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TERRACED LANDSCAPE AS CULTURAL AND ENVIRONMENTAL HERITAGE AT RISK: AN EXAMPLE FROM PORTOFINO PARK (ITALY)

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ABSTRACT

Man-made terraces represent both a cultural and environmental asset. This important human modification has determined changes in the original balance of geomorphological and geo-hydrological factors, representing a human interference with the geomorphic system. The abandonment of lands, according to altered socioeconomic conditions and climate change determine an increase of erosion and geomorphological risk. Terraces on the slopes of the Bay of San Fruttuoso di Camogli, in Portofino Park (Italy), have been analysed through historical, social and economic research, cartographic and photographic analysis, geomorphological field surveys, meteorological-climatic analyses and modelling of sediment yield with the aim to address management and mitigation of risk.

Keywords: terraced landscape, geomorphological risk, San Fruttuoso di Camogli, Portofino Park, sediment yield

IL PAESAGGIO TERRAZZATO, UN PATRIMONIO CULTURALE E AMBIENTALE A RISCHIO: UN ESEMPIO DAL PARCO DI PORTOFINO (ITALIA)

SINTESI

I terrazzamenti antropici rappresentano un bene culturale e paesaggistico. La loro costruzione è una importante modificazione antropica che ha determinato variazioni degli originali equilibri geomorfologici e idrogeologici. L'abbandono del territorio agricolo a causa delle mutate condizioni socio-economiche e i cambiamenti climatici che si materializzano soprattutto con la variazione del regime delle piogge, determinano l'aumento del dissesto geo-idrologico e del rischio geomorfologico e un conseguente grave impatto sul paesaggio. La presente ricerca riguarda l'analisi dei terrazzamenti lungo i versanti sottesi dalla Baia di San Fruttuoso di Camogli nel Parco di Portofino (Italia). I metodi utilizzati sono consistiti in una ricerca storico-socio-economica, nell'analisi cartografica e fotografica, in rilievi geomorfologici in situ e infine da analisi meteo-climatiche su eventi recenti di pioggia intensa e valutazione del quantitativo di trasporto solido, con lo scopo di fornire un quadro conoscitivo sullo stato dei terrazzamenti ai fini della gestione e della mitigazione del rischio.

Parole chiave: paesaggio terrazzato, rischio geomorfologico, San Fruttuoso di Camogli, Parco di Portofino, trasporto solido

INTRODUCTION

Terraced landscapes testify the intervention of man who, over centuries, learned to adapt and modify areas poorly suited to agriculture. For centuries, and until only 50 years ago, agricultural activity was the main economic occupation supporting the majority of the population. Cultivating the land and making use of its products was the main activity for survival, even in isolated and difficult to tame areas. The terraces of the bay of San Fruttuoso, within the Portofino Park (Liguria), are an example of the way man succeeded in transforming steep slopes overhanging the sea into arable *fasce* (a typical term for Ligurian terraces). Nowadays San Fruttuoso is still an isolated area (Figure 1) and is reachable only on foot along narrow paths, or by sea with boat-service. Terraced landscapes were built following the arrival and settlement of Benedictine monks, who built the Abbey dedicated to San Fruttuoso around the 10th Century. Given the large area of terrain owned by the Abbey, the abbots agreed to allow residents of the village and surrounding areas to cultivate the land as sharecroppers, according to the formula of *emphyteusis,* or long lease. The obligation to improve and maintain the *fondo,* or farming fund, by those working on it, guaranteed that for centuries the terraced landscapes were used to their fullest extent and kept in good conditions. In 1586, the territory surrounding the Abbey was entrusted, through a contract of *emphyteusis* (perpetual lease), first to the De Bernardis family and subsequently to the Roisecco family, until 1900. In 1984 part of the property passed to a regional agency and part to the Italian Environmental Fund (FAI).

