Energy and Culture

Perspectives on the Power to Work

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ASHGATE

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Chapter 3

Work and Environment in Mediterranean Europe

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The purpose of this chapter is to indicate the sources of energy available to the Mediterranean agricultural sector, and the use made of them, during the period from the end of the Middle Ages down through the twentieth century, as traditional agriculture disappeared. The intent is also to demonstrate that the risk of environmental degradation connected with human activity is not a peculiarity of industrial society, but that it had already manifested itself at the beginning of the period taken into account. Farmers, agronomists and governments strove to minimize this degradation which, had it been irreversible, would have caused the disappearance of entire communities. In fact, the risk of irreversible degradation has increased since the Industrial Revolution and especially during the course of the twentieth century. Only recently have we begun to understand the dangers that this creates for the planet. The dilapidation of the soil has been occurring for thousands of years but now it has increased dramatically. Approximately 35 percent of the earth's soil is degraded permanently.

During the long period taken into consideration and until the beginning of the twentieth century, the sources of energy used in Mediterranean agriculture were primarily human labour, accompanied by animal labour, supplemented by hydro energy and wind power. In conjunction with these types, energy supplied by wood was also available.

The forest was integrated in the agricultural system and its history is connected with that of farm plots. When agricultural spaces advance, due to demographic and/or economic growth, the forest recedes.

We intend to demonstrate that the use of the energy resources depended:

- On natural factors (the consistent presence of mountains and hills that for a long time hindered agricultural mechanization);
- On environmental conditions (the unhealthy situation of the plains during the entire modern age);
- On economic factors (such as the consistent presence of cities with their necessities of food supply, raw materials, etc);
- On demographic factors: such as the great demographic density of the area in comparison to the rest of Europe, and the consequent low price of labour as a production factor.

Between the late nineteenth and twentieth centuries, agricultural machinery became widely diffused; however the use of mechanization was confined to a few plains. The hillsides and the mountains remained subject to the labour of humans, aided by the few animals that it was possible to raise, and the small amount of forest still remaining on marginal lands. The diffusion of industrialization and the abandonment of the countryside by the farmers marked the end of an era, of a system of productive and environmental organization, and also the end of an energy system, that was capable of saving land and capital, of recycling every kind of production waste, and that functioned for at least a thousand years.

The Original Characteristics

The Environmental Characteristics of Human Activity

According to Fernand Braudel, the Mediterranean is made of earth, sea and air (Braudel, 1972). The air of the Mediterranean is affected by what happens elsewhere: by the Atlantic in the west and by the Sahara in the south. Itself resulting from the sum of microclimates, the Mediterranean unifies them into one climate. The main drawback of the Mediterranean climate derives from the unequal distribution of yearly rains. Rainfall is concentrated in the autumn and spring. The summer drought dries up springs and hinders vegetation. Plants and cultivation systems have taken this factor into account for centuries if not millennia. Water would not be lacking due to the mountains nearby. However, due to the steep nature of the soil, rivers are really like torrents, even a summer storm can cause them to swell enough to damage the farmlands. In a normal year two critical periods alternate: that of sudden floods, which can bring about the destruction of bridges, temporary passes and the flooding of fields, and the period of drought, which drains the beds of torrents and small rivers. Floods mean almost always loss of human life. To this day, at least in Italy, no institution is truly able to protect the inhabitants of the plains from the effects of an unwise use of mountain soils. What is even worse is that the overuse of the territory has now expanded from the mountains and the hills to the plains, due to the cementing of riverbeds, which prevents the dispersion of water, causing traumatic consequences for urban settlements.

