

and their role is presented in the study about the Catalan area of Spain (Chapter 3). The chapter analyses the anatomy of the landscape by revealing its structure, referring to its physiology rather than its appearance, using the social metabolism approach. Agriculture models that could attain the

highest energy yields without relying on a large amount of external input are therefore presented as a very good example of sustainability, an approach in line with a very modern way of assessing traditional cultures and their landscapes, facing the ecological footprint of globalization.

1 The Development of a Historical and Cultural Evaluation Approach in Landscape Assessment: the Dynamic of Tuscan Landscape between 1832 and 2004

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Introduction

The study of landscape has been largely influenced by two main streams of scientific thinking, the first one dominated by historical studies, mostly concentrating on the role of man as a cultural agent, but with a reduced interest in the structure and functions of landscape patterns, the second affected by the ecologic approach, interested in explaining landscapes at an ecosystem level. These different views have also developed different methodologies, although both of them, especially the ecological one, have been largely affected by the theory of 'degradationism', emphasizing the negative role of man in the environment, as an agent depleting the ideal state of 'naturalness'.

As already stressed by several investigations carried out in the field of forest history and ecological history, but today generally included in the wider framework of environmental history, there are a wide number of cases where the theory of degradation due to human influence cannot be applied, where man has created valuable landscapes, from both a cultural and an ecological point of view, enhancing

biodiversity and improving the condition of the environment.

In the last four decades ecological planning, by far the leading approach at world level, has clearly taken human abuse of landscape as the driving philosophical concept, while bringing human actions into tune with natural processes has been the common strategy of almost all the approaches, with little success in bringing culture as a main issue into planning.

On the other hand, ecology has traditionally tried to obtain laws regarding ecosystems, investigating environments relatively unaffected by man (McHarg, 1981). This resulted in an over-emphasis on natural processes, not only in planning, but also in ecosystem management, although no systems today are unaffected by man (Vogt *et al.*, 1997).

Even 'applied human ecology', considered an alternative to ecological planning, did not succeed in the attempt to successfully include the role of man and the role of time in planning, not even with the development of landscape ecology (Ndubisi, 2002). Also in countries like Italy, much of the emphasis is still put on geomorphology or ecological patterns in explaining

landscape structure and planning (Pignatti, 1994; Romani, 1994; Farina, 1998), with a relatively reduced interest in human influence, often resulting in an artificial division between natural features and anthropogenic features of the territory. Therefore, there is still the need to develop specific methodologies to assess human influence, including modern historical research into landscape analysis, a history no more limited to the use of written or printed sources but able to combine different tools and techniques (Agnoletti, 2000). The case presented here proposes an approach taking culture and history as the central philosophical paradigm to understand landscape changes and develop a planning approach.

The Background: is Landscape in Good Shape?

Tuscany is known all over the world for the quality of its cultural landscape, a heritage built through centuries of human influence, but today also an important economic resource. Although being a region where sustainability is the concept on which the most important regional law is based² and environmental directives and landscape protection have greatly developed, there was a growing feeling shared by several scholars and administrators that the quality of landscape had degraded in the past decades. This feeling was not only based on the visual effects of urban development, but mostly concerned with the quality of rural landscape, even in protected areas. This impression was not in tune with all the reports on quality of air, water, soil and biodiversity, as well as on certification standards, which showed a fairly good degree of fitness of the regional territory according to the way sustainable development is perceived and applied (Calistri, 2002).

In order to have a clearer view of this problem, the DISTAF of the University of Florence,³ in collaboration with the regional government, promoted a research project putting together several research institutions coordinated by the author. The

research team involved scholars from the fields of history, agriculture, forestry, economy, ecology and geography. The project had the main goal of developing a methodology based on the evaluation of landscape dynamics, selecting an appropriate spatial and temporal scale, with special attention to factors and processes originating landscape change and the quality of the changes. The expected result was the production of a state-of-the-knowledge report enabling identification of the dynamics of landscape, developing a monitoring system for landscape quality.

Materials and methods

Considering the difficulties of understanding a cultural landscape even in its ecological components without a historical perspective (Motzkin *et al.*, 1996), especially in the Mediterranean region (Naveh, 1991; Grove and Rackham 2001; Agnoletti, 2005a,b), history was not considered an option, but the central part of the method, aiming to understand the trajectory of landscape systems, indicating values, criticalities, degradations and threats. The methodology developed (see Fig. 1.1) did not have as its main goal to express an ecological evaluation, considering the role and the action of man in the ecosystem. In other words, man was not considered one of the elements usually listed in the models used to explain the relationships among the various biotic and abiotic elements across the landscape, but the 'main' actor in the hierarchy of factors and processes affecting and directing evolution and biodiversity.

Inside the working group there was an agreement that it would not be useful to concentrate on past experiences giving a strong emphasis on geomorphological features, or vegetation models used to describe landscape, but to focus on what was already appearing relevant in some of the most interesting studies, although not fully addressed (Vos and Stortelder, 1992). Therefore, most of the attention was given to 'spaces' linked to land uses and their changes through time, by far the most rele-

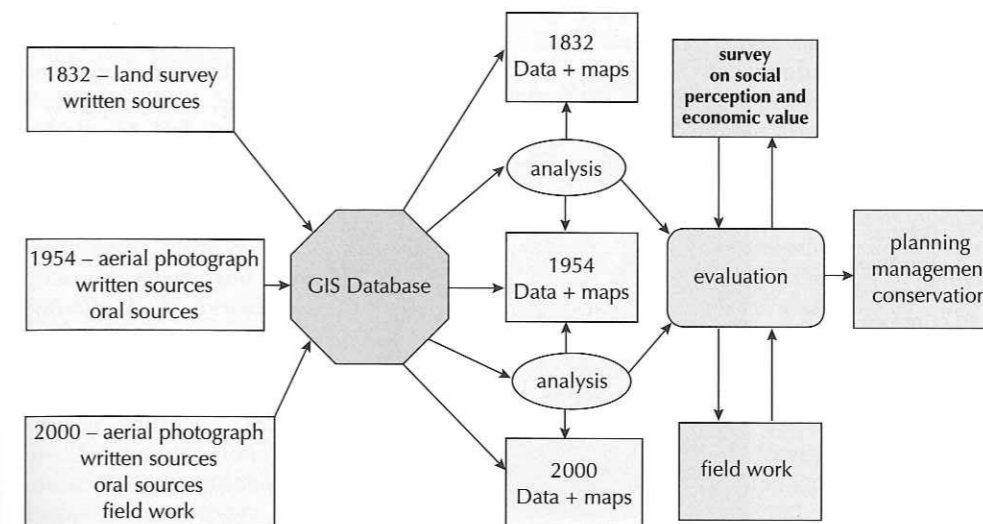


Fig. 1.1. Scheme of the historical and cultural evaluation approach applied in the project. The development of the project also took into account the land use and cover change (LUCC, Lambin and Geist, 2001).

vant issue in the historical dynamic of the landscape of Tuscany, also concerning biodiversity, but not addressed by official investigation (Calistri, 2002). There is in fact a clear relationship between biodiversity and land uses shaping traditional landscapes, often representing valuable 'habitats' for flora and fauna (Wagner *et al.*, 2000; Aauri and De Lucio, 2001; Ortega *et al.*, 2004). Another important aspect of the methodology was the intention to produce a comparative study, analysing many different areas with the same method, meeting also the recent recommendations of UNESCO for cultural landscapes (Fowler, 2003), in order to match the great variety of landscapes existing in Tuscany.

The research meant to cover the following points:

1. Identification of the natural and human factors responsible for landscape changes.
2. Definition of structural typologies and evolutionary patterns.
3. Definition of the historical and cultural value.
4. Determination of the economic value of landscape resources.

5. Definition of management and protection criteria.

To achieve these goals during a 5-year period starting in 2000, the project selected and analysed 13 study areas covering 23,753 ha, approximately 1% of the regional territory. The selection of the areas was made according to the following criteria:

1. To cover the main geographical areas of Tuscany: Apennine mountains, central hills, coastal strip.
2. To include territories with ongoing agricultural and forest activities, abandoned areas and areas placed inside the regional network of protected areas.
3. To provide evidence and sources to justify landscape changes.

The areas selected (Fig. 1.2) represent the geography of the region quite well. In fact, nine areas are located in the hilly region, representing 65% of the whole territory; two are located in the mountains (25%), and two on plains along the coast. Some of the areas also include plains, resulting from the selection of limits including portions of hills and plains. The

- 1 - Moscheta
- 2 - Gargonza
- 3 - Spannocchia
- 4 - Barbiaccia
- 5 - Castagneto C.
- 6 - Donoratico
- 7 - Bolgheri
- 8 - Montepaldi
- 9 - Paganico
- 10 - Cardoso
- 11 - Migliarino
- 12 - Castiglione Garf.
- 13 - Mensola

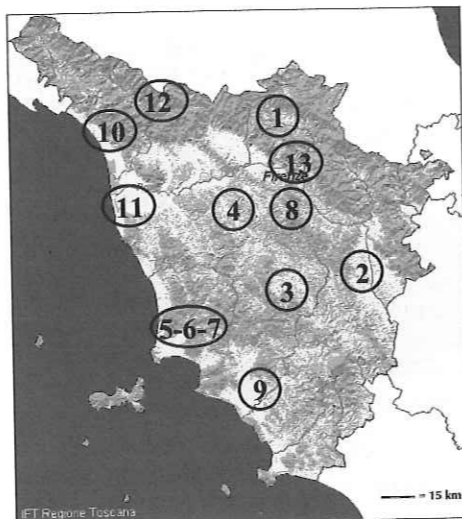


Fig. 1.2. Location of study areas.

choice of making study areas was preferred to methods applied in monitoring or inventories, using remote sensing techniques and statistical grids (Farina, 1998; Köhl, 2003). This method allowed the selection of locations and sizes favouring a good understanding of the structure of the landscape at the level of farming units, facilitating the analysis of the diversity of landscape mosaics. This meant the selection of areas including one or more farming estates, according to the traditional sharecrop system featured in the Tuscan rural economy, with an average size of 1000–2000 ha, facilitated by the availability of written sources preserved in public and private archives and oral sources for recent periods.

In order to develop a dynamic picture of landscape changes, a fairly extended time scale was chosen, selecting three historical moments with different kinds of documents available: 1832, 1954, 2000 (see Fig. 1.1). There is an obviously much longer period that could be analysed, but there was the need to stay away from descriptions already existing in literature (Greppi, 1990; Carandini and Cambi, 2002), but with no detailed descriptions of land uses and

their origins. The year 1832 was chosen because of the availability of a detailed survey represented by the Tuscan Land Register, the cadastre describing almost all the territory on a scale of 1:5000, started by the French at the end of the 18th century and continued by the Lorena Grand Duke after the restoration of the Grand Duchy of Tuscany. This period probably also represents the age with the highest complexity of landscape patterns, due to the strong development of agriculture and demographic growth, although an even higher complexity could be registered in the second part of the 19th century (Agnoletti, 2002). The black and white aerial photographs of 1954 are instead considered the last pictures of the traditional rural Tuscan landscape, documenting the years before the development of mechanization, the use of chemical fertilizers and the abandonment of many farms due to industrial development, the so-called Italian 'economic miracle'. The use of colour digital aerial orthophotos of the year 2000 allowed us to analyse the present landscape, but their interpretation was accompanied by field work to check the data collected.⁴ All the material was digitalized and included in a GIS database.

Analyses based on historical photos and cadastral maps have already been developed not only in Tuscany (Vos and Stortelder, 1992; Agnoletti and Paci, 1998), but also by Iseh for Sweden (1988), Foster *et al.* in the USA (1998) and Knowles (2002). However, in this project a systematic methodology was applied to all the study areas, developing tools to compare different years and specific indices to evaluate the historical value of the territory analysed, also described in the chapter about Moscheta. Different sources were used and integrated (oral interviews, written sources, sampling plots) while specific investigations on economic value and social perceptions were carried out by means of interviews with residents and tourists (see Fig. 1.3). The features of the landscape mosaic were studied in each area detected. Surveys of the individual stands were also undertaken to study the

distribution mechanisms of the vegetation. These studies covered the identification of the structural and evolutionary types in abandoned fields, pastures and forests. Some transects were also made to understand the floristic diversities. Synchronic comparisons verified the level of floristic diversity between identical types of crops, especially in the presence of secondary successions. In some areas specific studies on soil and geology were carried out to support the interpretation of changes in land use types. Investigations were also extended to supply further data in case of specific trends or issues, such as the extension of conifer forests for afforestation or of vineyards due to recent market developments.

Different levels of analysis were developed. The main dynamics were synthesized in graphs, while a more detailed evaluation used a cross tabulation



Fig. 1.3. The author during an interview with a lumberman discussing the features of a traditional billhook used for pruning (thanks to Gil Latz).

matrix comparing each couple of years (1832/1954–1954/2000, 1832–2000). Landscape mosaics were confronted and evaluated also by using some of the indices usually applied in landscape ecology. The categories selected for the legend after the evaluation to synthesize the main dynamics were: built up, deforestation, extensification, forestation, intensification, conifer expansions, stable. The category 'stable' included the percentage of territory not affected by any change in the main land use category (e.g. woods, pasture, fields, etc.). This means that general categories such as 'woodlands', including several different kinds of woods, remained 'woodlands' in the period considered, but might show internal changes related to wood types. The indicator 'built up' refers mostly to urban areas and material structures.

In the cross tabulations columns and lines allow one to check the dynamics of a specific land use between the two periods considered (see Table 1.2). The information collected in this way is very useful for many different kinds of evaluations, such as secondary successions, hydro-geological risk, technological changes, etc. (Agnoletti, 2005a), but particularly for the application of landscape ecology indices, for the construction of the historical index (HI) and the evaluation of integrity, significance and vulnerability of landscape (Fowler, 2003), as well as for restoration purposes. Simplified legends were used to compare information layers with different quality levels (e.g. photos of 1954 and photos of 2000), while more detailed legends were used to describe the land use for each year. This procedure was also necessary to compare the situation of 1832 presenting many land uses, in the year 2000, generally showing a strong reduction in the complexity of landscape mosaic. Maps showing the dynamics of the territory were produced to enhance the understanding of changes and their location in the study area, as already done by Foster (1992) and Vos and Stortelder (1992), but on a smaller scale and using GIS.

To summarize, the analysis provided information on:

- structure of the landscape;
- dynamics of the landscape;
- structure of the individual landscape patches; and
- dynamics of the individual landscape patches.

For each study area the following items were produced:

- land use map 1832;
- Digital Elevation Model (DEM) of 1832 with land use;
- graph of 1832 land use;
- land use map 1954;⁵
- DEM of 1954 (1981) with land use;
- graph of 1954 land use;
- graph of general dynamics 1832–1954;
- map of general dynamics 1832–1954;
- cross tabulation matrix 1832–1954;
- land use map 2004;
- DEM of 2004 with land use;
- graph of 2004 land use;
- graph of general dynamics 1954–2004;
- map of general dynamics 1954–2004;
- cross tabulation matrix 1954–2004;
- graph of general dynamics 1832–2004;
- cross tabulation matrix 1832–2004;
- maps of historical index (land use and topographic);
- dominance index (Shannon and Weaver);
- diversity number (Hill);
- index of Sharpe.

The Interpretation of Landscape Dynamics

One of the most important things that this project taught us is that every area shows its own dynamic pattern and each landscape has its own value, depending on the local context. It is not possible in this text to detail each one of them, although the area of Moscheta is described in this book; however, some generalizations can be made as the trends reported surely represent widespread tendencies related to socio-economic processes affecting the different geographical regions and protected areas. Two studies were in fact undertaken in

protected areas, according to the will of the Nature Conservation Service to monitor landscape changes (Agnoletti, 2005a,b). For each period we will give a description of the general changes, mostly referring to reclassified land uses, so as to present a first level of interpretation. The analysis reported here is concentrated on the original 13 areas surveyed, although in one case the local administration has allowed extension of the survey to the entire territory administered, covering a very large area. The inclusion of these data would have affected the value of a balanced distribution of the study areas in the region, therefore they have been omitted.

The Landscape in 1832

The data available for 1832 show the prevalence of woodlands as the main land use featured by the landscape (52%), followed by pastureland (28%) and cultivated land (20%) (Fig. 1.4). The distribution of the three land uses is not due to the ecological features of the region, because woodlands are prevalent mostly on hills and plains,

pastures are prevalent on the mountains and hills, and cultivated areas only on hills. The location of the three main land uses in the territory is clearly related to the need of man to use the land according to farming activities, whereas the ecological features are favouring or hindering them. The landscape in this period shows a wide variety of land uses with little correlation between the difficulties of environmental conditions and the development of complex rural landscape mosaic. The highest number of land uses is found on the areas placed in the mountains, Cardoso and Moscheta (see Plate 1 and Chapter 5), with 60–65 different land uses in 1000 ha, as well as the highest number of patches (up to 618 in 1000 ha) and the minimum average size of patches (Agnoletti, 2005a). The land uses existing in this period contribute to what can be considered one of the most important features of the Tuscan landscape, which is the great diversity and complexity of the mosaic, made of many patches of small-scale cultivations with trees and shrubs, partly native and partly introduced since Roman times (Di Berenger, 1859; Hughes, 2003). On mountains and hills the extensive use of

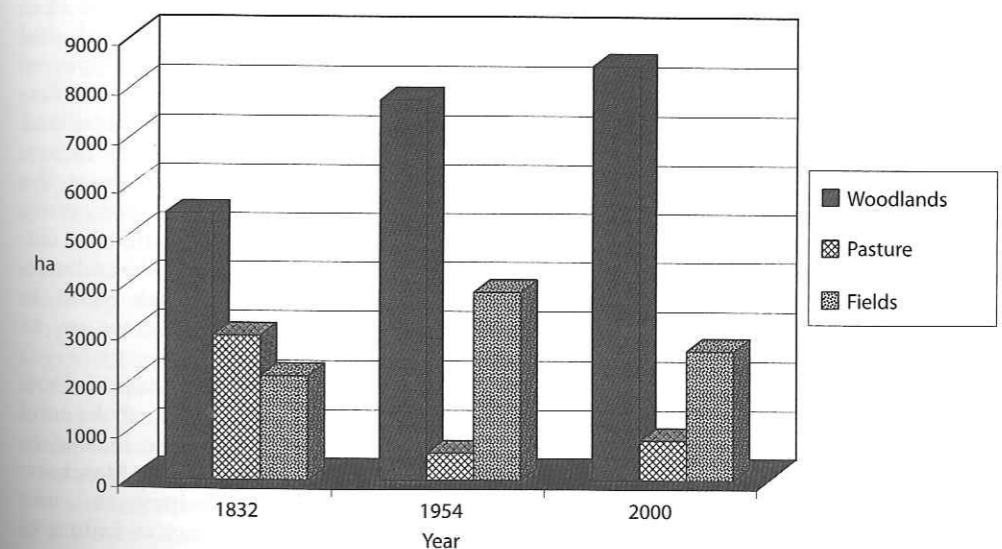


Fig. 1.4. Distribution of woodlands, fields and pastures in the three periods analysed.

terracing allows the creation of strips of land for growing cereals and mixed cultivation, with vines bound to olive, maple, poplar, and, more rarely, elm trees. This is the typical landscape created by the sharecrop system, where every farmer shares 50% of his crops with the owner, but must also grow all he needs in his own piece of land, with the help of large families to provide the labour needed. Considering the richness of flora and fauna and the diversity of spaces created by this system, strongly affecting the overall biodiversity (Baudry and Baudry-Burel, 1982), it is perhaps more correct to use the word 'diversity' rather than 'heterogeneity', as landscapes are often described (Farina, 1998).

Woodlands

In 1832, woodlands are the main land use in seven study areas: five in the hills and two on the plains. As described for other European countries (Watkins and Kirby, 1998; Agnoletti, 2000) they are at a moment in their history when they are at their lowest extent, due to a great demographic development that will result in a doubling of the population during the century, with the extension of agriculture even onto high mountain slopes. In Tuscany there is a strict relationship between farming activities and woodlands. Woodlands are managed using a very wide number of techniques to provide products ranging from leaves to nuts, bark and sap, as well as timber for building or fuelwood. The wood patches in the landscape mosaic are often surrounded by pastures and fields, although some large wooded plots can still be found in some areas in the south of Tuscany.

Unfortunately, not all management forms are described in the cadastre, especially the different kinds of coppice woods, the most common management form, as well as the different forms of pollard trees and other forms of culturally modified trees, so widespread in many traditional rural societies of the world (Arnold and Deewes, 1995; Rackham, 1995; Austad, 1988; Sereni, 1997; Östlund *et al.*, 2001).

High forests of oak used for acorn production (often in the form of pastured woods and therefore low density forests shaped to allow the maximum expansion of the canopy to increase acorn production) are described as very common landscapes, a technique still present in Spain (Fuentes Gonzales, 1994). These woodlands were already the most important landscape form on the hills and along the coast in the 18th century (Agnoletti and Innocenti, 2000). Many of the archival documents analysed show how the economy of the farms, more often concerned with raising livestock than cereal production, depended on the production of acorns from oaks to feed pigs grazing freely in the woods. They reported the impossibility to sell the pigs in very dry seasons, due to difficulties in weight increase caused by the scarcity of acorns. Most of woodlands are described as comprising chestnuts, oaks, beech or even shrubs, but chestnut and shrubs (mostly heather) are usually indicated as separate woodland categories. Shrublands (2%), mostly heather, are described in all the study areas, confirming their fundamental role in the economy of farms, providing fuel for domestic ovens and brick kilns, the raw material for making roofs, charcoal, and drainage systems for vineyards. They were cultivated as short rotation coppice (4–5 years) and were often maintained and created with fire. The different types of woodland categories reported in the cadastre can represent up to 40% of the total land use diversity of several study areas, although woodlands rarely represent the main land use type. In the Gargonza study area, on the hills, there are 11 different categories of woodlands listed in the cadastre, out of a total of 27 land use types. In Moscheta, in the mountains there are 15 categories out of 59.

Great attention has been given to chestnut orchards making up 4.3% of the total woodlands surveyed. They are located in only five study areas (Cardoso, Moscheta, Castagneto, Gargonza, Spannocchia), but here they represent a distinctive feature of those landscapes, with an extent close to those of pastureland and cultivated areas.

They played a fundamental role in the production of flour to feed the population and counter-balance the scarcity of wheat (Pitte, 1986) and in the production of timber assortments for many different purposes. In fact we find these trees in all the different geographic regions: mountains, hills and coast, even at 50 m above sea level. This confirms the little relevance of soil and climate conditions in understanding the distribution of this species compared to that of the role of man. Almost all farmhouses had at least a small chestnut wood. Their management included allowing grazing of animals, so that the ground would be cleared of bushes or leaves to facilitate the harvesting of nuts. It is very significant that the account books of the farms had specific sections dedicated to chestnuts involving both timber and nut production, dividing plots among different farmers. Similar occurrences, mostly for umbrella pines producing nuts or firs producing timber, are quite rare.

Pastures

Pasturelands in the reclassified data included also meadows and characterize 28% of the total land use, representing the main landscape in three areas – one in the hills and two in the mountains. An important role was played by wood pasture representing 11.2% of the total land use, but 44.5% of the total pastureland. They are a typical feature of Mediterranean landscapes, offering shelter to animals during the hot season, reducing the temperature of the soil, and producing nuts, leaves and wood (Grove and Rackham, 2001). They made up most of the coastal forest landscape in the 18th century in Tuscany (Agnoletti and Innocenti, 2000), but are still widespread in countries like Spain (Fuentes Gonzales, 1994; Gil *et al.*, 2003). In some areas, the different types of wood pasture may represent up to 95% of total pastureland diversity, due to the presence of different trees in the pasture, and up to 23–27% of total land uses, not including meadows. Trees in pastures are often

chestnut and beech on the mountains, but oaks, walnut, mulberry and even vines and olive trees are found at lower altitudes. Once again it seems that chestnut is the tree most often found in wood pastures, contributing to a large variety of landscapes from the coast to the Apennine ridge. On the other hand, most of the farms studied based their economy more on livestock than on crop production, confirming the importance of a type of landscape created according to economic needs.

Fields

The agricultural cultivations are prevailing only in two hilly areas, a clear symptom of the bad conditions of many plains, still covered with swamps and often flooded, but also of the prevalence of livestock. They are characterized by a larger extent of bare fields (72%) compared to mixed cultivations (28%); however, the latter present many different qualities due to the presence of several tree species and cultivation patterns, according to the distribution of terraces, hedges, single trees, tree rows etc. Specialized cultivations, such as vineyards and olive orchards, play a limited role in terms of extent (0.3%), the latter prevailing on vineyards. The most common pattern where vines and olive trees are found is surely the mixed cultivation technique, inherited from the Etruscans and extended by the Romans (Sereni, 1997). These cultivations have been detailed for each study area, where different types may represent up to 95% of the land uses classified inside cultivated areas, and 26% of all land use types, contributing greatly to the diversity of landscape in terms of habitats and aesthetic values (Fig. 1.5). One typical pattern, especially on terraced slopes, shows the presence of a row at the edge of the field or the terrace, including two or three vines bound to olive trees and maples, more often poplar in the plains, but even oaks or alder are used for this purpose. Sometimes we can find only olive or maple (*Acer campestre*) to hold the vines. It is certainly the rural part of the landscape creating a



Fig. 1.5. A photograph from the late 19th century showing the richness of mixed cultivation shaping the landscape around Bibbiena. The density of trees could be more than 100/ha.

higher diversity, in terms of patches and their internal features, compared to the woodlands. In fact, fruit trees also contribute to enrich this landscape, although the density of trees in the fields never reaches the level of 200 trees per hectare noted for the Padana valley (Cazzola, 1996). During these years terraces, with dry walls or not, have been greatly extended in the agrarian landscape, up to a point that agronomists argue that they have also been placed in unfavourable geological conditions. Certainly they represent an important expenditure in the account books and are the most common technique to extend cultivation on the hills (Agnoletti and Paci, 1998).

The Landscape in 1954

The landscape of 1954 shows the strong increase of woodlands (+60%) and cultivated areas (+30%), while the importance of pasture land has greatly reduced, covering only 4.3%. The analysis of this year presented some difficulties due to the bad quality of aerial photographs; therefore, the

identification of the internal qualities of each patch could not be as accurate as the description of the cadastre of 1832. There is a significant reduction of the number of land uses (-49%) and landscape patches (-17%), as well as in Hill's diversity number. In this year, more study areas than in 1832 are characterized by the prevalence of woodlands (9 out of 13). Woods are prevalent in five areas on the hills, three on the mountains and one on the plain along the coast, while four areas on the hills and one on the plains show more cultivated fields; but pastures no longer prevail in any of the areas studied. Reforestation is triggered by abandonment of farming, while the vegetation types are determined by the previous land uses and the ecological conditions (Agnoletti and Paci, 1998; Monser *et al.*, 2003). This situation shows that the transformation of the rural economy has already started before the coming of the great innovation affecting Italian society in the following years, although there is still a traditional form of agriculture dominating most of the areas, despite the agrarian reform.

The analysis of the general dynamics of

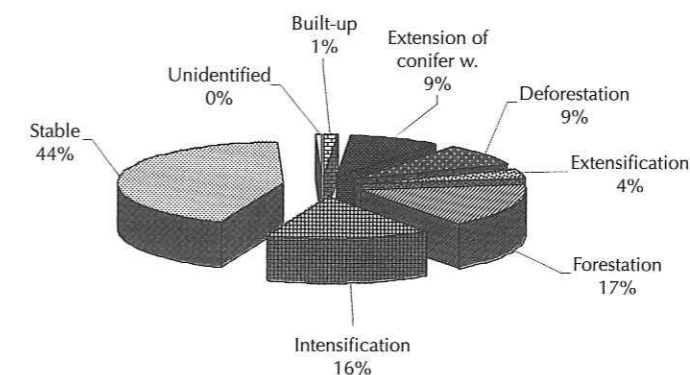


Fig. 1.6. Main landscape dynamics 1832-1954.

the period between 1832 and 1954 (Fig. 1.6) shows that 44% of land uses remained unchanged, while the most important processes are forestation (17%) and intensification (16%). The growth of forest occurs mostly on abandoned pasture and wood pastures, the quality of land use showing the strongest reduction in the landscape, because of the interruption of the practice of letting animals graze freely on the land (they are now kept in stables). The extension of new agricultural forms occurs mostly on former wood pastures, mixed cultivations, pastures and woodlands. New agricultural techniques are substituting old mixed cultivations and new cultivated areas extend on former woodlands or on wetlands in the plains. This is a clear trend along the coast, in Donoratico and Castiglione, where the centre of the farming activities moved from the hills to the plains after land reclamation, with the total abandonment of farms on the hills (Bezzini, 1996). Table 1.1 aids the understanding of some of the changes that occurred at regional level in this long period of time,

coming from an elaboration of the original publication by Sereni (1997), but probably not taking into account the different territories included in the different surveys.

Demography played a very important role in this long period, as the population of Italy increased from 22,000,000 to 47,000,000 inhabitants from 1861 to 1955, while the insufficient production of cereals led to a huge increase in the importation of this commodity, making it the second largest import between 1800 and 1900. Also in Tuscany the population grew from 1,303,000 inhabitants in 1810 to 2,317,004 in 1889 (Agnoletti, 2002), so the need for new land extended cultivation towards the high hills and the mountain slopes, favouring the growth of population in mountain areas until 1920-1930, with an increase of 150% (Fig. 1.7). The first industrialization of Italy occurred at the end of the 19th century (Castronovo, 1995) and this, together with the law of 1877, favoured deforestation of almost 1,000,000 ha within 50 years, causing the greatest reduction of Italian forests ever seen in modern times.

Table 1.1. Evolution of the main cultivation in Tuscany 1832-1929 (ha x1000). Modified from Sereni (1997).

Cultivation type	Year			
	1832	1860	1910	1929
Simple fields	681	722	553	454
Mixed cultivation	Not available	-	661	554
Pastures and meadows	583	480	455	134
Woodlands	630	697	909	813
Fallow	448	243	135	255

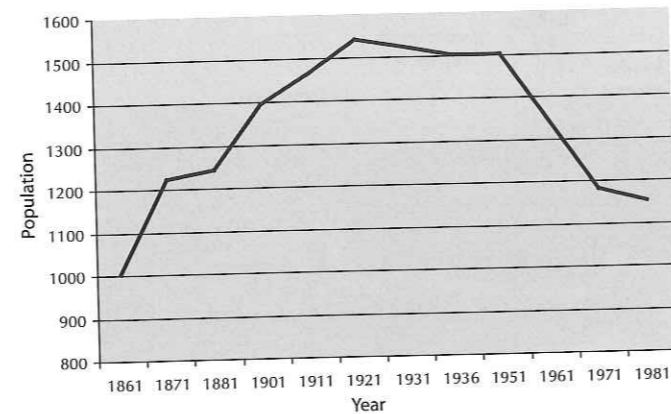


Fig. 1.7. Population in the northern Apennine mountains 1861-1981.

Woodlands

Among woodlands the reduction of shrublands (-40%) is very clear. Once cultivated as short rotation coppices and now mostly turned into high forests, they suffered from the interruption of their management due to the abandonment of farming. Coppice is now the most important management form, by far the most useful for farming activities and also for the production of charcoal, comprising 25% of the entire Italian production. Pastured woods no longer exist because the practice of feeding animals with acorns falls into disuse; they are now kept in stables. Chestnut orchards are also reduced in their extent (-84%) due to the changes in agriculture and the abandonment of farms on mountains and high hills, slowly reducing the importance of a method of cultivation more than 2000 years old. Almost 30% of them are turned into mixed woods and coppice, while 40% are woods where chestnut is clearly prevailing, but slowly evolving towards a mixed stand. Chestnut coppice provides poles for vineyards and the widest number of timber assortments available for agriculture and building on the market, but many new coppices are created after debarking of high trees for the production of tannin. The abandonment of chestnut cultivation is also favouring pests affecting these species, often occurring after the abandonment of the management of a species planted outside its ecological optimum (Vos and Sortelder, 1992).