The social and economic changes in the second half of the 1900s caused a slow and almost irreversible abandonment of the terraced lands for lack of manpower and absence of local inhabitants. In addition to the social factor of abandonment of the land, a series of geo-hydrological events added to the deterioration or the collapse of many terraces, increasing the vulnerability of San Fruttuoso. The village is located at the confluence of two streams that, in absence of a program of controls of water discharge during of heavy rains, transport a large quantity of debris and mud, especially in the San Fruttuoso village and in the area around the Abbey. History recalls a tragic event on 25 September 1915, when a debris flow, similar to those occurring in Alpine environment, nearly destroyed the ancient Abbey of San Fruttuoso. In that area, significantly nicknamed since that time "Vallone dell'Alluvione", that means "Flood valley", flood events have repeatedly occurred; the most recent happened in 2014, seriously compromising the geomorphological and the agricultural terraced system equilibrium of the San Fruttuoso area. The increase in rainfall intensity, as verified analysing rain gauges data over the last 100 years, tends to foresee an increase in flood events that, considering the steepness of the slopes and the accumulated debris, determine favorable conditions for triggering increasingly disastrous debris and mud flows. The analysis of geomorphological, geological, historical and socio-economic factors have clearly shown that the abandonment of the terraces lead to an increase in hydrogeological risk in an area already struggling to maintain a delicate balance between natural and historical aspects of its landscape.

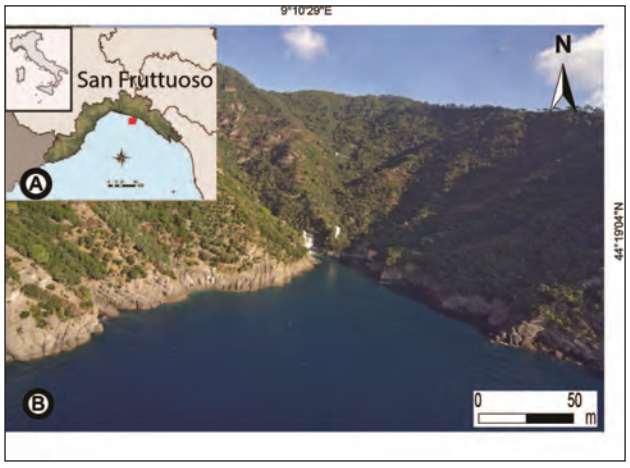

Figure 1: Geographic placement: San Fruttuoso (red rectangle), in Portofino Park in Liguria Region, northwestern Italy (A), San Fruttuoso bay (B). Photo by: A. Girani.

In fact, terraced landscape constitutes a human interaction with the morphogenetic system that controls the evolution of the relief (Brancucci, Paliaga, 2006): the immobilization of debris and sediments on the slope is made through terraces against gravity action, leaving a characteristic sign on the landscape and testifying ancient settlements. When terraced slopes are abandoned, due to changing social-economic conditions, the lack in maintenance causes the degradation of the dry-stone walls: gravity controls again the dominant processes and the accumulated soil and debris tend to descend at the bottom of the slopes and, for the studied area, in the sea environment. This evolution causes the increase of geomorphological risk, which is already influenced by the modification of the rainfall regime due to climate change. The historical debris flow, often interesting terraces and floods that involved the Bay, caused damages and morphologic modifications.

The park agency, initially established as a conservancy, today is attempting to preserve the delicate equilibrium of San Fruttuoso through a series of incentives for recovering the terraced lands, in order to mitigate geo-hydrological risk.

METHODS

The research was performed through cartographic, photographic, historical documents and land use analysis. The direct survey allowed to verify the actual con-

dition of the area, identifying the geomorphological processes on the slopes, while vector and raster layers together with 5m DTM allowed to evaluate the sediment yield with the Gavrilović method (Gavrilović, 1976; Globevnik et al., 2003); for this purpose the land cover layer of the area (scale 1:10000, Regione Liguria – year 2015) and the streams layer (scale 1:10000, Regione Liguria – year 2007), together with geomorphological features and lithology data have been used.

According to the Gavrilović equation (1), the sediment theoretical production in a catchment is controlled by land use, by lithology and by landslides and active erosion areas. Besides the other factors used in the model are the main morphometry parameters of the basin and the climatic characteristic of the area. The former ones have been evaluated from the DTM, while the latter from the weather station on the Mount of Portofino, that is the upper point of one of the two catchments, the Vallone dei Fontanini one. The method makes use of parameters subjectively attributed to the various features related to the erosion factors: this approach makes the methodology a semi-quantitative one.

$$V_s = \zeta * \Theta * h * \pi * \Gamma^{2/3} * A \qquad (1)$$

V_s=mean yearly sediment production (m^3/y)
ζ=reduction factor
Θ=temperature coefficient
h=mean annual rainfall
Γ=relative erosion coefficient,depending on land use, lithology and erosion processes
A=catchement' s surface