The Mediterranean, especially in the north, is a sea surrounded by mountains. These mountains are tall and wide, spanning the Spanish Pyrenees, the Alps, the Apennines, and the mountainous systems of the Balkans, up through Anatolia and the Caucasus. They are compact and their valleys are narrow. Passes between countries are rare, and until the late modern age, difficult to cross. It must be remembered that the Mediterranean area, besides the many towns on the coasts and the hills, where ancient civilizations and cultivations flourished, is a difficult territory with a skyward vertex, as noted by Braudel (Braudel, 1972), characterized by cold and snowy winters just a few kilometres from the coast. An example of this is Mt. Etna (3263 m), in Sicily. At sea level there are citrus and banana cultivations. Further up vineyards and olive trees can be found, then forests with oak trees and

finally alpine vegetation covered by snow for nine months of the year. A similar example in Spain is the coexistence of the snowy mountain tops of the Sierra Nevada close to the Mediterranean coast, and Andalusia, rich in population, with its highly cultivated plains and foothill areas, yet semi-deserted and wild in the mountain areas.

For centuries thousands of people, alone or accompanied by their flocks, have temporarily migrated from the mountains to the valleys. The mountain men have constituted a large part of the workforce that cultivated plains infested by malaria, avoided by those who had a better way to earn a living. Mountaineers travelled throughout Europe to perform hard jobs: they built roads and canals, worked as bricklayers and artisans anywhere they could. The economic activity of the Mediterranean valleys and hills, as well as that on the other side of the Alps and the Pyrenees, cannot be fully understood if we do not take into account the contribution of the mountain inhabitants.

One of the most complex situations in the Mediterranean is that of the hills. These are areas of ancient settlements and that have been transformed by human labour. Among the hills highly transformed in this manner are those of ancient Catalonia, Languedoc and Provence; in Italy those of Piedmont, Veneto, and central Italy. These will be the privileged areas in our discussion. It is an area that, between the Middle Ages and the twentieth century, has been characterized by a series of accurate and labour intensive land settlements, which we will later discuss.

Finally, we come to the plains. In the Mediterranean area, for the entire period taken into consideration, they enjoyed only a potential prosperity because of their agricultural activity. Their main problem was the imperfect control of rivers and streams that periodically flooded the land with disastrous effects. Floods became more and more frequent as deforestation progressed into valleys and hills, caused by the need to obtain more wood or more arable land. An even worse threat to human settlements was the transformation of rivers into swamps and the consequent diffusion of malaria. Attempts at land reclamation began with medieval tillages and continued until the twentieth century, when it became possible to drain land through the use of water-scooping machines.

The Impact of Man

Between the Middle Ages and the modern era, the northern part of the Mediterranean was the most densely populated in Europe. Many people crowded the small amount of infertile land, concentrating both in cities and in the surrounding countryside.

Since the Middle Ages cities had a strong presence, especially in Italy. Until the seventeenth century Italian cities were among the largest in Europe and certainly among the most densely populated areas in Italy. Here are some significant statistics: in the sixteenth century the population of Milan and Venice was about 100,000 inhabitants, Genoa had 58,000, Florence, Palermo and Rome, 55,000 (Malanima, 1995), whereas many other Italian cities held between 20,000 and 50,000 inhabitants. In medieval times, the only regions that had a development comparable to that of Italy were Flanders and Brabant in northern Europe, although

their cities were smaller in population. The density per square kilometre of central and northern Italian cities remained among the highest in Europe during the entire modern era.

'Dominant' cities became a prevailing environmental factor, since their power allowed them to spread through countryside and forests. These were manufacturing cities that needed to feed a population not employed in agriculture. They needed therefore a constant surplus of cereals, but also wine, oil, meat and raw materials for their manufactures.

The effects of this demographic density were the following. A precocious and widespread anthropization of the environment, whose effects are still evident to this day. As we know, artificial transformations of natural landscapes cause damage to the ecosystem, including desertification, erosion of the soil and pollution, all phenomena that intensify with the increasing need to procure food for a growing population. A second consequence of the demographic density was the development of labour intensive agriculture, both because of the relative costs of the production factors (land was the scarcest and most costly labour production factor) and because of the reduced possibility of raising working animals, since they competed for spaces otherwise dedicated for growing foods for human consumption.