Conifer forests resulting from afforestation are a new element appearing in the landscape. They represent almost 16% of the woodlands and 10% of the entire landscape, due to the activity of the Italian state in this sector and to private activity. After the unification of Italy in 1861, the state developed a large programme of afforestation affecting all Italy, but until World War II there was little success in this policy, with only 197,000 new forests planted (Agnoletti, 2002). The greatest obstacle to afforestation was not only money, but also the conflicts with shepherds burning plantations to keep pastureland. This conflict was overcome only with the abandonment of mountain areas that occurred after World War II, when the population of the mountains went back down to that of 1861.

Not all the conifer woods have the same significance. The umbrella pines planted along the coast have produced a valuable landscape, useful for protecting fields from sea wind, but also producing edible nuts. The conservation of these forests has been opposed by environmentalists preferring a more natural landscape, especially in protected areas (Agnoletti, 2005b). The afforestation on the mountains, mostly with black pine (*Pinus nigra*), has introduced a degradation in the aesthetic quality of the landscape because of the use of conifers planted in squared plots, typical of artificial plantations, in an area dominated by pastures and broadleaved species, and was

never really included in the local culture. Many pasturelands existing in 1832 (43%) have been turned into woodlands, 6% due to afforestation, and 27% into cultivated areas, especially on the plains; but wooded pastures have reduced in extent by almost 80%.

Fields

On the agricultural side there is an increase of cultivated land (+44%), with a very strong expansion of specialized olive orchards, almost 32 times more than in 1832. Specialized vineyards have also increased from 0.23 to 40 ha (see Table 1.2). However, the coming of these specialized cultivations is not yet deleting the old mixed cultivation, which does not show a significant decrease, but are simply adding new elements to the landscape, showing a slight growth. New specialized olive orchards, added to the traditional patterns with sparse olive trees in the fields, are substituting most sowable lands and woodlands, but also new specialized vineyards are replacing sowable lands, making Tuscany one of the Italian regions where the 'wine landscape' is most extensive (Sereni, 1997). Mixed cultivation still remains an important feature of Tuscany, placing the region somewhere between the larger extension of mixed cultivations occurring in the north and the much lower use of trees in the fields that characterizes the southern regions. These changes are slowly introducing the new trends of rural economy in Tuscany, helped by mechanization and chemical fertilizers, which will concentrate agriculture on the best areas and lead to the abandonment of marginal lands on high hills and mountains - a general trend affecting many other countries in the world in the years after the war (McNeill, 2000).

The Landscape in 2004

The years between 1954 and 2000 are a crucial period for Italy and Tuscany. The end of the 1950s and the beginning of the 1960s marks the transformation of Italy from

a rural into an industrialized economy, with millions of people moving from the countryside to industrial urban areas. Agriculture and forestry will be strongly affected by these changes from all viewpoints. After an initial period of abandonment, the last decades of the century see a return of people to the land, not as farmers, but as residents interested in the quality of life provided by the Tuscan countryside. Furthermore, many foreigners are buying properties in Tuscany - in some areas in the Chianti region they are approaching the number of local residents. This new interest in the landscape is rapidly increasing the role of services like agritourism (Cox *et al.*, 1994; Casini, 2000), often replacing production as the main source of income, and the role of landscape resources, as more and more people in Italy and abroad are buying wine or come to Tuscany for a holiday. Concerning forestry, the reduced pressure on forest territory has opened the door to the rise of environmentalism in society, and now forests and woodlands are mostly seen as an expression of 'nature', with an interesting and rapid deletion from the memory of the public of their cultural origin. It is the new urban society replacing the rural one which is developing these concepts and creating environmental ideas that will affect the way forests are seen by policy-makers.

The landscape in the areas surveyed shows a small increase in the number of land uses (+10%) and the number of patches, a result probably of the more detailed aerial photographs and field work available in these years, but also due to the new owners buying some of the farms surveyed. New capital is now put into the countryside, similar to what happened in the Renaissance when families of merchants like the Medici invested money made from trade into big farms (Sereni, 1997). However, the further increase in the average surface area of patches and in the average value of the dominance index clearly indicates a simplification of landscape occurring both in forest and agricultural areas, as the new agricultural techniques are not creating valuable landscapes as in the Medicean times.

Table 1.2. Cross tabulation 1832-1954. Columns and lines allow checking of the evolution of the land uses in the period analysed.

1832	1954														Total		
	Waters	Anthropic	Shrubs	Sparse vegetation	Woodland	Woods with prevalence of chestnut	Chestnut orchards	Quarry	Fallow	Olive orchards	Pasture	Wooded pasture	Meadow	Afforestation		Sowable	Mixed cultivation
Extent in ha	123.71	5.32	39.40	30.58	30.58	0.38	0.03	0.03	1.48	0.69	0.04	8.53	32.10	67.85	15.05	0.01	322.54
Waters	17.26	0.61	0.11	5.99	0.38	0.22	0.03	0.03	1.48	0.69	0.04	8.53	32.10	67.85	15.05	0.01	31.71
Anthropic	0.48	42.56	4.19	3.51	3056.21	15.74	14.90	0.21	20.59	269.15	48.85	88.08	589.06	178.30	221.14	0.43	4555.79
Shrubs	0.48	2.44	0.62	16.73	142.12	199.67	77.90	0.80	0.87	7.00	0.95	6.00	20.84	2.69	9.69	0.43	488.50
Sparse vegetation	0.48	0.61	0.53	0.02	19.64	1.02	0.71	0.15	0.11	10.75	2.03	0.49	0.40	25.45	1.21	0.43	49.33
Woodland	0.48	1.91	0.26	0.36	3.03	0.16	0.16	0.16	0.16	21.93	0.16	0.16	0.16	0.16	0.16	0.16	51.80
Woods with prevalence of chestnut	0.48	1.95	0.26	0.36	3.03	0.16	0.16	0.16	0.16	21.93	0.16	0.16	0.16	0.16	0.16	0.16	25.06
Chestnut orchards	0.48	19.30	14.03	114.54	653.03	26.67	4.96	0.06	11.18	53.75	88.71	45.41	0.43	136.30	194.59	169.11	1548.35
Fallow	0.48	11.50	53.42	1.59	562.58	15.47	6.78	1.81	32.64	54.01	51.77	5.68	43.85	389.15	16.39	0.35	1246.65
Not defined	0.48	2.16	5.74	1.65	16.67	6.02	1.64	1.22	2.76	7.62	4.95	0.59	0.59	27.92	2.24	0.00	81.52
Olive orchards	0.48	2.74	0.00	0.00	20.07	1.32	0.65	0.11	0.07	22.45	0.38	5.64	3.66	141.32	9.65	0.22	66.97
Pasture	0.48	5.90	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	147.22
Wooded pasture	0.48	5.90	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	25.06
Meadow	0.48	5.90	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	25.06
Wooded meadow	0.48	5.90	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	25.06
Afforestation	0.48	2.41	58.53	24.26	243.86	37.28	0.71	0.34	10.64	314.75	10.12	12.47	1.97	29.82	614.98	119.96	28.62
Sowable	0.48	2.60	38.49	1.20	92.17	31.21	2.17	2.06	1.78	78.59	1.97	6.14	0.67	30.97	267.45	33.30	0.36
Mixed cultivation	0.48	6.55	5.84	10.12	10.12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	89.29	0.06	9.17	120.97
Beach	0.48	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.23
Vineyard	0.48	131.01	217.76	149.85	5058.48	335.14	113.41	4.61	46.97	816.19	216.48	220.99	22.51	1141.37	1831.20	577.04	40.19
Total	0.48	131.01	217.76	149.85	5058.48	335.14	113.41	4.61	46.97	816.19	216.48	220.99	22.51	1141.37	1831.20	577.04	40.19

Woodlands

Woodlands no longer play a strategic role in terms of charcoal and timber production, showing a further increase of their extension (Fig. 1.8), covering 47% of the region and 55% of the productive land, making Tuscany the most forested region of Italy (Regione Toscana, 1998). However, after a decrease lasting until the oil crisis of 1978, there is a new growth of the importance of fuelwood production for domestic use, allowing the management of coppice woods, representing 75% of all management forms. Woodlands now cover 66% of the landscape in the area surveyed, followed by cultivated fields (20%), while pasturelands have slowly increased (9%). Woods are the most important land use in ten areas; only three areas – one along the coast and two on the hills in the Florence district – show the prevalence of cultivated land, a clear indication of the importance of the abandonment that occurred.