DESCRIPTION OF THE RESEARCH AREA

Geomorphological features

Several geomorphological risks, such as coastal erosion, landslides and floods endanger San Fruttuoso and its cultural and natural heritage. The San Fruttuoso Bay area is composed by two hydrographic basins: the Vallone dei Fontanini to the West and the Fosso di San Fruttuoso to the East. The two catchments extend to the crest running between Mount Portofino (609 m) and Mount Bocche (506 m). With a surface of 0,44 and 0,59 km^2respectively (Table 1), their capacity is some 12 m^3/s, with a return time T = 50 years. The mean slopes angle ranging from 50 to 75%, and frequently exceeds 75%; along the cliffs and in a few sections, e.g. in the zone called Buca dei Corvi, it may exceed 100% (figure 2). The hypsometric curves of the two basins (figure 3) shows the dominant tendency of linear erosion, more pronounced in the Vallone dei Fontanini. The bedrock of the San Fruttuoso is made up by Portofino Conglomerates: pebbles are almost entirely constituted by calcareous/limestone and marly shales varying in size from 5 to 50 cm, in thick layers frequently alternating with levels of sandstone which may also contain carbon levels. Underneath, the pebbles is made by sandstone, ophiolites, gneiss, marble and cherts. The matrix is calcareous sandstone with elements of quartz and clay. The layers show a mean dip direction toward south, with dip not exceeding 20° (Giammarino, Messiga, 1969). On a large scale the rock mass shows fractures and tectonic lineations, attributable to direct faults mainly in the direction NW-SE and NE-SW, whose superimposition is cause of the breakup of the rocky mass in blocks which may exceed 10 m. The break up in blocks determine a sizeable circulation of water underground. The geomorphological layout is essentially linked to the effect of the running water, to gravity, to the sea wave action and to man-made activities (figure 4). Along the upper basin of the Fosso di San Fruttuoso and the Vallone dei Fontanini, slopes subject to erosion and deposits left by rainfall are visible, while the circulation of water is mainly underground. In the sections where the riverbed gradient is higher, deposits of gravity induced loose soil are visible. Outwashing phenomena are visible in the areas marked by conglomerate outcropping. Along the cliffs coast those phenomena are clearly visible, exceeding 25 m height above sea level; cliffs are frequently subject to collapse (Figure 5). Among the man-made landforms are the agricultural terraces constructed over centuries, which survive today in the areas known as Caselle and Molini and closed to helicopters base, Torre Doria, and in the sections to the east and to the west of the settlement (Faccini et al., 2008a).

Historical events

The extreme angle of the slopes, the presence of loose soil and phenomena of intense rainfall determine conditions favoring a loosening of debris and mud flow: the basin of San Fruttuoso has historically been subject to these events. The current beach was formed by the geohydrological event of 25 September 1915, which caused the partial destruction of the Abbey complex (Faccini et al., 2009). Archival research has helped establishing that the event was characterized by rainfall exceeding 300 mm in Chiavari and more than 400 mm in the surrounding areas such as Cervara and Santa Margherita Ligure. The information obtained confirmed that on 25 September 1915 the rainfall caused a debris flow that, in form, content and volume, can be compared to typical rainfall phenomena in Alpine settings (Sacchini et al., 2012). The debris flow originated with the collapse of the terraces in the NW sector of the area and subsequently channeled along a tributary orographic right Vallone di Fontanini, nicknamed on that occasion “Flood Valley”. The debris fan begins at approximately 10 m a.s.l. and extends to form the border of the current beach: the breadth of the beach was greater at the end of the event and it has been periodically object of beach nourishment. Other important phenomena occurred in 1961, 1963, 1964 and 1995. The latest serious episode took place on 26 July

Table 1: The main morphometric features of the two studied catchments

Catchment	Area (km²)	Perimeter (km)	Mean steepness (%)	Terraced surface (%)	Hydrographical network length (km)	Main stream length (km)
Vallone dei Fontanini	0,585	3,507	70	2,5	2,825	1,142
Fosso di San Fruttuoso	0,444	2,945	64	9,4	1,953	0,838

