



Rural Landscapes in an Oceanic Volcanic Island

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Abstract

For a quarter of a century, the territorial dynamics of El Hierro have been influenced by the tertiarization of its economy, fundamentally focused on non-intensive tourist activity (green or nature tourism, hiking, rural tourism, sports in nature), causing a gradual abandonment of agricultural activities and, therefore, of their agricultural landscapes. However, it is still possible to recognize today the traces of traditional agricultural landscapes of great interest, both for heritage and for food production. It is then necessary to carry out a typology of these agro-cultural spaces with the aim of delimiting them, knowing their production systems, conserving and organizing them and, what is more remarkable, proposing for the future those ways of managing them. That can contribute to the sustainable development of the island, further justifying the declaration of the Island as a Biosphere Reserve.

Keywords

Agro-pastoral-forest landscape • Agricultural abandonment • Tangible and intangible heritage • Oral history • El Hierro

1 Introduction

Initially, when the first humans arrived on the island of El Hierro, they found an environment that would condition the use of its natural resources. The pre-colonial occupation by the *Bimbapes* (indigenous people) and the subsequent colonial occupation with its two stages (modern or feudal

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lordship and contemporary or bureaucratic capitalism) had to rely on these natural conditions to ensure survival as a society. The agro-pastoral-forestal use of El Hierro's territory has given rise to unique agrarian landscapes, some born early on and others arising barely half a century ago.

For the last quarter of a century, the territorial dynamics of the island has been influenced by the tertiarisation of its economy, fundamentally focused on non-intensive tourism (green or nature tourism, hiking, rural tourism, nature sports), causing a gradual abandonment of agricultural activities (see Table 1) and, therefore, of its agrarian landscapes.

However, it is still possible to recognize today the traces of some traditional agricultural landscapes of great interest both in terms of heritage and food production for the achievement of the so-called food sovereignty of the island, in particular, and the Canary Islands in general.

It is therefore necessary to carry out a typology of these agro-cultural spaces with the aim of delimiting them, understanding their production systems, conserving and ordering them and, more importantly, proposing ways of managing them in the future that can contribute to the sustainable development of the island, further justifying the declaration of the island as a Biosphere Reserve. This is all the more pressing in that the abandonment of the forests and the natural death of the people who manage them are causing the disappearance of a vernacular knowledge of unquestionable intangible heritage value.

2 The Role of Ecological Determinants in the Configuration of the Agrarian Landscapes of El Hierro

The genesis and evolution of the traditional agricultural systems of El Hierro involved decisive human factors—that had to overcome a series of ecological or environmental conditioning factors that, far from favouring agricultural activity, forced El Hierro and the *Herreña*

Table 1 Area of current crops, pastures and abandoned crops on the island of El Hierro by municipality (2015)

	El Pinar	Frontera	Valverde	El Hierro
Higuera	182.3	0.65	7.93	190.88
Almond tres	12.3	0.09	0.74	13.13
Other temperate fruit trees	23.61	12.48	37.81	73.9
Vineyards	51.49	103.89	47.47	202.85
Banana plantations	12.17	49.03	0.06	61.26
Family garden	6.69	10.91	17.23	34.83
Pope	5.15	5.14	22.04	32.33
Clean orchards	4.47	10.78	15.32	30.57
Tropical pineapple	0.07	116.63	0.05	116.75
Avocado	0.95	4.13	5.33	10.41
Mango	0.19	24.44	2.75	27.38
Other subtropical fruit trees	0.64	15.71	7.2	23.55
Cereals and corn	1.03	0.92	62.73	64.68
Vegetables	0.38	3.27	1.71	5.36
Citrus fruit	0.13	4.48	0.76	5.37
Total cultivated agricultural area	301.57	362.55	229.13	893.25
Pasture	18.8	470.4	1588.94	2078.14
Tagasaste	1.36	0	118.98	120.34
Total pastures	20.16	470.4	1707.92	2198.48
Total abandoned agricultural area	818.95	441.22	1688.3	2948.97

Source El Hierro Crop map 2015 https://www.gobiernodecanarias.org/agriculture/themes/crop_map/el_hierro/el_hierro_2015.html. Note how 71% of the agricultural area, excluding pastures, is abandoned

society to develop complex agro-pastoral-forestry systems that have given rise to a great diversity of agricultural landscapes of undoubted heritage value. The following is a summary of these conditioning factors: (a) topographical, (b) geological, (c) geomorphological, (d) edaphological, (e) climatic and (f) hydrological.

(a) Topography

El Hierro's small surface area is compounded by its high average altitude, which results in significant slopes, as well as the small extension of its many coastal areas (between 0 and 300 m above sea level). These are limited to the El Golfo and Las Playas landslide valleys and the small "low island" of Hoya de El Verodal, the generalised cliffs of its coasts and the scarce development of a network of ravines. El Hierro is shaped volumetrically as a truncated triangular pyramid with three concave lateral faces, Julian-El Golfo-Las Playas, which can reach altitudes of more than 1000 m, and a high upper base (above 600 m), formed by two plateau areas, La Dehesa and Nisdafe, sloping progressively towards the SW and NE, respectively.

The unique topography of the island presents conditioning elements for agricultural use: (1) difficulty for subtropical crops due to the absence of coastal plains, (2) almost vertical cliff walls impossible to cultivate (hence, compared

to the other islands that also have significant altitudes, El Hierro does not have large areas of dry stone terraces) and (3) the predominance of the so-called dry farming of "medianías" (midlands) and high altitude pastures (both plateaus).

(b) Geology

It should be taken into account that during the Quaternary and in relatively recent times a very intense volcanic activity of a mainly basaltic nature has affected the island, practically in its entirety. Three volcanic cycles have taken place with hardly any periods of eruptive calm, the last two being very recent (intermediate and recent series), so the volcanic shapes (cones with their craters and calderas) and eruptive materials (fields of basaltic lavas of malpaíses and "lajiales" and of lapilli -called "jables" on El Hierro-) are preserved with few alterations. However, such young geological materials have represented serious limiting factors for agricultural and livestock uses, as they have been scarcely altered by vegetation and physical and chemical processes.

(c) Geomorphology

The predominance of recent morphostructures as opposed to volcanic morphosculptures explains the lesser importance of

erosive phenomena, exemplified by the low level of the ravine network on the island. The exceptions are the macroforms of the three gravitational landslide valleys (Julan, Las Playas and El Golfo). In them, the dynamics of the slopes have caused the deposition of sediments (sands, gravels and pebbles) in the foothills of their almost vertical escarpments. In the absence of soils on the island, these sediments have historically been used for agricultural activities (terracing) and livestock (pastures).

(d) Soil science

Following the work of Fernández in this section (Fernández et al. 1974), the recent nature of the volcanic materials that cover the island means that they are little altered and the soils, therefore, are little developed, as they correspond to the first phases of the alteration of the volcanic soils. The most important edaphic formations are represented almost exclusively by andosols (vitric), located above 500 m. Below this isohyet, there are poorer, carbonate soils of a pulvulent nature. On the island as a whole, there are no soils with textural horizons. However, in some areas near Valverde, around 700 m above sea level where, exceptionally, accumulations of clays appear, due to endorheism phenomena caused by the interposition on the slope of lava flows or volcanic edifices.

The lithosols are very abundant and extensive, formed by “malpaíses” (recent, slightly altered lava flows) and recent cones and fields of lapilli. The erosion lithosols appear on the slopes of very rugged topography. Thus, in the El Golfo valley, there are large colluvial surfaces, sandy-stony, poorly evolved, forming cones and dejection fans that can be described as entisuelos.

In the cornice of El Golfo, with a steep slope, the laurel forest reaches up to 800 m, with thin and poorly evolved ranker-arid erosion soils. However, lack of soils has inspired the ingenuity of the *Herreño* farmers to try to overcome it, giving rise to original agro-ecosystems.

(e) Climate

Although El Hierro shares the same climatic characteristics as Canary islands of greater relief, its terrain leads to some differences that influence its agricultural use. Due to its shape of a truncated pyramid, whose upper base extends between 600 and just over 1000 m above sea level (almost two thirds of the island's surface), the “*medianías*” (midlands) are the greatest surface area among the three altitudinal bioclimatic floors (coasts, “*medianías*” and summits). This extensive area of “*medianías*” is in the condensation area of the trade winds, whose humidity also affects the midlands of the south of the island due to overflow because

of the reduced surface area above 1400 m. In addition, the high leeward plain of Taibique-Las Casas-Julan East is favoured by its opening towards the humid winds from both NE and NW.

It is no coincidence that, given the stability of the prevailing socio-economic conditions for five hundred years, the traditional settlements of El Hierro are located in these mid-altitude and high-altitude lands where, given the absence of irrigation water, the constant humidity of the trade winds has allowed agriculture and pastures in an otherwise dry regime.

(f) Hydrology

The surface water resources of El Hierro are scarce due to the recent conformation of the island, with a predominance of porous surface substrates and the scarce presence of impermeable materials in the subsoil. For all these reasons, El Hierro has historically been the only island in the Canary Islands with a totally dry farming system. However, every year, the island's aquifers incorporate on average about 11 hm³ of total rainfall, which shows that groundwater is important. Although only recently (since the late sixties of last century) has the population of El Hierro had access to them through the construction of wells and galleries. The consumption of groundwater is reduced to 1.9 hm³ with the new irrigated agriculture: the main water consumer (1.49 hm³) (Felipe and Herrera 2019). Technological advances, belatedly arrived on the island of El Hierro, allowed the creation of the last and most modern insular agricultural landscape.

3 Five Insular Territorial Keys to Understanding the Uniqueness of the Agrarian Landscapes of El Hierro

In the evolution of the construction of El Hierro's agricultural landscapes, there are a number of elements that make this island unique with respect to the rest of the Canary Islands. One of these elements, “*la mudada*” (the move), is an agricultural practice of transhumance that is no longer in use and is difficult to observe if you do not know the history of the island. Three other unique elements can be seen with the naked eye in all the ecological environments of the island: the stone walls, the fig trees and the total agricultural use of the territory. This last feature has to do with the scarcity of water: rainfall and humidity.

The agricultural “*mudada*”, together with the ploughing of Nisafe, responds to the particular form of economic organisation established by the *Herreña* seigniorial class to take advantage of the natural resources and produce both

income and the food necessary for the inhabitants of El Hierro (Galván 1997). During the feudal or seigniorial period, the rents for the large landowners (known as *rabos blancos* or white tails) were obtained through the social relationship of the “*medias perpetuas*” (perpetual rights) and a large communal territory of free grazing (*rabos negros* or black tails). The transition from the manorial system to the contemporary system during the nineteenth century did not change the class character of Herreña society, since the “*mudada*” continued to be the form of land use until its decline in the last quarter of the last century. Until the seventies of the twentieth century, important landowners continued to accumulate land through the usurpation and/or purchase of communal land and changed the system of “*medias perpetuas*” to the “*medianería*” (midlands). The shepherd and the poor farmer of El Hierro thus saw the rent they had to pay to large landowners increase, while their free access to communal lands decreased (Franco’s colonization policy in the Dehesa Comuna was the last expropriation of that period). In the absence of agrarian reform, emigration was the natural solution to the increasing overexploitation and oppression of the island’s poor families.

The “*mudada*” consisted of peasant families moving to the coastal areas at certain times of the year with their livestock, tools and household goods. The most important “*mudadas*” took place from the higher parts of the island to the north (El Golfo), the agricultural “*mudada*”, and to the south (Las Playas, Timijiraque and Cardones and the Dehesa Comunal) the pastoral “*mudada*”, which was probably the

oldest (Sánchez 2018). The move took place in the winter season, mainly in the month of January, when there was a significant amount of grass for the cattle (coastal pastures), and at the same time, to carry out the agricultural work of digging the vines and pruning in El Golfo. Farmer labourers remained there until the end of February, after which they returned to the highlands to continue the agricultural campaign and to take advantage of the pastures of the high midlands and summits. A second move to El Golfo was repeated during the summer, in August and September, also related to agricultural work and pastures for livestock (“*rastrójeras*” or stubble clearing) and fishing activities such as shellfishing and coastal fishing. The agricultural tasks were mainly the grape harvests (and cereal harvest), which were carried out from the second half of August until the end of September, after which farm labourers returned to the highlands.

Basalt stone walls are distributed throughout the island. They represent the result of the struggle that livestock rearing of a communal nature (free grazing), initially predominant, was losing against agrarian activities of a feudal and semi-feudal private nature (Lorenzo 2011). In reality, the creation of enclosures (plots of land surrounded by stone walls) and cattle tracks is the way in which *Herreño* social groups prevented the introduction of livestock into cultivated areas and stopped their cattle from leaving their properties (Fig. 1).

If you had to highlight a fruit tree of El Hierro, this would undoubtedly be the fig tree. In fact, there are too many fig

Fig. 1 The basalt stone walls of the enclosures and cattle road are a characteristic element throughout the island of El Hierro (Nisdafe)



trees for an island with so few inhabitants, so the fig, especially in the past, has always been one of its main export items. In addition, its leaf serves as green fodder for cattle in summer. The enormous ecological adaptability of this dry land tree, both from the climatic and edaphic point of view, means that we find it, isolated in a dispersed manner, in association with other crops, or in true monoculture plantations, throughout the length and breadth of the island. The fig tree appears from sea level to the summits, on the windward and leeward sides, on the east and west sides, on evolved soils and on recent badlands, in “polvillos” (mixture of soils and lapilli) and on slag and lapilli fields. A “gorona” is a circular wall built to protect fruit trees from livestock and almost always contains a fig tree (Fig. 2).

The limited natural resources of El Hierro and the backward production techniques and societal relations meant that all areas of the island territory have been used by humans over the centuries. Even the island's forests were used by its inhabitants for forestry and livestock exploitation. Therefore, it can be said that there are no natural areas untouched by humans, because the inaccessible in El Hierro does not exist when it comes to subsisting in an inhospitable environment. Even today, the apparent abandonment of agropastoral systems, is just that, appearance, because on an island with more livestock than agricultural must always have a source of food such as grass for livestock.

This element of livestock preponderance since *Bimbape* times, origin of “*la mudada*” is the reason for our final description of the El Hierro's singularity. It is the seasonal

provision of natural pastures for livestock according to altitude, and how the livestock moves throughout the territory looking for fresh grass that the high altitudinal gradient (0–1500 m) provides. It is the altitude and the climate that are responsible for the availability of pastures throughout the year. From late autumn to early spring, it is the rain that guarantees the coastal pastures, but from spring to autumn it is the humidity of the trade wind mists (and the horizontal rain) that descends from high altitude that governs the movement of livestock from the forest peaks to the lower northeast-facing mid-altitude lands. Even today, despite the crisis of traditional agro-ecosystems, there are still livestock farmers who drive their herds down the slopes following the mist generated in the area of thermal inversion of the trade winds. In addition, there is the “*juelgo*” or “*manchón*” (mixed cultivation of cereals and leguminous plants—lupins, peas, broad beans—for green fodder), haymaking and *ta-gasaste* (*Chamaecytisus proliferus*), thus providing essential feed for the cattle in anticipation of bad weather years that can affect the natural reproduction of the pastures.

More than five centuries of colonialism have not managed to convert the El Hierro's shepherds into sedentary farmers, nor come to that, into state or tourism employees.

Although there are few shepherds left, if you dig a little into the mentality of the farmer, the civil servant or the service worker, we still find in these people the roots of the El Hierro's identity: the freedom that has since *bimbape* times meant the availability of free grazing of their livestock throughout the length and breadth of an island that will

Fig. 2 Fig tree cultivation in the high midlands of El Pinar



always want to remain a large communal pasture democratically managed by the locals, themselves.

4 The Agro-Pastoral-Forest Landscapes of El Hierro

The sources consulted and the fieldwork conducted provide an initial approach to the agricultural landscapes of the island, showing their diversity and richness. Many of these landscapes date back to the seventies of the last century. For this reason, we have called them traditional agricultural landscapes. However, it is necessary to start from the typification and delimitation of these traditional agricultural systems because they represent part of the cultural heritage and identity of the island and an element of present and future applications for sustainable production in the primary sector.

For this classification we have differentiated between agrarian landscapes (still recognizable today and of some extension), agrarian landscape enclaves (recognizable, but reduced dimensions) and agrarian paleo-landscapes (practically or totally abandoned). We briefly review the list of the most significant present-day agricultural landscapes of El Hierro and refer the reader to the detailed descriptive table (see Table 2) (Fig. 3).

Within the class of *agricultural landscapes on evolved soils of the “medianías” (midlands)*, these three appear:

1. Rainfed polyculture in the Northeast (Valverde). This is probably the first agricultural landscape after the conquest, as this is where the best soils on the island and the best climatic conditions for dry farming are to be found. Today, this landscape is in clear regression.
2. Scattered chestnut groves in the high midlands of the El Golfo valley (Frontera). This unique landscape of the

Table 2 Inventory of agricultural landscapes, agricultural paleo-landscapes and landscape enclaves of El Hierro

Category	Class
1. Agricultural landscape on evolved soils of the midlands Humid windward “medianías” (midlands) (500–1000 m altitude) Semi-arid leeward midlands (600–1200 m altitude)	1. Rainfed polyculture in the “medianías” (midlands) of the northeast of El Hierro (Los Barrios, Valverde): cereals (mainly barley; wheat, rye), fruit trees, potatoes, sweet potatoes, millet/corn, legumes and fodder legumes (chickpeas, broad beans, beans, kidney beans, lentils, peas, lupins, lupins) and vines on evolved soils in the humid windward midlands
	2. Scattered chestnut groves on poorly developed soils in the high “medianías” (midlands) (800–1100 m altitude) of the valley of El Golfo (Frontera)
	3. Rainfed polyculture with tuneras of the Taibique-Las Casas plain (El Pinar)—occasional irrigated land—(cereals, fruit trees, potatoes, vines, forage crops) on poorly developed soils of the semi-arid leeward “medianías” (midlands) of El Hierro
2. Agricultural landscape in lithosols Crops in areas of recent volcanism and little altered materials Crops in areas of recent volcanic materials mixed with poorly evolved soils: “polvillos”	4. Rainfed vineyards in the valley of El Golfo (Frontera), in low “medianías” (midlands) on basaltic scoria (“breñas”) (need for “despedregamiento”) with scattered stone fruit trees (peaches, apricots, loquats, plums)
	5. Rainfed vineyards of Sabinosa and Frontera (Frontera) on basaltic volcanic cones of lapilli, inclined, without construction of terraces, in low “medianías” (midlands)
	6. Vineyards of Echedo (Valverde) (together with scattered fruit trees: mulberry, fig and pear trees), rainfed on recent lapilli fields with stone walls
	7. Dry-farmed fig tree crops in “polvillos” (on recent, scarcely edaphized basaltic lapilli) of the high midlands of Taibique-Las Casas/Julan Oriental (El Pinar), southwest of the leeward slope
	8. Rainfed vines in “polvillos” (on recent basaltic lapilli, scarcely edaphized) of the Taibique-Las Casas (El Pinar) “medianías” (midlands), southwest of the leeward slope
3. Terraced agricultural landscape on sedimentary slope deposits in ravines of ancient volcanic massifs	9. Polyculture in rainfed terraces (potatoes, rye, beans, broad beans, chickpeas, millet/corn, pumpkins, juelgo/manchón) in the low “medianías” (midlands) of El Golfo in Frontera and Sabinosa (Frontera) on sedimentary deposits of slope
4. Agricultural landscape of subtropical fruit trees	10. Open-air tropical pineapple and banana crops in greenhouses (and other tropical fruit trees, to a lesser extent) under irrigation on recent former “malpaíses” (aa lava flows) in the coastal platform of the El Golfo valley (Frontera) with “suelos de prestación”, transported from the plateau of Nisdafe

(continued)

Table 2 (continued)

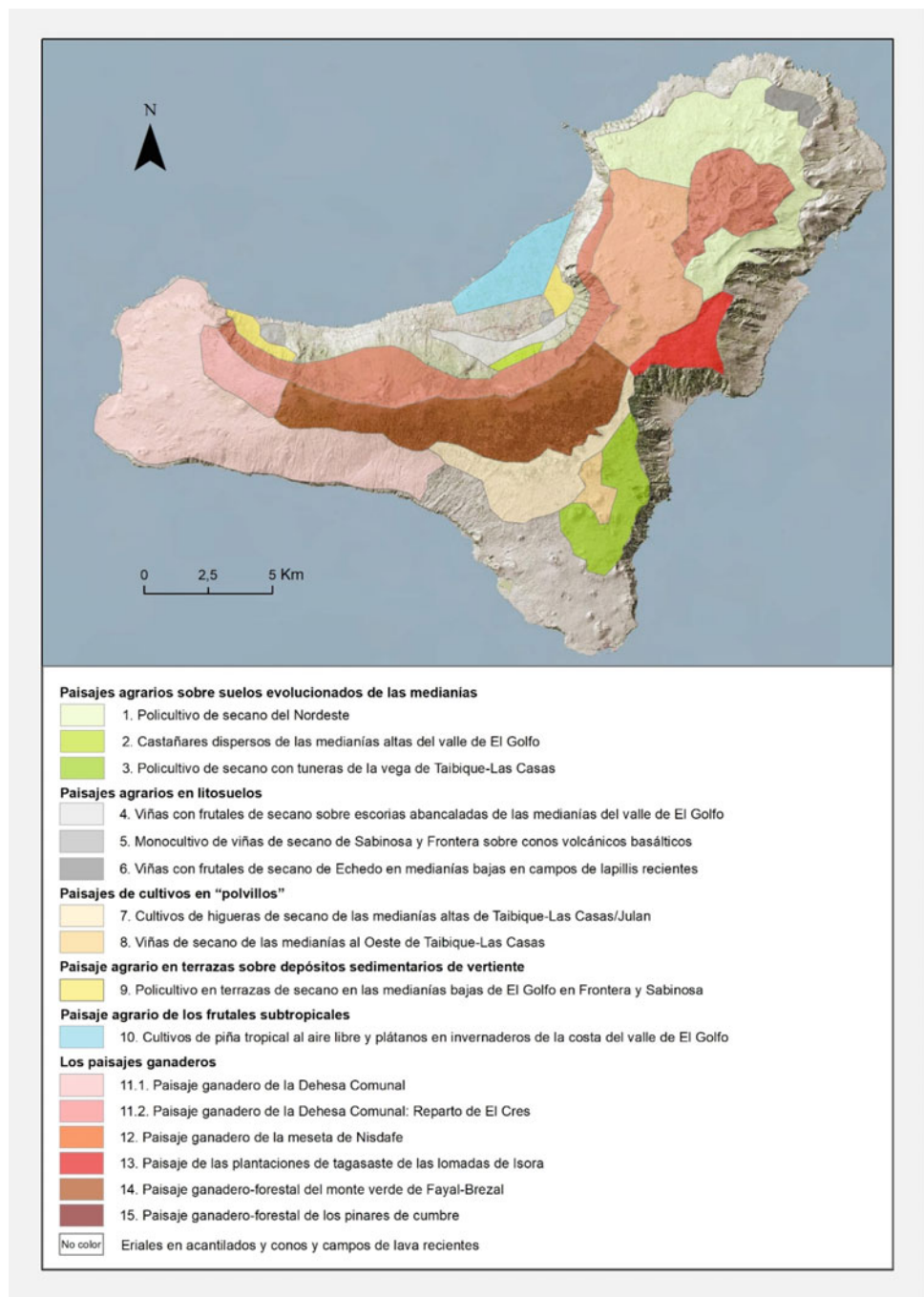
Category	Class
5. Livestock landscape	11. Livestock landscape of the Dehesa Comunal (Frontera, El Pinar): sheep (predominant), goats and cattle (to a lesser extent) in flat arid pastures and high leeward areas (variant: distribution of El Cres in Frontera)
	12. Livestock farming landscape of the Nisdafe plateau (Valverde): sheep (predominantly), cattle and goats (to a lesser extent) in pastures in flat and high windward wetlands; intercropping (barley, leguminous plants, winter potatoes and “ <i>papas de hoyo</i> ” or <i>veraneras</i> ; “ <i>juelgos</i> ”)
	13. Landscape of the tagasaste bush pasture plantations of the Isora “ <i>lomas</i> ” (flat surfaces between ravines) (Valverde), in the high leeward “ <i>medianías</i> ” (midlands)
	14. Livestock-forest landscape of the Fayal-Brezal green woodland (Frontera, El Pinar)
	15. Livestock-forest landscape of the summit pine forests (El Pinar)
Paleo-landscapes and agrarian landscape enclaves	<p>Paleo-landscapes</p> <ul style="list-style-type: none"> • Agro-pastoral paleopastoral landscape with “<i>goronas</i>” or “<i>góranes</i>” with fig trees on recent “<i>malpaíses</i>” (volcanic flows) in the coastal of El Golfo (Frontera) • Paleo-landscape of “<i>henequén</i>” (sisal) cultivation on poor soils on the North Coast (Pozo de las Calcosas) • Paleo-landscape of cereal-grassland crops on lithosols and poor soils of the North and Northeast coast (Valverde) • Paleo-landscape of natural coastal grasslands on sedimentary slope deposits in the gravitational landslide valley of Las Playas (Valverde) • Paleo-landscape of the landscape enclave of intensive agriculture of irrigated banana trees on “<i>malpaíses</i>” with “<i>suelos de prestación</i>”, in the low island of Punta del Verodal (Frontera) <p>Landscape enclaves</p> <ul style="list-style-type: none"> • Landscape setting of rainfed almond tree crops in “<i>polvillos</i>” (on recent, scarcely edaphized basaltic lapillis) in the southwest of the high “<i>medianías</i>” (midlands) of the leeward slope of Taibique-Las Casas (El Pinar) • Landscape enclave of banana plantations in greenhouses on “<i>malpaíses</i>” (volcanic flows) with “<i>suelos de prestación</i>” on the low island of Tacorón (El Pinar) • Landscape enclave of fig trees with prickly pear cactus on recent “<i>malpaíses</i>” (volcanic flows) in Los Llanillos (Frontera) • Landscape enclave of tropical fruit trees (mango, papaya, avocado) on slope deposits, in Las Lapas in the valley of El Golfo (Frontera)

Source Prepared by authors based on documentary, cartographic, statistics, oral information and field work

- high midlands of the most mountainous islands is represented in El Hierro in the valley of El Golfo, but much more restricted due to the absence of quality soils. Nowadays, it is difficult to observe, as it is in an advanced state of abandonment within the fayal-brezal.
3. Rainfed polyculture with prickly pear cactus in the Taibique-Las Casas plain (El Pinar). This is a typical landscape of the high leeward midlands. Here, it stands out for the large presence of prickly pear cactus (used as fodder for livestock and for its fruits both fresh and dried locally known as “*porretas*”), sown on the edge of plots, which gives them a certain uniqueness among the Canary Island agrarian landscapes.
 4. Vineyards with stone fruit trees (peaches, apricots, loquats, plums) on dry land on terraced slag in the midlands of the El Golfo valley (Frontera). This agricultural landscape, which began to be built from the expansion of the vineyards in the sixteenth century, has always been linked to the worst soils (volcanic substrates), fruit trees often accompany the vines. It can be said that the cultivation of vines, although it has diminished in this region, currently represents an active agricultural landscape (Fig. 4).
 5. Monoculture of unirrigated vineyards of Sabinosa and Frontera on basaltic volcanic cones of lapilli little altered and not terraced (Frontera). On these cones of lapilli and slag, the vines appear as a monoculture without fruit trees to accompany them and without the construction of terraces. There are some abandoned plots, but the landscape is still cultivated.

In the class of *agricultural landscapes in lithosols*, we highlight those with crops in areas of recent volcanism and little altered materials:

Fig. 3 Map of the agrarian landscapes of El Hierro. *Source* Prepared by authors based on the sources consulted: documentary, cartographic, statistics, oral information and field work



6. Vineyards with fruit trees (mulberry and fig trees) in the dry land of Echedo in the lower midlands on recent lapilli fields with stone walls (Valverde). These scattered vineyards cultivated in deep fields of lapilli and slag stand out for the black colour of their substratum (as opposed to the ochre ones, the result of oxidation and greater age of the previous landscape) due to the recent volcanic materials emitted (reminiscent to a certain extent of the landscapes of the vineyards of Lanzarote). After decades of abandonment, nowadays there are some farms that have been recovered for this crop.

Secondly, cultivated landscapes in areas of recent volcanic materials mixed with poorly evolved soils ("polvillos"):

7. Cultivation of rainfed fig trees in "polvillos" in the high midlands of Taibique-Las Casas/Julan Oriental (El Pinar). This landscape is unique in the Canary Islands, as the fig trees occupy the whole plot as a monoculture in rows and with a plantation frame (possibly some cereal crops in the past). Their origin seems to be a distribution of wasteland following the disentailments of the nineteenth century in

Fig. 4 Agricultural landscape on recent basaltic slag in the “*medianías*” (midlands) of the El Golfo valley. Note the nearby Monteverde vegetation (fayal-breza) on which the arable soil was built



the context of the boom in exports of figs in the past (Hernández and Niebla 1985). At present, this fruit landscape is abandoned; nevertheless, it is possible to recognize its former remarkable extension.

8. Rainfed vineyards in “*polvillos*” on recent basaltic lapilli, scarcely edaphized, of the “*medianías*” to the West of Taibique-Las Casas (El Pinar). The vineyards are scattered among others formerly dedicated to polyculture, and although the latter are in a considerable state of abandonment, the cultivation of vines has survived and has even been strengthened and modernized in recent years.

There is also an example of a kind of agricultural landscape on terraces on sedimentary deposits on slopes in ravines of ancient volcanic massifs:

9. Polyculture on dry terraces in the lower midlands of El Golfo in Frontera and Sabinosa on sedimentary slope deposits (Frontera). This is a landscape developed on sands, gravels and pebbles formed after the gravitational collapse that gave rise to the El Golfo valley. