

## **THE ENVIRONMENTAL PROBLEMS OF THE PIANA DEL SIGNORE (GELA, SICILY) FOR A CORRECT AGRONOMIC, CULTURAL AND LANDSCAPE UPGRADING AND ENHANCEMENT OF THE AREA**

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### **Abstract**

In Sicily it is witnessing an environmental degradation that can be conducted to the human activity and the already known process of desertification. The present study had as object the c/da Piana del Signore in plain of Gela being an area characterized by an extreme aridity and salinity. Through consultation and study of the various researches realized on the area, the various environmental and territorial characteristics outlined, highlighting the issues and possible improvements. The objective was to outline the damages caused by man proposing possible routes for a correct requalification of the area in order to enhance a landscape of great agronomic and naturalistic interest. In fact to enhance that area it is necessary to restore it and, in this case, it is to undertake an activity of depollution, given that today in the area are deposited waste of any natura therefore highly polluting.

**Keywords:** *Gela, saline soils, aridity, pollution, upgrading.*

### **Introduction**

In Sicily it is witnessing a degradation of the productive potential of soils, it has now initiated the process of desertification where responsible is the man and climate change. The territories most affected are the plain and the hill (Fierotti, 1975; Raimondi 2002). Among the processes that lead to the reduction of soil's fertility there is the process of salinization that is distinguished by primary or secondary depending on whether the process is originated from natural causes or anthropogenic. The Piana del Signore falls into the area of Gela (CL). It is a vast alluvial plain subject to a process of primary and secondary salinization and to phenomena of water stagnation. In fact downstream of the freeway in course of construction, the surface of the soil is characterized by an irregular plant cover and by a surface of salt crust where there is no vegetation (Fig. 1). Instead in winter it is possible to find marshes of considerable size and ecological importance that create a unique landscape little cozy for man but highly frequented by migratory animals and not only. As said affirms that the area cannot be destined to an agricultural use but results to have a certain importance from a naturalistic point of view. In fact part of the area falls in the Sito di Interesse Comunitario (SIC) and Zona di

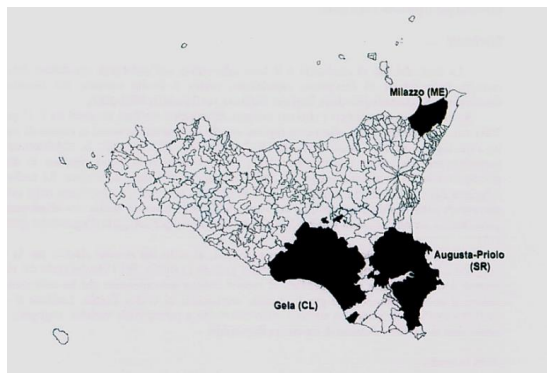
Protezione Speciale (ZPS) "Biviere Macconi of Gela". Instead the innermost part of the area above the freeway is characterised by flat and hilly areas where soils are no longer subject to water stagnation in following a reclamation made around in the fifties and sixties. These soils were intended for an agriculture use and in particular they were used as pastures, to the cultivation of the artichoke and arable land. The benefits obtained with the reclamation, today they are getting less as a result of the realization of the road at the service of the municipal cemetery Farello and freeway, as they have occluded and interrupted the ditches by modifying the outflow of waters. Therefore the Piana del Signore is marked by a "cultural landscape" having both an agronomic and naturalistic interest.



**Figure 1**  
*Landscape of Piana del Signore (21<sup>th</sup> June 2017).*  
*The white area is due to the saline crust.*

In the sixties in the southwest of the Piana del Signore it was realized, on the initiative of Enrico Mattei and realized by Anic (Azienda Nazionale Idrogenazione Combustibili), a petrochemical pole which included chemical productions, thermoelectric power and refinery. The activity of the aforesaid petrochemical pole has determined in time at Gela (together with Augusta-Priolo (SR) and Milazzo (ME), an area at high risk of environmental crisis" of Sicily, given that it pollutes in a significant way the atmosphere and other environmental matrices increasing the incidence of tumors in the inhabitants of urban border centers (*Fig. 2*). In fact in the three industrial poles of Sicily it has been observed a greater number of hospital admissions and mortality (often between them not directly proportional) because of tumor diseases and not. An example of a relationship between a polluted environment and health is the malignant mesothelioma in which is now note its close correlation with long exposures in areas contaminated by asbestos. In order to clarify on the relationship environment-health, in 2004 the European Commission has adopted an Action Plan "Environment and Health" so as to assess the environmental pollution on human health. The contact with polluting material takes place by inhalation, dermal contact and ingestion of drinking water and vegetable products irrigated with contaminated water or in which the plant has absorbed and not metabolized the contaminants present in the circulating solution of soil as for example hexachlorobenzene. It is possible that the milk obtained from animals fed to pasture on contaminated soils is also contaminated since generally animals ingest a certain amount of soil (specifically ingest the salt crust). In

particular the milk may contain dioxins, hexachlorobenzene, polychlorinated biphenyls (PCBS) and polycyclic aromatic hydrocarbons (PAHS), but in the latter case undergo a partial degradation with consequent formation of intermediate products considerably harmful.



**Figure 2**  
*Industrial poles of Sicily Region*  
(Source: WHO EURO, 2010)

In the document "Stato della Contaminazione e Attività di Messa in Sicurezza di Emergenza", edited by or on behalf of the MATTM (Ministero dell'Ambiente e della Tutela del Territorio e del Mare), there is an environmental survey conducted in the industrial pole of Gela where it is confirmed the serious pollution of the soil and groundwater and it is reported that it has a contamination by arsenic and mercury, dichloroethane (DCE), vinyl chloride monomer (CVM), benzene and other carcinogenic PAH, nickel, cadmium and beryllium. In the case of soil the concentration of pollutants are lower but still high. The mercury is well held by the soil and for this reason the contamination by this heavy metal will give its negative effects for a long time. The refinery of Gela is the only one in Italy which used as fuel the pet-coke (solid residue of the process of coking) that has a high calorific value but contains sulfur, heavy metals and PAH. The use of this fuel has done so that Gela polpute it of arsenic, molybdenum, heavy metals, dioxins and other. The industry, to try to counteract the heavy pollution, uses the SNOx process for treating the fumes emitted and possesses a biological implant for treating oily wastewater and the urban waste. In recent years the petrochemical pole has gone through a severe crisis that has hit all the petroliferous productions of the West which in 2014 led, also as a result of a serious fire, to the definitive suspension of industrial activity. In the same year Eni, to try to save the numerous jobs, has announced the launch of a project consisting in the conversion of the old refinery in Green Refinery which will consist in the production of biofuels transforming palm oil, waste oils and animal fats. In the perimeter of the refinery, in areas unused now, will be realized photovoltaic implants, a hub for natural gas and possibly part of the area will also be dedicated to the cultivation of shrimp. The Green Rafinery had to begin its activity in 2017 but this was not because of the various delays in the authorization procedures. The area is not only polluted by industrial activity

but also the various dumps present in the area and the intensive green house, that makes a disproportionate use of pesticides and fertilisers and burns the plastic cover, are responsible. The European Directive of 1996 "Integrated Pollution Prevention and Control (IPPC) (transposed in Italy in 2005) suggests the need to draw attention to emissions, seeking to reduce them by the adoption of the best techniques and/or available technologies and to take into account the production chain-emissions-pollution-exposure - effects on health and the possible environmental impacts and to respect the principle that those who cause damage, are constrained to pay.

### **Materials and Methods**

All the publications of the work carried out in the area of study have been collected making it an historical excursus in such a way as to obtain a series of useful data in order to characterize the area. Raimondi has undertaken and performed alone or together with other numerous scholars in the Piana del Signore as regards climatologic, pedologic and agronomic aspects. In 1994 Raimondi undertook his first study in the Piana del Signore with the purpose of characterize climatically the area and to that end he used 4 Climatic indexes (index of Lang, De Martonne, Crowther and Bagnouls and Gaussen) and realized its respective cartographic elaborates. It was taken into consideration data processing of climate of the period 1965-1994 of the Hydrographic Service of the State in order to outline the trend thermo pluviometric of the area and he also obtained the Peguy's climograma.

