Guidelines for the recognition of historic rural landscapes according to the Ministerial procedure. The case study of Mandrolisai (Sardinia)

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Abstract. Landscape is a highly dynamic process in which the protection of historic rural landscapes (H.R.L.) clashes with the need to innovate production processes. The Ministry of Agriculture, Food Sovereignty and Forestry (MIPAAF now MASAF)establishedthe National Observatory and the National Register of H.R.L. in 2012,to protect the still "living" landscapes that have preserved on at least 50 percent of the territory the land uses prevailing in the immediate post-World War II period. The internal hills of Mandrolisai (NU, Italy) are home to two of the three H.R.L. present in Sardinia. Their significance is based on environmental (high elevation and thickening of vineyards on the outskirts of rural hamlets, e.g.) and agronomic characteristics, such as their small average area, the persistence of the traditional form of training ("alberello", little tree or gobelet), and the use of native grape varieties. The diachronic analysis of aerial images showed the maintenance of active land uses in the post-World War II period (images from 1954 vs. 2016 or 2019) in 52.6 percent of the 2,363 hectares in the first certified area and 65.7 percent of the 417 hectares recognized in the second, respectively. The two areas, united by progressive depopulation, showed a reduction in "gobelet" vineyards, but these maintained their spatial location.

In the countries of Mediterranean Europe, rural communities have developed agro-silvo-pastoral models since the Middle Ages to meet the population's food needs. Vineyards and orchards of modest size were in peri-urban areas in a landscape mosaic comprising arable land, pastures and patches of forest vegetation (Fig. 1). In Sardinia, these ancient systems have been eroded, or obliterated, by technological innovation and, beginning after World War II, by the depopulation of inland hilly areas [1, 2].

Fig. 1. The heterogeneous landscape mosaic still present on the outskirts of MeanaSardo (NU).

In Italy, the 'Code of Cultural Heritage and Landscape' [3], compliant with the European Landscape Convention [4], contains prescriptive measures that the Regions must include in their Landscape Plan (RLP) and related Technical Implementation Rules (TIRs); then the municipalities must, adopt Urban Plans (MUP) in accordance with the RLP. In Sardinia, this Plan has been protecting coastal areas (49.6% of the island's 24,000 km^2) since 2006 but has not yet produced detailed guidelines for inland areas.

The gradual urbanization of rural populations, the spread of coastal tourism and the regressing birth rate underlie the territorial imbalance with population densities in inland mountainous and hilly areas ranging between 20÷30 inhabitants per km^2, while values of 200÷300 inhabitants per $km^2$are recorded in urban areas and in the tourist-oriented coastal strip.

In Sardinia, vineyards were the most widespread woody crop in modern times with more than 80,000 hectares in the nineteenth century [5, 6, 7]. This flourishing business was severely damaged after the

1880s by the rapid spread of the phylloxera aphid (*Viteusvitifoliae*), which caused the decline of vineyards [8, 9, 10]. A second critical phase occurred a hundred years later, between 1980 and 1990, when excessive wine production in the EU pushed the Common Development Fund to encourage the permanent abandonment of vineyards [11]. As a result, the regional wine-growing area was about 65,320 ha in 1970, and 26,301 in 2000 [12], followed by an expansion phase with 27,000 ha in 2022 [13]. A similar trend was recorded in the study areas (Tab. 1).

Table 1. Dynamic of vineyard areas in three municipality of the Mandrolisaiarea (ha).

	1860 [7]	**1929** [10]	**1970** [12]	**2000** [12]	**2022** [13]
Atzara	466	104	324	289	248
MeanaSardo	237	40	24	140	157
Sorgono	339	96	339	104	164

Pending the extension of LRP to inland areas, conservation of HRLs can be attempted using the methodology developed by MiPAAF, first, and MASAF then [14], which we tested in a modified version that analyses land uses since the 19th century.The Old/Disused Cadastre (*CessatoCatasto*), a patrimonial register of rural properties implemented for the unification of the Kingdom of Italy in 1861, shows land-use data including both maps produced for the geometric measurement of land and registers (*Sommarioni*) in which, for each parcel of land, the name of the owner, the surface area and the quality of cultivation are indicated.

The study area is in the centre of Sardinia, in the historical region of Mandrolisai, where the population of the rural villages of Atzara and Sorgono (first area), and MeanaSardo (second area), preserve a long viticultural tradition that has allowed the red wine “Mandrolisai” to obtain the Registered Designation of Origin as early as 1982 [15]. Based on the current distribution of vineyards and their historical location, the two areas were delineated in GIS environment [16] on the most recent available orthophotos, including current vineyards and areas of historical ones. The orthophotoswere taken on March 2016 at a nominal ground resolution of 0.2 m [17]. The photointerpretation from 2016 and 2019 was validated by ground inspections (conducted between 2017 and 2021).

Fig. 2. Gobelet: the traditional vineyard training system in the arid areas of the Mediterranean country.

To describe and perimeter the landscapes at present, the following information was extracted from georeferenced information layers: Bioclimate [18], Geology [19], Soils [20], Cultural Heritage [21], and Georeferenced Regional Technical Map [22].

The historical land use, more specifically vineyard cover, was reconstructed through the digitisation of handwritten registers and the georeferencing of handmade cadastral maps. The spatialisation operation was facilitated by the persistence over time of municipal boundaries and networks of roads. These features were overlapped with orthophotos and Regional Technical Maps, which allowed the geolocation of each vineyard at a scale of 1:15,000. Since the Old Cadastre also contains placenames, the toponymy analysis contributed to historical reconstruction of the rural territory [23, 24].

The heart of the methodology is a Historical Environmental Assessment (*ValutazioneStoricoAmbientale*, VASA), where the first step is an analysis of land cover/ land use changes over time [25]. This was achieved by photointerpreting the orthorectified aerial photographs series, from 1954 [26] and 2016 [27]. For both years, photointerpretation and ground validation led to the identification of ten Land Use Classes (LUC), mostly classified in accordance with the Corine Land Cover nomenclature [28].

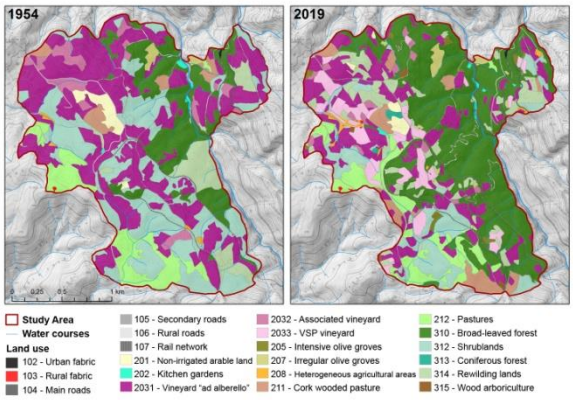

Fig. 3. Land use maps in 1954 vs 2019 in MeanaSardo study area.

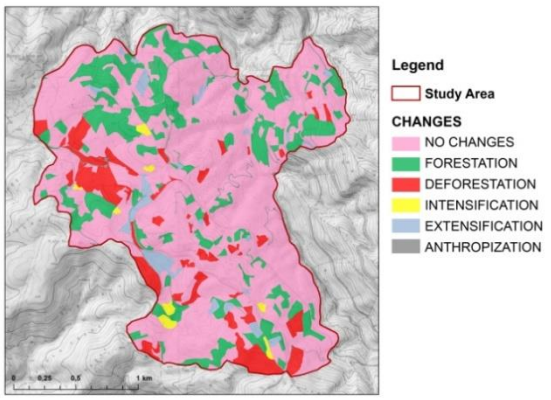

Fig. 4. Map of changes between 1954 and 2019 in MeanaSardo study area.

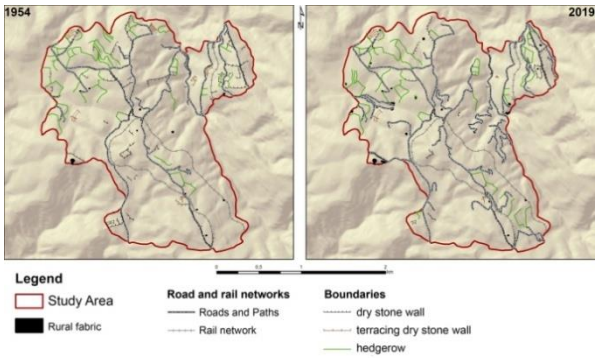

Fig. 5. Road map of the MeanaSardo study area.

The Ministerial methodology, as modified by us, has made it possible to recognise and describe the wine-growing area between the rural villages of Atzara and Sorgono, first study area, and MeanaSardo, second study area (Mandrolisai region, Sardinia), components of a broader agro-silvo-pastoral system. Old Cadastre of the second half of the nineteenth century shows the widespread presence of vineyards, confirming what is reported in the older literature and the information obtained from toponymy analysis. The 52.6 percent of the 2,363 hectares in the first certified area and 65.7 percent of the 417 hectares recognized in the second, respectively, maintained the land uses present in the early 1950s.

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