The features of forest landscape are characterized by the prevalence of mixed stands and coppice, but the general patterns show simplified typologies, mostly made of dense, homogeneous forest covers, where diversity is mostly due to the presence of mixed species, that do not contribute much to the diversity of landscape mosaic (Agnoletti, 2002). In terms of management forms, simple coppice has now replaced mixed coppice with standards, a clear indication of the reduced amount of timber assort-

ments produced, due to the change in farming systems, once deeply linked to coppice. Many coppices are quite aged, following the interruption of cuttings in areas far from roads, especially after the end of charcoal production in the late 1950s due to the introduction of new energy sources, while pollard trees for fodder or nut production no longer exist. Most coppice woods on the highest part of the mountains have been turned into high stands by foresters in order to develop a protective role, but terraced charcoal kilns on mountain slopes are still there, to testify to the former use of those woodlands. In the high stands there is now a higher proportion of conifers due not only to afforestation (15.5%), but also to secondary successions on abandoned fields and pastures. The new law of 1952, financing afforestation with the goal of creating new jobs, was clearly trying to create new forests not only for protection, but also to produce more timber. About 800,000 ha of new afforestations were registered in Italy in the following decades. Between 1947 and 1997 conifer woods have doubled in area in Tuscany and broadleaved woods have reduced, continuing a trend already observed in many European countries (Agnoletti, 2000; Johann *et al.* 2004; Brandl, 1992). More than 50% of afforestation since 1954 is in fact occurring on former woodlands, while the rest is occurring on fields, chestnut woods, pastures and old olive orchards. Even today, afforestation continues with no regard for

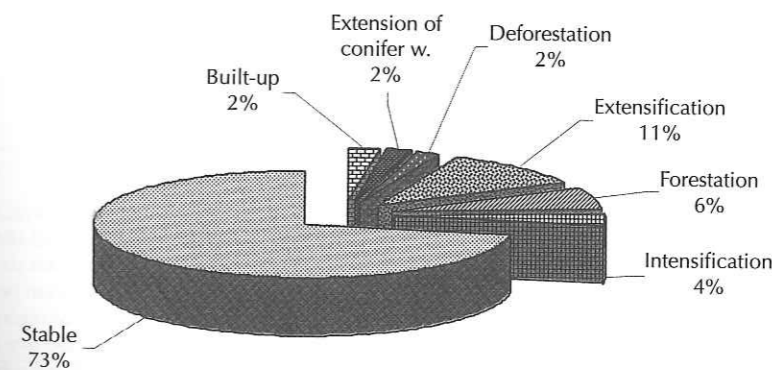


Fig. 1.8. Main landscape dynamics 1954-2004.

and chemical fertilizer are rapidly increasing the amounts produced per hectare. Mechanization favoured the abandonment of terracing and the elimination of trees and hedges, especially in marginal areas, creating large fields and extended monocultures. In many cases, like in Gargonza and Cardoso (Fig 1.10), the forest is today covering terraces once shaping hills and mountains (Agnoletti and Paci, 1998). New vineyards have been planted on mixed cultivations (45%), on fields (30%) and olive orchards (24%), but technical evolution has concentrated its efforts on making large regular plots cultivated uphill, even on steep slopes, often causing erosion and degrading the quality of the landscape. In some areas the extension of the maximum concentration of adjacent vineyards plots has increased from 26 to 253 ha, with a

strong simplification of landscape patterns forming large subsystems with only vineyards (Fig 1.11). The development of new vineyards is occurring only on hills and plains, while on the mountains they have been deleted from the landscape.

The decrease of mixed cultivations is quite significant in the areas studied (-66%) – generally diminished by 75% between 1955 and 1974 in the whole region (Agnoletti, 2002) with a great loss also in the wood species included, ranging from fruit trees to woody species. It is worth noting the creation of a new form of 'European' agrarian landscape, due to plantations favoured by the EEC directive 2080/92. The idea of favouring the designation of large portions of farmland with subsidies given to replace existing crops with tree species suited for timber production on



Fig. 1.10. Photograph (a) shows a view of Cardoso (Regional Park of the Apuane mountains) at the beginning of the 20th century. It is possible to note that the slopes behind the village were all terraced and planted with trees. Photograph (b) shows the same view of Cardoso today. The old landscape is now covered by forest (see Plates 1 and 2).

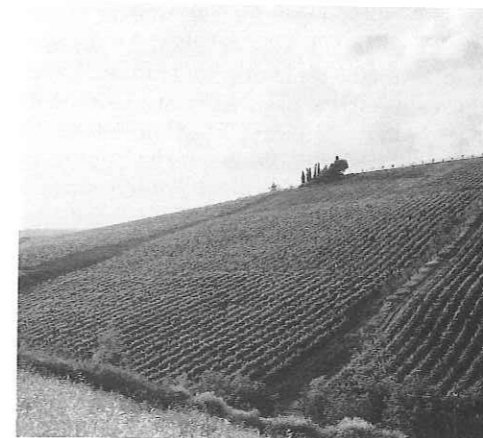


Fig. 1.11. Wine monocultures covering entire hill slopes are making landscape more homogeneous, creating a sort of 'globalscape' typical of many wine regions in the world.

them from a scientific point of view, the interviews have confirmed our results. This is true even for a very interesting aspect regarding the fact that the same element (e.g. afforestation) may have a totally different meaning in two different areas. Umbrella pine plantations along the coast have created historical landscapes appreciated for their beauty and recreational features, while the afforestation of black pine made on the hills and mountains seems to be valuable only for the foresters who planted them. Another aspect of this investigation is the willingness of most of the people to accept a tax to preserve landscape, while farmers do not accept it. This is an interesting indication of how rural policies have failed to address some of the needs of society (Agnoletti, 2002).

A General View of the 1832–2004 Changes

a 25-year cycle has often contributed to a further degradation of the cultural features of the landscape, speeding up the abandonment of traditional forms. At the same time this policy has very little chance of affecting the timber market in any way. The landscape quality of these plantations is not necessarily always bad, but it should be asked why, when decisions like these are made about valuable landscapes, there is no evaluation of their impact or any study to adapt them to the local context.

Public perception and economic value

Besides the sampling plots made to analyse the features of vegetation changes, some of the most interesting investigations relate to the perception of the landscape by residents and tourists. There is not enough space here to present these results (Casini and Ferrini, 2002), as will be done in Chapter 5 about Moscheta, but, confirming what has already been noted, there is a strong feeling of cultural identity among the people represented by the landscape (Bacci, 2002). It is very relevant that in areas where our investigations have indicated the most significant landscape forms, characterizing

Landscape changes occurring in Tuscany over the last two centuries are due to direct socio-economic factors. Their size and features are not comparable to any ecological or climate change that occurred in the past two centuries, or to those foreseen for the next. The quality of landscape resources reflects how society develops, especially in the way landscape is perceived by the public, both when development is very much based upon local resources, as in the past, or when this is no longer occurring.

Most of the changes analysed occurred in the period 1832–1954. The following decades confirm a trend initiated before, although some processes such as demographic fall in the mountains are surely very fast, but comparable to the growth between 1861 and 1920. Woodlands and trees in the fields are both central elements involved in the landscape dynamics. Forestation is the most important process occurring (21% of changes), followed by intensification in agriculture (11%) and again by afforestation due to conifer plantations (10%). The increase of woodlands (55% since 1832, 8.7% between 1954 and 2000) is taking place mostly on abandoned

pastures and wood pastures (53%), less on cultivated land (20%). Woodlands have increased their area in ten study areas, sometimes by more than double where abandonment has been stronger, as in the mountains and even in the hilly areas. These trends are similar to those reported in several rural areas submitted to abandonment for comparable periods of time (Foster, 1992; Foster *et al.*, 1998), but in our case we have also measured overwhelming changes in the landscape mosaic (see Plate 3). The expansion of woodlands is a process comparable to the general trend reported for Italy in the last 100 years, showing that forests have more than doubled their area, with the evident absence of any real threat for them in the last 50 years (Fig. 1.12). It is worth noting that new plantations with conifers are mostly occurring on territories previously presenting different woodlands or shrubs (65%), but not denuded land.