In 2000 Raimondi took two other studies. The first concerned the temperature regime of the soil and the winter temperature at 15 cm depth that is an important quality of soil from an agronomic point of view, while the second study concerned the observation and the description of the motion of the water in the soil and its reply in the process of salinisation that characterizes the area. In 2005, thanks to the information acquired through the years, Raimondi codified a new index, the Winter Need in Water Surplus (FISI) and finally, in 2009, he observed the change of the landscape during the course of the year.

In order to the lithological characterization were used in particular way the geotechnical report of Catania (2011) and the lithological paper of the catchment area of F. Gela and territorial area between the basin of F. Gela and the basin of F. Acate (Tav. No. 2, scale 1:50000; 2006).

The pedologic classification of soils located in the Piana del Signore has undergone radical changes with the time in relation to the knowledges that were gradually acquired. The material taken into consideration has focused on the Carta dei Suoli d'Italia of Mancini et al. (1966), Carta dei suoli della Sicilia (Fierotti et al., 1988) and two publications of Raimondi (1995 and 1998).

For the agronomic characteristics were taken into consideration various studies, one of which is made by Raimondi et al. (2000) in Caccamo, that highlights in a clear way the already known adaptability of Vertisols to the cultivation of durum wheat. Instead as regards studies in the area of Gela, studies of considerable importance are those made by Gallo and Raimondi (2001) on the adaptability of

durum wheat to saline soils and to this end was made an experimental field containing different varieties of durum wheat including landraces, varieties SGS and commercial varieties in order to compare them. That experimentation has been carried out in the inner part of the plain.

Raimondi et al. (2003) have undertaken a study on the agro-technical used in the cultivation of durum wheat comparing 3 parcels of 1000 m<sup>2</sup> having a different depth of the water table and the depth considered was at 0, 30 and 50 cm from the surface of the soil respectively, and this obviously involves a different effective soil depth.

Finally agronomic techniques have been proposed to overcome the limitation salinity as to increase the volumes of watering (digesting irrigation) or that of amendment the saline soil with earthy mass not saline (Vindigni's tesis of unpublished degree 2007/2008).

As regards the naturalistic features, Vindigni describes in a clear manner the composition of flora and fauna through field observations. Recently studies concerning the characterization of the microorganisms present in the saline soils of the Piana del Signore have been undertaken and to that regard 3 publications of Canfora et al., (2014, 2015 and 2016) were of great interest. In 2014 in order to observe the diversity of bacterial community, a metagenomic technique consisting in pyrosequencing of the hypervariable regions V1 and V2 of the sub-units 16S ribosomal (16S rRNA) has been used, and to that end 9 soil samples collected from the first 10 cm of the profile and spaced 50 m have been analyzed. Each sample was obtained from the mixture of 3 subsamples taken at the vertices of an equilateral triangle of 1m side. In 2015 T-RFLP technique (Terminal Restriction Fragment Length Polymorphism) was applied in order to study the DNA of the microbial community present in the soil and through this technique it has been possible to observe the composition and richness not only of the community of bacteria but also that of archaeobacteria. In fact the latter technique allowed to obtain a sort of fingerprint of the microbial community present in the soil. In the latter study were analyzed 16 samples with the same methodology used in the previous study. Finally in 2016 the technique of the X-ray diffraction (XRD) and scanning electron microscopy at a variable pressure (SEM) in combination with spectroscopy to dispersion of energy X-ray (EDS) was used in order to analyze the crust in salt present on the surface of the soil, investigating the biological components and geochemical properties and their interactions, in so far as they play a key role in the formation of the crust in salt. By means of the technique of pyrosequencing of hypervariable regions V1 and V2 of the sub-units 16S ribosomal (16S rRNA), also in this case the bacterial community present in the soil was characterized.

## **Results**

By the climatic investigation undertaken by Raimondi in 1994, it showed that the plain of Gela is one of the areas most dry and warm of Sicily, in fact it presents a  
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value of the index of De Martonne equal to 12, and consequently falls in 2<sup>nd</sup> class (5-15) which represents the circumdesert areas. Also according to the index of Lang the plain of Gela falls in the arid climatic regions, while according to the index of Crowther the plain of Gela falls into 2<sup>nd</sup> class in the semi-arid areas and, therefore, in areas where the irrigation is necessary, abundant and continuous. Finally according to the index of Bagnouls Gaussen the plain of Gela falls within the climate type maritime termic where the pluviometric water deficit is high.

By climatic processing of meteorological data of the period 1965-1994 is resulted that the average annual temperature is 19.5°C, while the average maximum temperature is 24.2°C and the average minimum of 14.7 °C. Instead the average annual rainfall is of 351 mm. The events of rain are mainly concentrated in the autumn and winter months with the maximum in the month of December. From climograma of Peguy it is possible to note that the arid period goes from the month of April to the end of September, while in the remaining period of the year the climate is temperate. From the studies conducted by Raimondi (2000) on the regime of soil temperature, it was found that the soil of the Piana del Signore presents a temperature regime of the type maritime termic, while the winter temperature at depth of 15 cm is found to be 13.7°C and therefore according to the classification developed by Raimondi the Piana del Signore falls in the 1<sup>st</sup> class where the sensitivity of the autumn-spring cereal crops and the turf of pastures is absent or almost (Tab. 1). In other words there is not a vegetative stasis of the plants during the cold months of the year.

| <i>Temperatura media invernale a 15 cm di profondità (°C)</i> | <i>Sensibilità delle colture cerealicole autunno-primaverili e della cotica erbosa dei pascoli</i> | <b>Table 1</b><br><i>The sensitivity of the autumn-spring cereal crops and the turf of pastures at the average temperature in Winter (Source: Raimondi et al, marzo 2000)</i> |
|---|--|---|
| ≥ 11  | Assente o quasi  |   |
| 11-8  | Leggera  |   |
| 8-5   | Media  |   |
| 5-2   | Forte  |   |
| <2  | Fortissima   |   |

In the same year it was observed that prevail ascending motions of the water in the soil and therefore in order to leaching soluble salts, it is necessary an appropriate water surplus and an efficient drainage network. Raimondi (2005) proposed the FISI index indicating the value of the water surplus necessary for leaching 1 g of soluble salts in 1 kg of earthy mass. This index is measured through the ratio between winter water surplus (mm) and the variation of the content of soluble salts between August and February of the following year (g/kg). Finally, Raimondi observed (2009) that to the change of the seasons the landscape of the Piana del Signore changes aspect, and in particular, in summer it results to be arid with salt crust on the surface, while in winter it results to be green with marshes rich of biotic activity.

From the geotechnical report of Catania (2011) is reported that *«la piana di Gela è formata da una serie di depositi di natura alluvionale, intervallati da livelli costituiti da antichi fondi lacustri e talvolta da accumuli di alluvioni superficiali. Tutto questo genera un'alternanza di depositi eterogenei con scarse caratteristiche meccaniche, oltre che la presenza di falde stagionalmente più o meno estese e più o meno superficiali»*. It is a marine sequence of Pleistocene of the type silt → clays/sandy clays → Clays/loamy clays. Also the Carta litologica (2006) shows a lithology of alluvial origin. As regards the adjacent hills the lithology is constituted by outcrops of series Gessoso-Solfifera of the upper Miocene or Messinian responsible for the increase in soluble salts of rain water in its path along the hydrographic network of the slope, transporting and depositing them downstream (band Piana del Signore), causing their accumulation.

From pedological surveys and by climatic knowledges acquired, Raimondi has changed the pedological soil classification located in the Piana del Signore. The Carta dei Suoli d'Italia (1966) reports the presence of alluvial soils, while the Carta dei suoli della Sicilia (1988) reports the presence of alluvial soils (Typic and/or Vertic Xerofluvents and Typic and/or Vertic Xerocepts) and Vertisols (Typic Chromoxererts and/or Typic Pelloxererts). Raimondi (1995) observed that the Vertisols located in the Piana del Signore did not close the cracks during the winter months and therefore inserted them in the suborder Torrerts (Chromic and/or Typic Calcitorrerts and/or Chromic and/or Typic Haplotorrerts).