2014: the ARPAL rain gauge on Mount of Portofino registered 70 mm of accumulated rainfall/2 hours. The effects on the ground included earth flows along the gully behind the western sector of the inhabited area (behind the building housing the hotel and restaurant called "Giovanni"), at the mouth of the stream on the eastern front of the Bay, under the "Casa dell´Árco" and especially at the end section of the Vallone di San Fruttuoso, where the channel of loose soil damaged parts of the building (Figure 5). Basing on the long time data series of the Chiavari and University of Genoa weather station analysis, the 1915 exceptional precipitation should have a return time longer than 100 years. Nonetheless, the geomorphological characteristics of the basin, in relation to the climatic changes underway, make the statistical approach difficult to reconcile with the actual phenomena. In fact, while the actual rainfall does not show significant changes, the average temperature and the days without rain are showing a positive trend; the subsequent rise in the rate of daily precipitation causes an effect of tropicalization of the rainfall, with a consequent greater probability of triggering landslides and flash floods (Faccini et al., 2008b). This trend is confirmed by recent events in surrounding areas, especially in the last 25-30 years. The multitemporal analysis of cartography and aerial photographs revealed changes in land use linked to abandonment of agricultural activity during the first half of the 20th century (Van der Sluis et al., 2014). This phenomenon contributed to the deterioration of the terraced landscape and the upkeep and repair connected with it and, then, an increase of the geo-hydrological risk. Only in recent times environmental policies have been adopted with the aim of recovering the landscape, in particular through incentives to resettle the original inhabited areas.

The land use in the two catchments (figure 6) shows the dominant presence of woods and bush, typical of the Mediterranean areas; terraces are mainly used for olive cultivation and for vegetables.

SOCIAL, ECONOMIC AND HISTORICAL CHARACTERISTICS

San Fruttuoso, in the township of Camogli, lies in the central-southern part of the Portofino Park about 30 km East of Genoa and represents, with Portofino, the most important sector of the protected area since it combines the historical-architectural value of the village with its surrounding naturalistic value, in particular its terraced landscapes. It is bordered by Punta Torretta to the west and Punta Carega to the east - one km apart - and has a

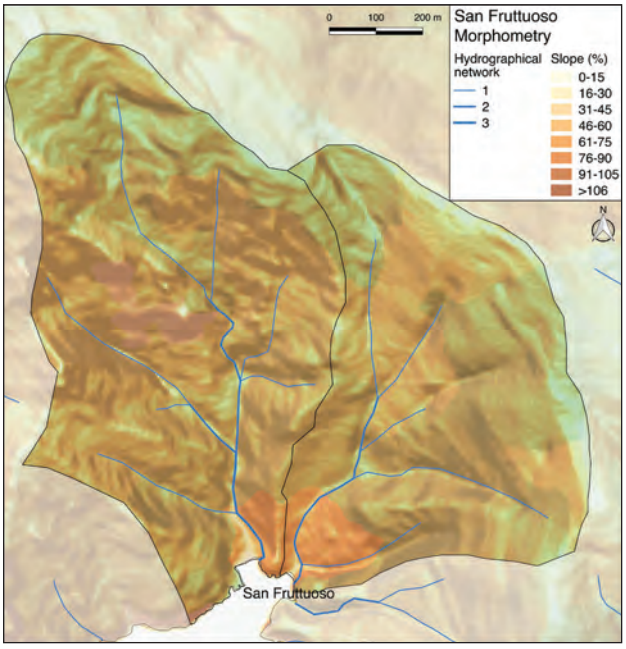

Figure 2: Steepness of slopes map for the two studied catchments.

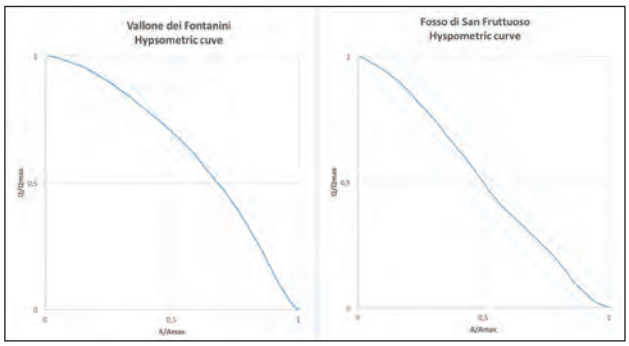

Figure 3: Hypsometric curves of the studied catchments.