The average human energetic efficiency is similar to that of a horse, amounting to a figure of about 13 percent. However, even though the level of useful power efficiency might be similar, the absolute performances are not. Human beings cannot sustain levels of useful power higher than 70-100 Watt, while a draught animal can work for hours at levels between 500 and 800 Watt.

One hour of an oxen's work can substitute 4 hours of human labour; that of a horse 5 to 8 hours (Wrigley, 1988). However, when the energetic balance of the two animals is considered, there are also other factors to take into account. Bovines provide milk and require less maintenance than a horse, in addition they are ruminant animals and therefore are only a partial burden to humans. Horses' needs, on the other hand, are more specific. Horses require the presence of a field sown with oats, which subtracts space from the cultivation of cereals for human consumption, such as wheat and rye (Malanima, 1995). Therefore, due to the scarcity of tillable land, many farmers in the Mediterranean area preferred oxen to horses as draught animals in the fields and for transportation, even if they were less efficient. In the hills of central Italy, farmers who had only one or two working animals, frequently used cows instead of oxen, because cows had the advantage of providing milk for the children and to make calves.

The scarcity of working animals remained a handicap for Mediterranean agriculture up until the mid-twentieth century. In fact it had as consequence a scarcity of animal energy to use in the fields and for transportation, as well as a scarcity of manure to be used as fertilizer in agriculture.

Another consequence of demographic density was the early anthropization of the forest, which became assimilated within human settlements. The *Sylva* was integrated into the ecosystem (Delort-Walter, 2001). Human beings colonized the forest to get extra food for themselves (see the case of the domesticated chestnut tree) or for their animals (like in the case of acorns used to feed pigs). In addition,

the energy generated by firewood was necessary for human activities, both in agriculture and manufacturing. Wood was essential for making tools as well as dwellings and for transportation; however, with every sizeable demographic growth and the need to devote more land to farming, the forests receded, which was a serious environmental risk.

Historical Evolution

Mediterranean societies sought to create agrarian systems capable of meeting the demands of people and of the other sectors of the economy without exhausting the soil, since this was the most important collective resource.

Some widespread agrarian systems, especially those that integrated in the same fields agriculture and cattle raising, worked at a low entropy level. As a matter of fact, much of the waste was reused (manure, human excrements, leftovers, ashes) for new productive cycles.

The development of labour intensive agriculture was also relatively environmentally friendly. The aim was to safeguard and restore soil fertility while drawing the greatest possible returns. This was achieved by systems of slope cultivation that held on to the soil, preventing erosion (through stepping and terracing); rotations maintaining the fertility of the land; plantings requiring little water, including trees; water protection strategies in the valleys; raising and use of the appropriate animals (oxen, pigs, sheep).

The 'Malthusian Centuries': Growth, Crisis, and Recovery of the Mediterranean Population and its Consequences on the Environmental and Agrarian System

When looking at population figures in the Middle Ages, we notice that from 1000 to 1300 there was substantial demographic growth in the Mediterranean area. From the twelfth century to the first half of the fourteenth century, the demographic growth of the Middle Ages is characterized, in the northern Mediterranean, by tillage, an increase in the cultivation of domesticated trees, as well as an increase in hydraulic improvements on the plains (see Figure 3.1).

A major role in this process was played by the cities, which in the northern and central part of Italy were organized in *communes* (city states). In southern France similar forms of government started to appear in cities such as Lyons and Toulouse, which organized their own rural areas around the city. The capital circulating in cities was used to acquire more land and, partly, also to till, build houses and create roads. This was an era of heavy tillage and deforestation. The 'creation of the Mediterranean landscape' had begun, characterized by sparse settlements and family farms. The work of families who devoted themselves entirely to the cultivation of the land became an essential element of agricultural production (see Figure 3.2).

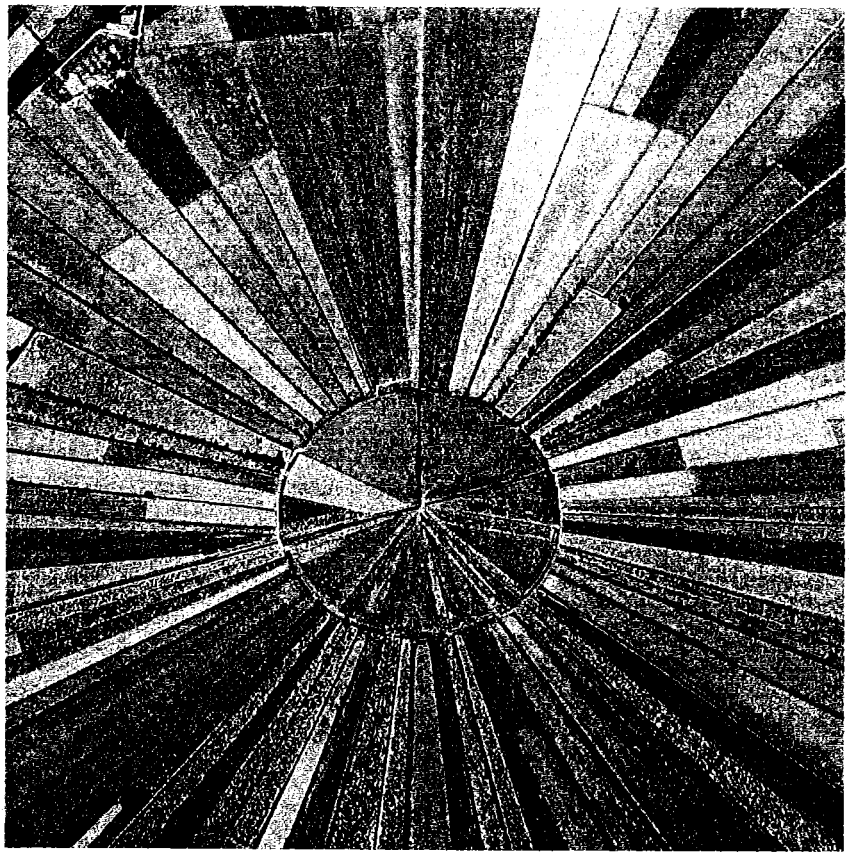

Figure 3.1 Star-shaped field arrangements in reclaimed swampland at Enserune in Hérault, France

In this era domesticated tree cultivation expanded considerably in the Mediterranean region. One of the most important was the vine. Until the High Middle Ages vines were cultivated in enclosures near cities or villages. In areas where a landowner would give a worker the permission to cultivate his land with various sharecropping contracts, vine cultivation and the sharing of grapes were usually excluded from the contract. Vines are plants that require much care. Usually they were cultivated in small closed plots with narrow rows, on a dry stake or as a bush.

Figure 3.2 A. Lorenzetti, 'The Effects of Good Government in the Countryside', Siena, Palazzo Pubblico (1338-40). Courtesy of Comune di Siena

In the late Middle Ages (from the second half of the thirteenth century) the vine began to emerge from enclosures, made its appearance in the arable fields and became part of the Mediterranean landscape, from Catalonia to Provence, to Central Italy. Quite often, it was planted without the intervention of the landowner. As a matter of fact, throughout various eras, vine planting was at the core of many long-lasting emphyteusis contracts that were common until the twentieth century (like the Catalonian *rabassa morta*). However in other cases, like in the Italian *mezzadria* (sharecropping on a 50/50 basis) the landowner had to plant vines and olive trees at his own expense. The sharecropper was the one who maintained them, but in this case the agrarian contract was much shorter than the emphyteutic. Besides, every year free of charge, sharecroppers had to dig for the landowner a certain amount of ditches and maintain the rows in good condition and without empty spaces.

On the plains, vines were grown in connection with trees at the edge of the fields, close to ditches that had been created to allow water to run off. In the hills, the slow reshaping of the relief had begun. Attention was focused on soil protection, to avoid the loss of important nutrients and to prevent the process of desertification. Deforestation of the hills required immediate intervention in

defense of the arable land in order to maintain its fertility, and this was usually accomplished through the control of surface waters.

Effects of the Plague of 1348

The consequences were not always positive (see Figure 3.3). There were negative environmental effects in terms of soil washing and soil erosion. Due to changes in the eating habits during the great demographic expansion of the Middle Ages, there was a decline in the use of pork products and new types of condiments were introduced, such as walnut oil and olive oil (especially in southern Italy and Spain, in the Seville area) to replace the usual lard and suet.

The period 1347-80 was characterized by demographic crisis. The steep population decline was accompanied by a complete unravelling of economic organization and extremely low agricultural production. The effects of the demographic crisis of the XIV century included the regrowth of forests, the expansion of uncultivated land, and an increase in the number of animals. In addition, more land became available for those who had survived the plague. Much of the land was now unfarmed. Hunting and sylvopastoral activities, not yet integrated into the agricultural system, regained importance. Pastures also became more widespread because they required less manpower.

Figure 3.3 A. Lorenzetti, 'The Effects of Bad Government in the Countryside', Siena, Palazzo Pubblico (1338-40). Courtesy of Comune di Siena

The old houses in the abandoned villages disappeared along with their gardens and orchards. The number of vines declined as there were no longer enough men to take care of them. Wherever they still remained, they were no longer farmed by daily workers because salaries had increased, but rather under lease contracts or, particularly in Italy, under sharecropping contracts. The work of the sharecropper, for those owners who chose short-term contracts, was the least expensive and at the same time the most reliable, in this as in other arboreal cultures.

In Aix-en Provence, where many villages had disappeared, between the end of the fourteenth century and the first decades of the fifteenth century, the vineyard almost vanished. In Languedoc there was a true catastrophe as a consequence of the Black Plague and the Hundred Years' War. It would be enough to take a look at the data mentioned by LeRoy Ladurie (*Les Paysans de Languedoc*): in one village where in 1353 there had been 40 vineyards, only 6 remained by the end of the fifteenth century. The decline of the vine was definitive wherever the climatic conditions were not favourable, as in parts of France.

From the end of the fourteenth to the beginning of the fifteenth century, though there were many fewer people, both land and capitals remained intact. There was an increase in salaries, more abundant resources for the survivors, a decrease in the price of cereals due to diminished demand and more land becoming available for the producers.

15c-16c Recovery

During the fifteenth- to sixteenth-century recovery, growth was not uniform and population density remained different in different areas. In the sixteenth century, Italy, like the Netherlands, had a density of 40 inhabitants per square kilometre, but 100 in the Milanese territory; France had an average of 34, England slightly less; Spain and Portugal 17 (but the Kingdom of Valencia 30), while there were only 2 inhabitants/km^2 in Russia and in the Scandinavian countries. The population density in the Mediterranean area affected the prices of wheat that were the highest in Europe till the end of the sixteenth century.

In the Mediterranean area at the end of the sixteenth century, 60 million people were unequally distributed. Between 1500 and 1600 the population of the Mediterranean doubled. Population growth was very intense, particularly between 1450 and 1550, and then it slowed down. Let us examine the case of Sicily: in 1501 the island had a little more than 600,000 inhabitants, whereas in 1583 it had over 1 million. The demographic growth in turn determined the price revolution, which was mostly its consequence. People living in areas that had not been so badly hit by the plague moved towards the Mediterranean coasts. There was a migration from the mountains and the highlands to the abandoned plains and valleys. Thus, Catalonia was repopulated by immigrants from the French Roussillon; the Italian Adriatic coast by people coming from northern Italy, but also by Slavs and Albanians who arrived from the opposite shore.

In the sixteenth century, demographic growth pushed the population of the Mediterranean areas once again up the hills but also down into the plains, where they had to face and fight malaria, which threatened their survival. The reward in

the case of victory was the conquest of more fertile land, a mirage for the starving populations of the Ancient Regime.

Land drainage projects were long and expensive, and no owner, no matter how big, could afford to undertake them alone, also because hydraulic problems concern always vast territories and require the investments of huge capitals, which only great commercial cities, like Venice, Milan and Florence could undertake. The operations, before the era of the water-scooping machine, were undertaken with the slow, although less costly, method of 'filling up'. Land drainage projects were also undertaken by great capitalists in lower Languedoc (the work continued from the end of the sixteenth century to the end of the seventeenth), and in coastal Spain.

The Conquering of the Plains Represents the Greatest Success of the Mediterranean Agriculture

In central Italy, *poderi* (family farms) and sharecropping became the key to reclaiming uncultivated land and turn woods and bramble into arable fields.

In the Marche region, the agricultural recovery relied on emphyteutic tenants, with grants *ad pastinandum*, at the end of which the land, drained and ready to produce, was divided between the owner and the tenant.

Wherever population grew, agriculture grew accordingly. Once again the number of trees increased. Vines were once again on the rise. In the Mediterranean area, between the sixteenth and nineteenth centuries, they were rarely cultivated alone. More frequently, like in the late Middle Ages, they were planted in the same fields where cereals and olive trees grew. The landscape, at this point assumed very precise and regular characteristics. Vines were grown in rows on hillsides, on trees, or at both sides of ditches in the plains. The English philosopher John Locke described them in 1667: 'From Bordeaux to Cadillac ... in many places the vineyeards set thus: 2 rows of vines and between them 3 or 4 times their breadth of ploud land for corne' (Locke, 1953, p. 239). Locke is referring to the area around Bordeaux, but this system was practised also in Provence. It continued until the nineteenth century, when agronomists criticized it, since ploughs damaged the roots of the vines. The Italian 'piantata' (planting) or 'la plantade', which began in the second half of the sixteenth century, and that LeRoy Ladurie described for the Cevennes, satisfied many agricultural and economic needs. The vines high on the trees were less susceptible to the humidity of the plains, and the supporting trees furnished 'forages' for the livestock. Thus, from the same land, one could get three or four products (cereals, wine, oil, forages).

It was during this time that the most typical features of the Mediterranean landscape began to emerge. The first was the arrangement of the hill soil through terracing and grass edging, and of the plains through the thick network of drainage ditches. In the plains, alongside the creation of the macro hydraulic network entrusted to the state magistrate, farmers developed a complementary micro hydraulic network, connected to the first one, which they maintained themselves guided by their deep practical knowledge.

The second feature was the presence of trees in the arable land. Their number had been increasing steadily since the High Middle Ages: not only vines, but also olive trees, walnut trees, citrus trees, mulberry trees and almond trees. Chestnut trees spread in the high portions of hills and mountains. They were known as the 'trees of bread', because they ensured the survival of the populations of Vivarais, of the mountains of the Cevennes, of all the Italian Apennines, of Corsica, of the Greek and Macedonian mountains. In some areas their cultivation was a one-crop economy.

The cultivation of some plants used in the manufactures expanded. They were plants that needed labour intensive farming, like hemp in the Po valley and *pastel* in the countryside around Toulouse. There was also a big growth in the number of mulberry trees, from Spain to Italy. The mulberry tree required, like hemp or vines, a large amount of work. The peasants families of these areas were engaged in farming – both working the land and raising livestock – all year around, including winter.

The amount of agricultural products increased mostly due to the expansion of the cultivated land. The yield of cereals, however, remained low, due to the scarcity of livestock and thus of manure. In fact deforestation progressed, thus reducing the space devoted to woods and uncultivated land. As a consequence, hunting and wild fruit harvesting decreased. Hunting became an occupation for the upper classes, whereas before it had been open to all.

The construction of the 'anthropised' artificial landscape resumed. The goal of the hill arrangement was 'to ensure the defence of the agrarian soil, a more balanced hydraulic economy and a more efficient land utilization, by constructing horizontal fields of appropriate width' (Sereni, 1961). The arrangement of hillsides with grass planted in contour strips and terraces was not new. It was done during periods of demographic growth in those territories where people had been residing since antiquity and where agriculture was the only possible activity.

In the Mediterranean landscape between the sixteenth and the nineteenth centuries a variety of methods was employed for the mountainside and hillside arrangement. One consisted of grass strips planted in contour edges, another employed 'lunettes'(circles of stones and dry twigs arranged around every single tree or around two or three, so that the small amount of soil would not be swept away); another consisted of steps without real terracing; and finally there was terracing. In this case the terraces were supported by embankments made with the stones dug from the tilled soil (the same stones that were used to build the small peasant shelters in the areas far away from villages, or the houses of the tenants who lived permanently on the fields).

The care taken by humans to protect the hill and mountain soil, however, did not prevent environmental degradation, which was evident in many parts of the Mediterranean. In particular, deforestation and the farming of steeply sloping areas had very negative environmental effects. Abbé Rozier (1785) complained about the ill effects of cultivating terraines along steep mountainsides and the almost irreparable mistake of cutting the forests covering the mountain tops, leaving only bare rock where trees could not be replanted, and allowing silt to reach the plains below.

Some sovereigns in the sixteenth century tried to put a stop to deforestation. In France, Francis I and Henry II's love of hunting had as a consequence the issuing of decrees regulating the management of forests in the first decades of the sixteenth century. In 1669 Colbert issued *l'ordonnance*, aimed at a more rationalized exploitation and protection of royal, city and church-owned forests. In Tuscany in 1559, Cosimo I, concerned about the repeated flooding of the river Arno, sought to remedy the situation by prohibiting the cutting of forests within the first half mile of the highest peaks of the Apennines; in 1564 this distance was increased to one mile. These were followed by other restrictive measures, including those against cutting more than ten chestnut trees without permission from the government, against cutting any ashes, pines or elms, and against cutting deciduous trees under fifteen years old (Vecchio 1974). This policy, concerned less about the environment than about the safety of the land and the rational exploitation of forest resources, was abandoned in the second half of the eighteenth century. Then, a policy based on physiocratic theories and favourable to the creation of bourgeois private property was applied to forests. Owners were now free to use their forest resources as they leased, without any interference from the government. By the nineteenth century, this had caused an ever worsening erosion of mountain and hillside soil and increasing problems in the hydraulic situation of the valleys and plains.

The Heyday of the Man-Made Countryside

In the late modern age (eighteenth and nineteenth centuries), the Mediterranean area was still characterized by demographic growth, although less so than other European regions. During this period the 'man-made countryside' and peasant labour reached their heyday. The land very rarely belonged to those who worked it. Landed property was in the hands of old noble families, of the church, or it was acquired by families belonging to the manufacturing or commercial sector or to the professions.

Peasant families were often part of an estate, in which each member of he family was required by contract to work. According to sharecropping contracts in Catalonia, France and Italy, the labour force represented by the family was required to work for the estate all year long, as a look at the Tuscan calendar can show. In these contracts the labour force supplied more labour power than in any other type of contemporary agrarian contract.

We can find examples of this in the bookkeeping of Tuscan estates, the *fattorie*, comparing their data with the data from parish registers. Around the middle of the nineteenth century, at *La Cava*, one such *fattoria* on the low hills around Pisa, there were sixteen *poderi*, i.e. family farms, farmed by sharecroppers. The density for every hectare of land was of 1,4 sharecropper family memebers, and an adult worker for every two hectares of land (almost all of which was cultivated). The draught animals were generally two oxen in each *podere*. Here the number of workers was higher than in other less cultivated areas of Tuscany. A comparison with the sharecropping numbers of less populous France makes the density in Tuscany stand out even more (Tourdonnet, 1979-80). As I have already

mentioned above, these families were obliged by contract to work all year on the farm, which absorbed all their labour force.

These sharecroppers, the day labourers who helped them (paid by the owner), and the owners of small lots, accomplished the organization of fields on hillsides and plains. On hillsides, the energy of men and women was the only force that built kilometres of terracing, edging, and other arrangements that are still visible today in various areas of Italy and the Balkans. We could still see similar ones in many other areas, except that they are now buried under the wild vegetation that has reclaimed the land after the last fifty years of neglect. The unique landscape of the Cinque Terre in Liguria, offers a good example of the importance of human work in shaping nature, in creating and saving soil for agricultural purposes and in cultivating vines in a very traditional way up to this day. Here women's work has been particularly important, as the men were mostly sailors.

The terraces are often masterpieces of technique in the use of stone and the channeling of rainwater. Soil was often carried up by hand, from the lower levels or from the valleys, to create the artificial terraces. These surfaces were then surrounded by 'dry' stone walls with water drainage ditches at the base. We have calculated that in the nineteenth century in the Chianti region, 100 metres of terracing, built according to the best criteria, would cost the equivalent of 250-500 days of labour, with peasant labour calculated on the basis of a daily wage. This amount, multiplied by the hundreds of kilometres of artificial terraces created in the Mediterranean area between the Middle Ages and the twentieth century, gives some idea of the incredible amount of work, almost all human (with minor help from animals for the transportation of the stones, wherever possible), involved in creating these artificially level surfaces on hillsides, and some idea of the costs in economic terms of such an operation, possible only in centuries with extremely low labour costs. Let us try to quantify the phenomenon for another Italian area, the Cinque Terre, in Liguria. Here, from medieval to modern times, the portion of terraced land reached a maximum of about 1,400 hectares. In each cultivated hectare there where 20 to 25 bands with wall lengths between 2,500 and 2,000 metres, that is, a minimum of 56 million metres of dry stone walls. Adopting the Chianti calculation, this means something like a minimum of 140 million days of work, a full time job for 2,000 people for nearly two centuries.

The most perfect hill arrangements are perhaps found in Tuscany, where herring-bone cultivations had been practised at least since the eighteenth century, and where in the nineteenth century century the so-called *colmate di monte* originated, and spread later to other parts of central Italy.

This hill arrangement, invented by an administrator of the marquis Ridolfi named Agostino Testaferrata, aimed not only at protecting the soil from rainwater, but also at using silt driven by rainwater to improve hillside soil for agricultural purposes. Testaferrata implemented a method that consisted in digging cavities in one part of the hill by building an embankment. From these cavities various ditches originated and ran down the hillside. When rainwater had filled the cavity, the embankment was removed and the waters fell into the ditches, which contained soil shovelled from the sides. This soil, together with silt that the water collected on its downward journey, went to fill the lower cavities that needed to be filled,

and which had previously been embanked. Thus, step by step, the system of filling up the mountain allowed the creation of new regular fields along the hillside, on slopes that were gradual and easy to cultivate. The hill drainage was complete, however, only with the creation of drain ditches that could prevent damage caused by erosion and landslides. It was therefore necessary to trace a system of drainage ditches allowing the water to descend gradually to the plain. The ditches had to be pitched just enough to allow the flow of water. The water began at the main ditch at the top and flowed down to the following one, parallel to the first. Upon hillsides prepared in this manner, the characteristic 'herring bone' cultivation was imposed, which is still considered the most perfect example of hillside agrarian landscape architecture.

The End of a World

In all the countries affected by industrial development, including Italy, the second half of the twentieth century saw the abandonment of the countryside and the end of traditional peasant labour devoted to the construction and protection of the soil.

When agriculture was no longer the primary activity for the survival of the population, and the soil ceased to be the 'great mother' of everyone, its safeguard ceased to be economically necessary. The consequences are before our eyes. Over the last forty years the degradation of the Mediterranean landscape and environment have been so rapid that it is visible in images of the same place across a short span of time. Terraces threaten to collapse or have already vanished; hill soil has washed away because of the end of water control due to the disappearance of ditches, a consequence of the use of tractors, meanwhile ditches and wind breaking hedges have vanished from the plains, soils and riverbeds have been cemented. No doubt, labour and human energy have their price; and one can not think of safeguarding everything that these have created in the past centuries when they were economically the cheapest production factors. Nevertheless, all the progress of contemporary scientific research has not yet found an adequate substitute for them.

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