Finally Raimondi (1998) proposed to insert the soils present on the alluvial deposits not vertic in the order of Aridisols given that there is a regime of humidity of the aridic type. In a particular way the soils on dune strips coastal stabilized classified them as Typic Haplocalcid, while those of the plains (alluvial deposits) as Aquic Natrargid. The Aridisols is possible to meet them throughout the southern coast of Sicily, from Trapani to Catania as also the Torrerts, including, however, in the latter case, also the plain of Catania.

As regards the agronomic features the study conducted in Caccamo by Raimondi et al. (2000) confirms the adaptability of Vertisols to durum wheat and was especially compared with a gypsum Inceptisol noting that the latter allows a higher quality but a lower production. The kernels have a lower weight and a maturation more advanced, a lesser starch content (effect of gypsum) and a higher protein content and finally a greater content in dry gluten. Therefore the obtained kernels have lower commodity characteristics but having high quality for the purposes of their transformation into pasta.

Gallo and Raimondi (2001) examined 30 genotypes of durum wheat cultivated on saline soils and observed the effect of salinity on the vegetative and productive activity. As regards the first aspect they observed that the landraces and SGS have not shown a considerable reduction of the vegetative development as well as the commercial varieties but the first two have reduced height in a more evident manner. Furthermore they observed that the landrace Bivona, SGS 9020 and commercial variety Capeiti have reduced little height. As regards the second aspect

they have observed a good tolerance to salinity in the SGS 9008 and 9027 and a decrease in the yield in the landraces enough content with the exception of Bivona. Moreover at a second moment they associated to saline stress also water stress and they observed that the commercial varieties and the SGS have endured better the concomitant effect of the two stress and that the landraces and the commercial varieties have changed little the aspect of the ear. Finally they observed that the landraces do not have suffered the water stress, given their well known adaptation to this type of stress.

Raimondi et al. (2003) noticed that the rotation adopted by farmers, durum wheat → fallow → durum wheat was a sustainable practice given that the rainfall of two years allowed to obtain optimal results in production in a year. They studied the influence of the depth of the water table on the cultivation of wheat observing that with the increasing of the depth the conditions for plants improved. In fact in the first plot where the water table outcropped, the kernels are not germinated and where it came to pass, the seedlings did not grew well.

The technique of amendment the saline soil with not saline earthy mass proposed by Vindigni in his thesis (2007/2008) has not brought to the expected result because the positive effect is only manifested in the first year, while with the passing of time the earthy mass underwent the process of salinization according the natural pedogenesis of soils present in the Piana del Signore.

As regards the composition of flora and fauna it is noted how it is strongly influenced by the anthropic activity which characterizes the area. Among the activities that have had a significant impact on the environment, in addition to the industrial activity which has damaged alophylous vegetation present, it is necessary to remember the activities of deforestation for the realization of a quarry in dune strimps and the activities of afforestation with allochthonous species (*Pinus halepensis*, *Acacia cyanophylla* and some species of eucalyptus). Important is also the continuous disturbance caused by the abandonment of waste by the inhabitants.

As regards the characteristics of the flora, halophilic species and psammophilous plants prevail but also some hydrophilic species that find their ideal conditions in marshes and therefore they are all species well adapted to the specific environmental conditions that characterize the Piana del Signore.

Instead the characteristics of fauna are related to species that have found an advantage in the human presence in the area, it is enough to think about the presence of *Mus domesticus* that finds nourishment in the waste left by man even if the *Oryctolagus cuniculus* and the *Vulpes vulpes* do not lack.

Instead the migratory birds that stop in the area due to the already mentioned presence of marshes are of great interest and among these are the *Anas querquedula*, the *Egretta garzetta*, the *Himantopus himantopus*, the *Ardea cinerea*, the *Gallinula chloropus* and the *Circus aeruginosus*.

As regards the studies on the microbial community present in the soil, Canfora et al. (2014) came to the knowledge of the composition of the bacterial community and richness of various bacterial phyla and it has been observed that the composition of the bacterial community changes from one site to another because



of a discontinuous vegetative cover and intercalated with a covering of salt crust. It is also observed that halotolerant and halophilic bacteria prevail. In any case, the bacterial phyla more abundant resulted the Proteobacteria, the Actinobacteria and the Acidobacteria and the abundant presence of the latter, even if negatively correlated with the salinity, could be explained, according to our opinion, by the presence of waste into the soil and conditions reductive of the soil itself. Canfora et al. (2015) are gained knowledge that in saline soils the archaeobacteria prevail on the bacteria. In fact they observed that with the increase of the salinity the biodiversity of archaeobacteria increases while that of the bacteria decreases and they observed the positive correlation between archaeobacteria and organic carbon content of the soil. This was explained by the fact that the archaeobacteria require a lot of energy to synthesize the osmolytes, necessary molecules for the osmoprotection.

The analysis conducted on the salt crust (Canfora et al. 2016) have highlighted that the extremophiles, including in addition that the archaeobacteria and halophilic bacteria also cyanobacteria, play a key role on the formation of the salt crust. In a particular way the salt crust is the result of a close interaction between the biological and geochemical component of soil. By the investigations carried out, a strong correlation between the presence of cyanobacteria (especially filamentous species) and the salt crust has highlighted, suggesting that the cyanobacterial filaments have an active role in the formation of the crust. Moreover it has been documented a stratification of calcite, gypsum and halite around the filaments of cyanobacteria. The pyrosequencing has shown that the kind of cyanobacteria more abundant was the *Microcoleus* and was also observed a particular association between cyanobacteria and sulfur bacteria and, therefore, that has suggested that the cyanobacteria could be involved in the oxidation of hydrogen sulfide, sulfur, sulphite, thiosulphate and various polythionates in alkaline, neutral and acidic conditions, thus precipitating sulfates.

## **Discussion**

All the knowledges acquired on the Piana del Signore are essential so that maybe undertake any activities of upgrading and enhancement. In fact the various researches permitted to understand the characteristics of quality and typicality but also the problems that exist in the area. The thermo pluviometric data considered are dated, considering also the climate change of which we are witnessed. In fact probably the average temperatures will be uplifted while the rainfalls will have been reduced or have recorded a different distribution. Consequently also the climograma of Peguy undergoes as many variations.

By the information acquired in the areas overlying the freeway, it can affirm that the agronomic potential is 13 % (V class) but this potentiality can increase and arrive up to 35 % in areas altimetrically higher reaching up to 60 %, if it improves the drainage of soils and in some vintages, where there is an appropriate water surplus, it can reach up to 80%. Therefore it can affirm without hesitation that the

soils of the hilly areas of the Piana del Signore are optimum and in a particular way the slopes with strong limitations, if they are managed in a suitable manner, they can guarantee a good pasture, while the agricultural areas can ensure a cereal growing in quality, obviously if an adequate agronomic technique is practiced as for example a suitable soil tillage, management of the organic substance (avoiding the practice of burnbeating) and achieving an efficient drainage network. Therefore it is essential to put in act all those techniques capable of increasing the internal drainage of the soil. However before undertaking any agricultural activity it is necessary to restore from pollution the soil. For example a possible rehabilitation activity could be that of removing the polluted earthy mass from the site placing it in a special dump for its disposal and carrying earthy mass not polluted. This activity would not compromise the balance of the ecosystem given that the origin of the soil is alluvial and therefore the profile of the soil is heterogeneous. The presence of saline soil which characterizes the ecosystem is of considerable importance but as demonstrated by Vindigni, in a little time the carrying earthy mass would undergo the process of salinization. In this way the specific environmental characteristics of the area would not be altered but there will be in the presence of a soil not polluted, thus avoiding any damage to human health caused by the suction of powders from a polluted soil.