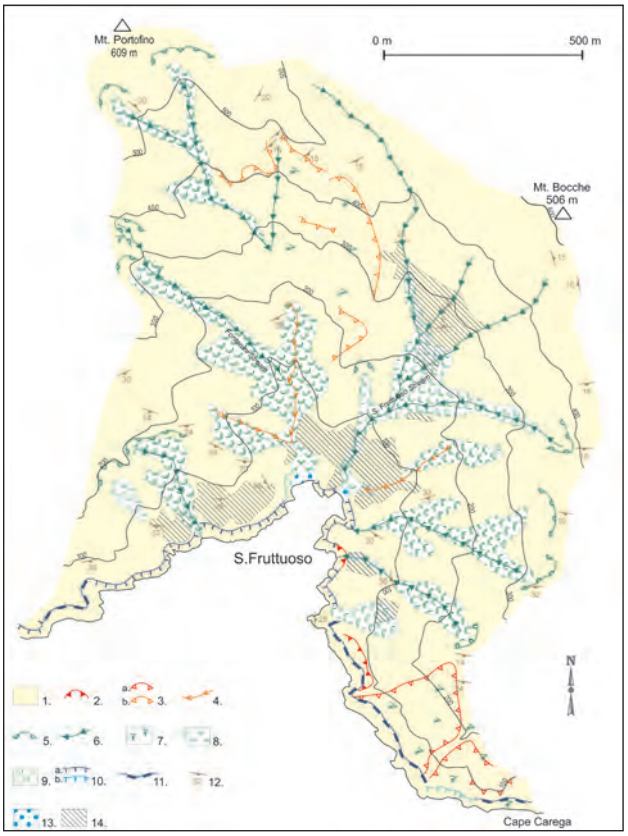

Figure 4: Geomorphological map of San Fruttuoso.

LEGEND:
1) conglomerate
2) landslide scarp due to fall, active
3) landslide or degradational scarp, active (a), inactive (b)
4) rock defile with rock fall, inactive
5) denudational scarp
6) riverbed with trend to downcutting
7) area affected by rill wash
8) debris flow
9) mainly colluvial deposit
10) cliff scarp with height < 25 m, active (a), inactive (b)
11) cliff scarp with height > 25 m, active
12) bed attitude
13) beach (gravel and pebbles)
14) agricultural terraces

roughly triangular shape (Faccini et al., 2009). Portofino Park was constituted in 1935, when the first perimeter of the protected area was traced. The area was subsequently extended and newly classified; in 2001 the present perimeter was established. In 1999, the Marine Protected Area of Portofino was established to preserve the underwater environment and its rare species. San Fruttuoso can be considered a Mediterranean example of cultural and natural assets threatened by coastal erosion, gravity-driven phenomena and floods - to mention only the hazards of geomorphological type that affect this area more or less severely - as well as man-made alterations to the land such as terraces. The terraces around the area

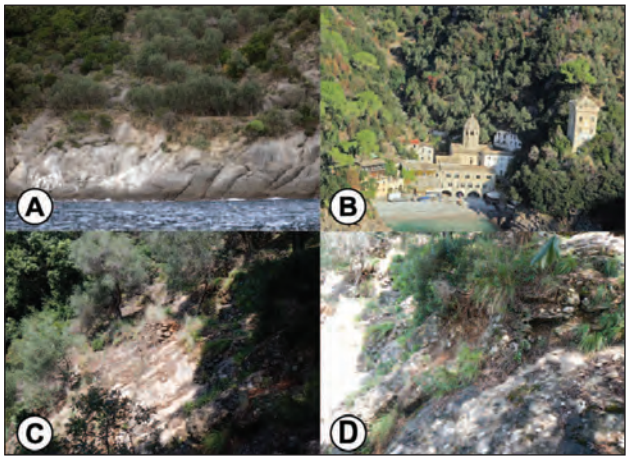

Figure 5: Terraces of olive groves close to the sea (A) San Fruttuoso Abbey, (B) incidents of collapse and other cases of geo-hydrological deterioration such as soil erosion and landslides in the wake of abandonment or poor maintenance of dry-stone walls, (C), (D)
Photo by: A. Girani, F. Faccini.