As in the rest of Italy, the success of afforestation is not only due to the money spent, but to the decrease of population in mountain areas and the reduction of livestock farming, or the cessation of the eco-

nomie role of former forests, such as chestnut orchards. Finally a 'state landscape' came through, replacing the former social landscape of the past, and this new landscape is the real legacy of afforestation. In fact, these new conifer forests had no influence on the timber market. They probably had a role in reducing risk on former pastures and fields on steep mountain slopes, but they definitely had an impact on the landscape, leaving large squared plots, with little relevance to local culture or ecological conditions (see Plate 7).

Pasturelands show a very significant reduction, decreasing to only 25% of their former extent, as do wood pastures (15.5%) (Fig. 1.13); a certain amount of them have been turned not only into forest, but also into specialized cultivations and sowable land. Cultivated fields have slightly increased, but with a strong growth of sowable land (+ 407%). A very substantial increase is the one shown by olive orchards, which have increased 25-fold, and vineyards, almost non-existent as specialized cultivations in the past. It is worth noting the increase of specialized olive

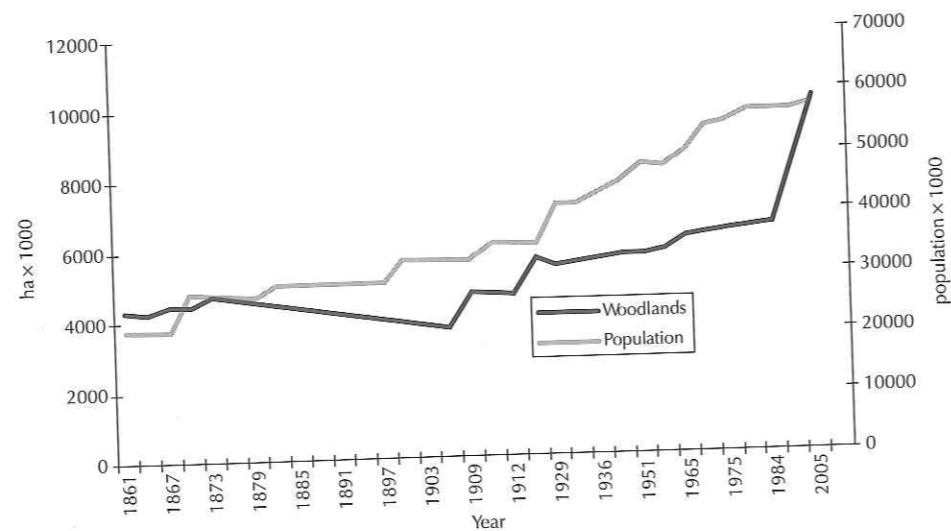


Fig. 1.12. Extent of the Italian forests and population growth between 1861 and 2005. The substantial increase after 1985 is mostly due to the different ways of considering what is 'woodland' by the National Forest Inventory made in 1985 and 2005. Nevertheless, there is undoubtedly a steady growth after World War I due to the changing relationship between socio-economic development and forest resources.



Fig. 1.13. A wood pasture with beech in the study area of Moscheta (see Chapter 5). Wood pastures have almost disappeared because of the reduction of grazing and the advancement of woodlands.

orchards and vineyards. Both of them also show a strong increase in the size of patches, as described for 1954–2004, with large portions of land with a repeated monoculture pattern presented as 'typical' elements of traditional landscapes by rural developers, but clearly presenting the fea-

tures of industrial cultivation (Fig. 1.14). The data also show the strong reduction of all the categories of mixed cultivations described for 1832, now reduced to almost one third. Unfortunately, only field work is able to show that most of those still existing are modified and simplified forms, usually

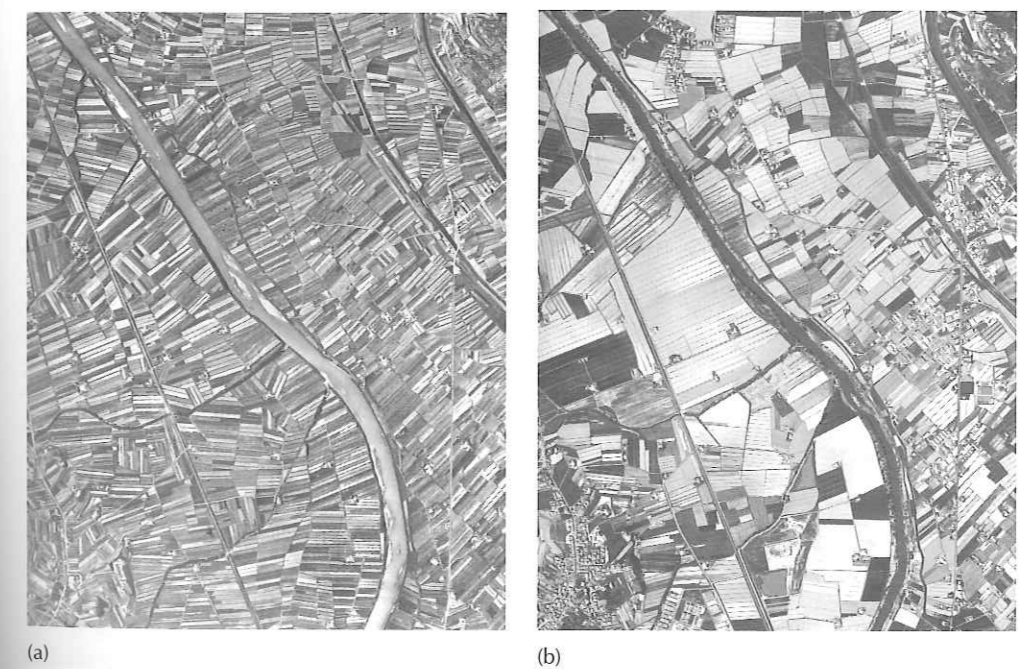


Fig. 1.14. The increasing size of the fields in a rural mosaic along the Arno River. Left: a photograph taken in 1954. Right: the same area on a photograph of 1996.

linked to fruit orchards or tree rows at the sides of fields.

One of the most dramatic trends, starting even before 1954, is the great loss of diversity in the landscape, with the decrease of many land uses linked to pastures, fields and woods and a consequent dramatic reduction of the diversity of spaces due to land uses, by almost 45% between 1832 and 2004 (see Plates 1, 2 and 3). The biodiversity of spaces is a part of general biodiversity and a fundamental aspect of the quality of the cultural landscape existing in Tuscany, as well as in the entire Mediterranean region (Baudry and Baudry-Burel, 1982; Naveh, 1998). This reduction, related to the number of land uses, is fully expressive of a reduced biological diversity; very diverse landscapes are more species-rich than individual habitat components. The reduction of this diversity is supported by the trends analysed in other indices. The number of patches is 84% of that existing in 1832, while their average size has also increased by 11% (Table 1.4). These data together with the decrease by 36% of Hill's diversity number confirm the simplification of the landscape mosaic. This reduction in diversity of patches in relatively small areas, according to the size of our study areas, makes the present diversity of the regional landscape mostly based on the features of larger subsystems inside the main geographical areas, confirming the change from a fine-grained to a coarse-grained landscape (Angelstam, 1997).

This loss of diversity is particularly significant from many points of view. First of

all, the diversity of species is probably not the only important feature of Italy (although quite significant in the European context), but rather its diversity of spaces created by man in centuries of rural and forest practices, also introducing many species originally not present in the Italian peninsula before Roman times. It is also well known that specific forest types, like chestnut orchards, often present a higher floristic diversity compared to abandoned orchards (Romane and Valerino, 1997). Another problem is the loss of cultural values related to rural and forest practices existent since Etruscan times, connected to small-scale productions creating many small patches in the landscape mosaic, although this feature cannot be generalized for the entire region and Italy. From this point of view, the world-famous pictures of Tuscany showing denuded landscapes with rare cypress trees cannot be considered a common pattern, but an element of the general diversity of the landscapes in the region.

Conclusions

This project has produced a large amount of information on the landscape dynamics occurring in the Tuscan territory in the last 180 years, only partially presented in this text, mostly focused on the factors and processes affecting the main dynamics and the reduction of landscape diversity. The decreased diversity can be clearly ascribed to some main trends. One is the advancement of a continuous forest layer covering

Table 1.4. Indices detailing the changes in landscape diversity for all areas studied.

	Year		
	1832	1954	2004
Number of land uses	310	158	173
Number of patches	1838	1521	1549
Average surface area of patches (ha)	11.66	12.40	13.00
Average number of patches × ha	0.17	0.14	0.15
Shannon index (mean value)	1.09	0.90	1.11
Hill's diversity number (mean value)	8.30	5.00	5.30

the former landscape mosaic like a mantle (see Plate 3). Another is the increased size of fields in agricultural areas. A third is the simplification of the internal structure of landscape patches. In many cases this trend is not sustainable, not only for biodiversity but also for the conservation of landscape resources, not to mention the disappearance of specific woodlands, like chestnut orchards, and a wide number of traditional management practices. In the areas more affected by this process landscape diversity may be only 9% of what it was in 1832, while the number of patches may be only 14% of that in 1832 (see Plates 1 and 2). In the areas where the farmers are still present instead, this tendency can even be inverted, although the internal quality of new landscape patches is not always good. The interruption of traditional techniques like mixed cultivations, terraces, wood pastures, tree rows, and hedges that characterized farming until the 1950s has been replaced by extended monocultures created with mechanization, allowing uphill cultivation even on steep slopes, as in the case of vineyards. This has often created a landscape where diversity and uniqueness, according to UNESCO criteria (Fowler, 2003), are often given mostly by morphological features, while the mosaic can be compared to other regions in the world. The interruption of traditional rural practices also has a strong impact on the hydro-geological risk, causing erosions and landslides affecting especially mountain and hilly areas. In this respect the landscape existing in the area studied until the early 1950s can probably be compared with the ones still surviving in places like Eastern European countries, where industrialization will soon induce the same process. These tendencies are also degrading the economic role of landscape, as an added value for typical products and tourism, and decreasing the quality of life for citizens who prefer a more diverse landscape and feel a very strong cultural relationship with their historical landscapes.

It seems that no real policies have been enhanced to change these trends – on the contrary, many European Union directives concerning rural development and nature

conservation are speeding up these trends. The lack of attention given to the role of landscape resources as an added value for rural economy, protecting and favouring the upkeep of traditional practices (Fig. 1.15), creating markets for typical products linking them to their landscapes, promoting the role of landscape for agritourism, have been neglected in favour of other choices. Initiatives promoting setaside, industrial plantations, and technological innovation have denied the fact that development should also care for the conservation of landscape resources as a cultural value, for the quality of life, as a factor of competitiveness. From this point of view, the subsidies given by the EU favouring setaside and plantations have contributed to the disappearance of the typical elements of cultural landscape. Very probably these trends will have the same effect in new eastern EU countries.

Another threat comes from the nature conservation strategies and a paradigmatic way of considering the role of nature and the concept of sustainability. The network of



Fig. 1.15. An old farmer tying vines to maple trees (circa 1930) in a mixed cultivation according to a tradition existing in Tuscany at least since Etruscan times, 1000 BC. Saving traditional knowledge is one of the most important issues in the conservation of cultural landscapes.

protected areas and the habitat directive, acknowledged by Tuscany with a regional law, is enclosing a list of habitats according to the EU habitat list, presenting a peculiar reading of the territory where the protected areas have been established. Areas clearly having a human origin have been described by presenting them as natural or semi-natural. This operation can sometimes be seen as an attempt to offer another 'reading' of the European territory by denying its cultural origin, a factor regarding not only Mediterranean woodlands but also boreal forests (Axelsson and Östlund, 2000).

Another reason for the reduced attention to landscape quality is the perception

of managers and a large portion of the public and media that the extension of forest land and renaturalization is a very favourable process, increasing the value of the territory. This vision is supported also by the current way certification standards are developed, enabling agencies to give a label of 'sustainability' to a new forest growing on an ancient rural pattern. In Tuscany, this is also helped by forest legislation saying that an abandoned field covered by a new forest after 15 years is to be considered untouchable, unless the owner pays for a new afforestation of the same size. The fact that a forest is 'untouchable' is very representative of a hierarchy of values paying little atten-

Table 1.5. Criteria and indicators proposed for the sustainable management of cultural landscapes in Tuscany.

Criteria	Indicators	Description
1. Significance	Uniqueness	In the local, regional, national or international context
	Matrix	Internal feature in terms of complexity
	Persistence of mosaic	Historical persistence of the structure of landscape mosaic
	Socioeconomic activities	Practices, traditional knowledge, productions, to maintain landscapes
	Persistence of land uses	Historical persistence of single land uses
	Extension of land uses	Maintenance of the extension of each land use
	Internal features of patches	Maintenance of the internal structure of patches
	Material evidence	Persistence of material evidence in the landscape
	Social perception	Social awareness of landscape values
	2. Integrity	Extension
Geomorphologic features		Maintenance of specific geomorphologic structures
Aesthetic		Maintenance of aesthetic values
Management practices		Conservation of traditional knowledge and management forms
Structure of the matrix		Maintenance of the structure of the landscape matrix
Structure of the mosaic		State of conservation of landscape mosaic
Structure of patches		State of conservation of single patches
Cultural heritage		State of conservation of architectural assets and material evidence
Natural heritage		State of conservation of flora and fauna
Conservation and research		Research and conservation activity related to the area
3. Vulnerability	Fragility	Intrinsic fragility of landscape structure
	Farming	Farming activity affecting landscape
	Forestry	Forest activities affecting landscape
	Industrial activity, infrastructure, urbanization	Direct and related activities influencing landscape
	Natural evolution	Fragility of landscape to natural dynamics
	Tourism	Tourist activities influencing landscape
	Social structure	Social features affecting landscape

tion to cultural landscape and denying the role of spaces in biodiversity. Under these circumstances it would be worth reflecting on the way in which sustainability is conceived and applied, and how paradigmatic visions can reduce the chance to develop an approach more adapted to local situations. The methodology developed in this project has been shown to be particularly suited for the development of criteria and indicators to assess significance, integrity and vulnerability of these landscapes, helping to develop management, monitoring and restoration, but also new ways of managing the network of protected areas (Table 1.5). So far, the HCEA methodology has been applied in a wide number of regional proj-

ects ranging from environmental impact assessment to the management of protected areas and urban and landscape planning, but it is currently discussed in the National Strategic Plan for Rural Development and presented also during the work of the Ministerial Conference for the Protection of Forest in Europe, dedicated to the promotion of historical and cultural values in sustainable forest management.⁸ However, some signs of new trends appearing in rural development, in the European forest strategy and important events like the European Landscape Convention, suggest a possible change, hopefully taking effect before cultural landscapes are completely lost (see Plate 4).

Notes

1. The author is writing as coordinator of the group of researchers involved in the survey. A team of 20 researchers was involved in the project. The international institutions included: the International Union of Forest Research Organizations, the American Forest History Society, Portland State University and the American Science Foundation.
2. Law number one, the Management of the Territory, n. 5 of 1996, now revised as n. 1 of 2005.
3. Department of Environmental Forestry Science and Technology, Faculty of Agriculture.
4. The project lasted for 5 years; the interpretation of the photographs of the year 2000 was accompanied by field work carried out in 2001, 2002, 2003, 2004 and 2005, according to the different areas surveyed.
5. For two areas photographs of 1981 were used. However, the result was incorporated in the data regarding 1954, since the comparison between the two years did not show significant changes in the trends.

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