In the flat area under the freeway it is not possible to practice any agricultural activity due to stagnation of water and the consequent formation of marshes but given the presence of a characteristic landscape, the resting place of migratory birds and the presence of a flora of great naturalistic interest, it would be desirable for it to become a natural reserve in order to the conservation of biodiversity and soil, braking the current degradation and giving in this way also a contribution to the touristic cultural sicilian activity (Egli et al, 2013). From 19 to 25 June 2017 a group of Swiss students of the University of Zurich have participated to an excursion in eastern Sicily and, between stages provided, there was also the Piana del Signore by virtue of its interesting and unique environmental characteristics (Fig. 3). Therefore the Piana del Signore can also have a didactic utility (cultural enhancement).



**Figure 3**  
*Exposure of the peculiar environmental characteristics of the Piana del Signore to the Swiss students (21/06/2017).*

## **Conclusions**

A detailed knowledge of an environment is an essential prerequisite so that it operates in an exact manner in a territory. The case c/da Piana del Signore (Gela, Sicily) is an example of great importance since the set of peculiar environmental characteristics make it unique but at the same time susceptible to a permanent degradation. However the right works of improvement and enhancement (Curatolo et al., 2000 a; Curatolo et al., 2000 b) could give to the area a great dignity and interest for the community not only for agricultural purposes but also landscaping, assuming in this way also a didactic and touristic role (cultural). (Egli et al. 2013; Raimondi and Badagliacca, 2012).

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## **LES PROBLÈMES ENVIRONNEMENTAUX DE LA PIANA DEL SIGNORE (GELA, EN SICILE) POUR UNE BONNE MISE A NIVEAU ET L'AMÉLIORATION AGRONOMIQUE, CULTURELLE ET DU PAYSAGE**

### **Resumé**

En Sicile, on est témoin d'une dégradation de l'environnement qui peut être liée au, déjà bien connu, processus de désertification. La présente étude avait pour objet le c/de Piana del Signore située dans la Piana di Gela, étant une région caractérisée par une aridité et salinité extrême. Grâce à la consultation et l'étude de plusieurs recherches effectuées sur la zone on a tracé les différentes caractéristiques environnementales, mettant en lumière les problèmes et les améliorations possibles. L'objectif était de tracer les dégâts causés par l'homme proposant des itinéraires possibles pour corriger une requalification de la zone afin d'améliorer un "paysage culturels" de grand intérêt agronomique et naturaliste. Pour améliorer cette région, il est en fait nécessaire de restaurer et, dans ce cas, il s'agit d'entreprendre une activité de dépollution, comme le déchets sont encore déposés dans la région. Ils comprennent également les matériaux de l'industrie pétrochimique situé tout près.

**Mots-clés:** *Gela, sols salins, aridité, pollution, restructuration*

## **LE PROBLEMATICHE AMBIENTALI DELLA PIANA DEL SIGNORE (GELA, SICILIA) PER UNA CORRETTA RIQUALIFICAZIONE E VALORIZZAZIONE AGRONOMICA, CULTURALE E PAESAGGISTICA DELL'AREA**

### **Riassunto**

In Sicilia in diverse aree è diffuso un degrado ambientale che può essere condotto all'attività umana e all'ormai noto processo di desertificazione. La c/da Piana del Signore, sita nella piana di Gela, è un'area caratterizzata da un'aridità e salinità estrema. Attraverso la consultazione e lo studio delle varie ricerche realizzate nell'area, sono state delineate le varie caratteristiche ambientali e territoriali, mettendo in evidenza le problematiche e i possibili miglioramenti. L'obiettivo è stato quello di mettere in risalto i vari danni causati dall'uomo proponendo le possibili vie per una corretta riqualificazione dell'area al fine di valorizzare un "paesaggio culturale" di grande interesse agronomico e naturalistico. Per valorizzare quest'area, infatti, è necessario risanare e, in questo caso, si tratta di intraprendere un'attività di disinquinamento, dato che tutt'oggi nell'area vengono depositati rifiuti di qualsiasi natura, pertanto, fortemente inquinanti.

**Parole chiave:** *Gela, suoli salini, aridità, inquinamento, riqualificazione.*