of San Fruttuoso are among the most characteristic in the park because of their position on the steepest hillsides and their isolation from the rest of the park: in fact, even today terraces are accessible only by land along a footpath, or by sea. San Fruttuoso village extends to two small inlets that are divided by a ridge where the Doria Tower rises (25 m a.s.l., built in 1562). The village's main settlement - where the 10th-Century Benedictine Abbey stands - lies at the end of the Vallone dei Fontanini. A smaller settlement is made up of a few buildings and lies at the easternmost end of the Fosso di San Fruttuoso. The use and cultivation of the terraced lands of San Fruttuoso are linked to the history of the Abbey. The lands were the property of the Benedictine Abbey that developed at the beginning of the 10th Century by Greek monks who had settled in the bay area starting in 711. As a result of legacies and donations, the Abbey's lands became increasingly extended. The earliest documents attesting

Figure 6: Damages due to the recent flood event in 2014 (A), (B), (C)
Photo by: A. Girani, F. Faccini.

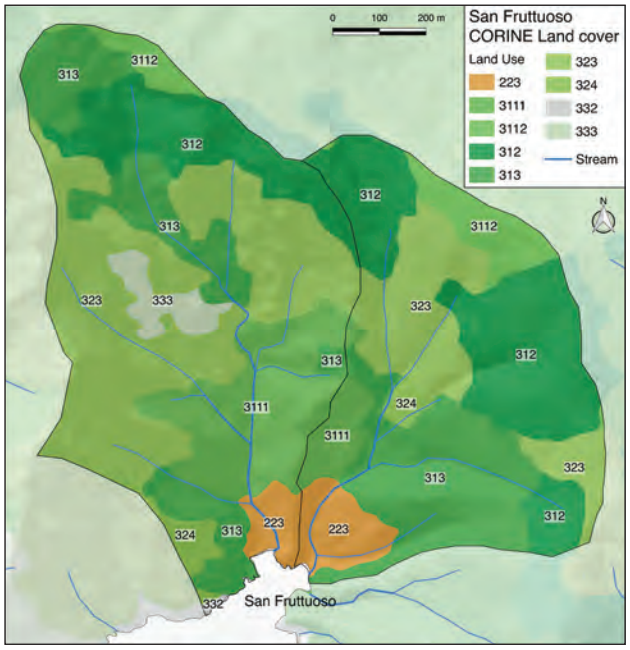

Figure 7: CORINE land cover map of the two studied catchments

LEGEND:
223 olive groves
3111 broad-leaved forest with continuous canopy, not on mire
3112 broad-leaved forest with continuous canopy on mire
312 coniferous forest
313 mixed forest
323 sclerophylious vegetation
324 transitional woodland shrub
332 bare rock
333 sparsely vegetated area

the practice of cultivation on terraced lands date to the mid-13th Century. A mixed cultivation of vineyards, olives, figs and chestnuts was typical of Ligurian agriculture in the Middle Ages in the area around Portofino. A more specialized cultivation of olives is documented beginning in the 15th and 16th centuries through documents citing taxes on oil; in 1535 the Genoese historian Giustiniani described the territory as being rich in orchards and olive groves. The lands were given over for cultivation to the peasant sharecroppers using a system of *emphyteusis*. *Emphyteusis,* from the Latin "to plant, to graft onto"—i.e. a "location for plantation and fruit"—is a property right allowing the use of a piece of land belonging to another, according to which the title-holder (the *emphyteuta*) has the right to full use (*dominio utile*) the land itself, but for his part must improve the land and also pay the landowner (direct or concessionary) an annual rental fee in cash or in produce. The obligation to improve the land's fertility and increase production, required a constant maintenance of the terraces, which remained in good condition up to the middle of the 20th Century. References to terraces built of dry-stone walls are found in documents from 1800 on, whereas earlier terraces more commonly used a system of embankments. The embankments were preferable for allowing livestock to crop grass and bushes, keeping the area clean around the terraces. The dry-stone wall terraces of San Fruttuoso are distinguished by the use of conglomerate of Portofino (Figure 8), comprised almost entirely of limestone-and-marly pebbles. Terraces built on conglomerate have great resistance and durability and consist of elements of sizeable dimensions, sometime several meters in length; this feature indicate a social and territorial organization that was capable of involving a sizeable amount of manpower. The agrarian landscape and the cultivation techniques typical of the area around San Fruttuoso remained relatively unchanged from the Middle Ages to modern times until the 1950s, when a major shift in the uses of the terraced landscape took place as the inhabitants abandoned the most isolated buildings and subsequently the land as well, to move to more accessible areas. The exodus from the terraced areas was the result of changes in social and economic conditions causing entire generations to search for a better and more comfortable life. Low economic returns, years of poor olive harvests, and the effort required to reach the terraced areas and transport their produce were determining factors in this population shift, (Pedroli et al., 2013). In 1999, interviews with farmers in Portofino Park (Mosconi, 2000), revealed the following problems: the average age of the farmers was between 60 and 80 years; they remembered that their own parents had labored under the ancient emphyteutic (sharecropping) system; their children were unable to continue to work the land. In addition, the restrictive rules of the park itself no longer allowed them to keep livestock; the rule, dating back to the 1960s, was aimed

Figure 8: Dry-stone walls in conglomerate:
(A) dry-stone walls in conglomerate mixed to limestone
(B) olive grove
(C), (D) San Fruttuoso's environment and terraces
Photo by: A. Girani.

at modernizing the image of the park in the interests of tourism. According to the locals, the rule increased the difficulty of maintaining the terraces since the animals cropping the greenery had helped control weeds and overgrowth. The increase in the population of wild boar which devastated the cultivated lands and a lack of mills in the area, once abundant and necessary for the production of oil, added to the farmers' difficulties. The park attempted to improve the situation by adopting countermeasures to recover the terraced landscapes, supporting some projects presented by young people such as the cooperative called Il Borgo (Caggiani et al., 2009), which recovered one of the oldest olive groves, planted by the Benedictine monks. The park also invested a consistent sum for the recovery of the dry-stone walls (Balletti, Soppa, 2015). Despite these efforts, the balance of the terraces of San Fruttuoso continues to be at risk, above all because of geo-hydrological events which affect the landscape after heavy and intense rainfall (Brandolini et al., 2006).

RESULTS AND DISCUSSION

Analysis of historical, socio-economic and geomorphologic-environmental data gives clear evidence of the precarious equilibrium of the terraced landscape of San Fruttuoso. For centuries the terraced landscape was maintained thanks to the efforts of monks and peasants who inhabited the territory. A multitemporal comparison of the land use shows how the areas dedicated in particular to the cultivation of olives (a specialized crop) have diminished, starting with the most remote areas and concentrated around scattered buildings and sparse dwellings. This situation calls for a reflection on the implications of lack of maintenance and upkeep of the footpaths which once provided access to such areas, now abandoned and rendered impassable by weeds and overgrowth. The geomorphological characteristics make clear the delicate environmental balance of the area under study. The current terraces are located principally at the confluence of two streams, The Fosso di San Fruttuoso one and the Vallone dei Fontanini; both are susceptible to debris flow. The function of the terraces, which allow water drainage and controlled seepage, is important for reducing the impact of repeated geo-hydrological events. The abandonment of terraces upstream of the bay of San Fruttuoso has led to a decrease in the absorption capacity of terrain now covered by uncontrolled overgrowth, while the quantity of loose soil carried downstream during flood events has increased. Currently the terraced landscape of San Fruttuoso runs the risk of disappearing under a thick layer of wild vegetation and mud from landslides caused by the increasing number of floods. In particular, in the area the main risk is given by the combination of floods and debris and mud flows, whose source is often in the terraces.

More in general the theoretical sediment production in the two catchments, as resulted by the application of Gavrilovic methodology, gives high values (table 2) that are probably mainly due by the morphometry of the catchments, which are characterized by a very high value in mean steepness. It must be underlined that the model asses the maximum possible production of sediment in the catchment, but the values obtained in any case are high. These value highlight the necessity in maintaining terraces in order to reduce important source of sediments that, with the collapse of the structures, may be available to erosion abruptly and then with critical consequences. The influence of a well maintained terraces system may reduce the sediment erosion by about 12-18 times, then with important effects on soil conservation and risk reduction (Bazzoffi, Gardin, 2011).

From a social-economic perspective the advent of mass tourism, mainly day-trippers who arrive by sea, has done little to aid in revitalizing the area. The type of agriculture carried out on the terraces in these inhospitable areas is known as "heroic" cultivation, precisely because of the enormous sacrifice it requires both in terms of transportation and the conditions of life it imposes. Currently, in the zone of San Fruttuoso, activities aimed at recovery of the terraces are carried out exclusively by private homeowners who cultivate as a hobby and by the above-mentioned cooperative, whose core business is tourist hospitality. It is to be hoped that the park will encourage these anthropic efforts through a program of tours and educational excursions to the very heart of the terraced areas, to highlight the importance of this system of cultivation which is so complex and fascinating and is so rooted in the history of the area. Each area has its own terraced landscape which is different from all the others, and this is especially true in Liguria, the region with the greatest number of terraces in Italy. It would be interesting to distinguish every single landscape.

CONCLUSION

Landscape and cultural assets in the studied area seems at risk because of the dynamical evolution of the

Table 2: The result of Gavrilović methodology for theoretical sediment production in the two studied catchments.

Catchment	Sediment production (m^3y^{-1})	Specific Sediment production ($m^3km^{-2}y^{-1}$)
Vallone dei Fontanini	4200	7190
Fosso di San Fruttuoso	2100	4700

slopes, once slow down by the holding action of terraces on the gravity processes; the abandon of maintaining terraces makes the gravity processes rise again and then the degradation proceed. Besides the increase in concentrated rainfall due to climate change, causes an increase of geomorphological risk in the whole area. Then the analysis of the two small catchments facing the San Fruttuoso Bay highlights the necessity of applying urgent management policies to induce the maintaining of terraces in a delicate equilibrium environment.

Recovery policies, carried out by government entities of the territory, could take long-term benefits.

In Italy, an example of functional recovery, is the project called *ADOPTED TERRACING*, where the municipality has decided to give free loans to those who are interested to reuse the abandoned terraces. With this method you will not take the land from its rightful owner, but at least it is done for its reconstitution, and it allows an enthusiast to cultivate and enjoy the fruits of terrace farming. This project have been tested in Brenta Valley (Veneto), where numerous abandoned sites were recovered, and the rebirth of mixed cultivation, such as fruit trees and herbs like mint was witnessed, (Varotto, Lodatti, 2014). In other countries of the world, such in, China and Perù terraced landscapes are preserved and appreciated, through the implementation of "agricultural tourism". In China, in the Yuanyang Hani Rice Terraces, and in Macchu Picchu in Perù, tourists appreciate the beauty of an agricultural landscape.

In Italy, the proindustrial policies of the '60s helped to marginalize the primary sector of agriculture, and to encourage the mass emigration from rural population to the larger towns, so it must be recovered the tourist and socio-economic value of agricultural terraced landscapes. It still remains to further incentivize agriculture, de-tax it, it needs to become a full-time job as the sole source of income. The cost to society will be the funding for the reconstruction of the walls, for the years of the bad growth of crops, but the benefits will be larger, as it will reduce the landslide risk by the work done throughout the country by farmers.

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OGROŽENOST TERASIRANE POKRAJINE KOT KULTURNE IN OKOLJSKE DEDIŠČINE: PRIMER PARKA PORTOFINO V ITALIJI

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POVZETEK

San Fruttuoso di Camogli je starodavno obmorsko naselje na hribovitem območju parka Portofino. Terase so bile edini način za pridobitev ustreznih kmetijskih površin na tako strmem pobočju. Raziskava zajema analizo značilnosti ozemlja in prevladujočih procesov, ki vplivajo nanj. Osredotočena je na obstoj teras in posledice njihovega opuščanja. Na koncu je obravnavano še upravljanje območja: nevzdrževanje antropogenih struktur povečuje odplavljanje gradiva in tako povečuje geomorfološko tveganje. Z neposredno raziskavo smo preučili naravo degradacijskih procesov tako na terasiranih kot na naravnih pobočjih, z zgodovinsko raziskavo pa smo dobili vpogled v začetke tega naselja in njegovih teras. Z Gavrilovićevo metodo smo ocenili teoretično sproščanje gradiva na dveh manjših delih preučevanega območja, rezultate pa ovrednotili v skladu s teoretičnim vplivom teras na odplavljanje. Ohranjanje teras je ključno vodilo politik upravljanja, da bi zmanjšali geomorfološko tveganje.

Ključne besede: terasirana pokrajina, geomorfološko tveganje, San Fruttuoso di Camogli, park Portofino, odplavljanje

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