to do are on the financing: we need to invest on the network; to increase the number of supplied farms and increase the number of paying subjects. This would allow to reduce the costs of the Consortia and reduce the tariffs to the farmers. If everybody starts paying, they would have to pay less.

New strategies have to be introduced: if you don't pay the water, I won't supply you next year. This is a legitimate reasoning applied only in the last years. Farmers don't pay because this this and that. They use excuses. The must pay. The agricultural sector is at the bottom of the agro-food one. It produces food. Today, the agriculture has regained importance, this is a moment of future perspectives. We have opened the tender for new establishments for young farmers. But before this, services have to be guarantee to support the development of the area. Water is the main resource! And if you want water, you have to pay for it. The Region doesn't pay anymore. Before, it was paying the 95% of the costs of the Consortia.
For the future, the agriculture has to be seen as the strategic sector. The economic resources have to destined to the networks, otherwise it is like a dog chasing its own tail (a vicious circle).
We need to increase the production quantities. We have now a big food distribution system, but not a big production. For this, we need to reinforce the agricultural services. And what it needed is a reorganization, not a reform. Here, I ask aid to the trade union and to the workers to rebuild a public consensus.
Politics has acted as nothing was happening. Now it returns to be efficient. We are determined to carry out the reorganization of the Reclamation Consortia, so that the agricultural services will be guaranteed and the farmers supported in their production.
Millions of euro are spent for the electric energy linked to the water systems. We need to modernize the whole Sicily. We have to be up to the challenge that economy poses to us.
The agro-food system is at the basis to reconstruct our future.

President of CIA (Confederation of Italian Farmers)
We need to regain contact with the territory. Water has to be publicly and fairly managed. Illegality and unregulated activities have to be battled. We need to find a new working public and private model.

Sara Palazzoli General Secretary FLAI CGIL
There are major points that have to be fulfilled, in order to develop our territory and support the agricultural sector:

- Expertise is fundamental. Competences have to be clear and entrusted to qualified people;
- Lands confiscated to the mafia have to be reassigned and farmed;
- Supporting made in Italy;
- Improving planning;
- Looking ahead, making long-term scenarios;
- Focusing on the land defence and on a fair water supply;
- Combating illegality;
- Tariffs and funding has to be appropriate;
- Funds should be linked to specific projects for workers;
- Reclamation Consortia have to be reorganized, costs for inefficient management have to be abolished;
- Farmers should be encouraged to associate;
- We have to create an efficient working system, in which farmers have a respectable, sound and legal job.

Enzo di Paola, Trade Unionist
In Partinico, we suffer from water scarcity issues. The cause is the competition between different uses. Palermo has the 70% of the water from the Lake Poma. It has the priority. But, the use for agriculture is aimed at the economic development of the area. The Irrigation Consortium was a democratic agency. Now the Reclamation Consortium is inefficient. There are many illegal links to the network and people steal the water from the public networks. Everybody is silent. Nobody complains or cares about it. Each one has found autonomous solutions.
The managing system is centralized in Palermo, it is not easy to reach. Communication problems are felt, there is a lack of management in the rural areas.
Before the dam was constructed and the Irrigation Consortium was established the water resources, wells and springs, were controlled by the mafia. However, this didn't affect the dam. Yet, after the dam's management was taken by the Region, Palermo had the priority over the agricultural use.
The battle that the trade union did, was to have the full exploitation of the dam's potentiality. But many links to water networks were never made, sedimentation is a big issues, the storage capacity is now limited…
Now, the water from the dam is not enough for everybody, we need to split it. Next to a correct management and prioritizing investments to water infrastructures, an educational process must take place. Awareness on the importance of the resource is missing.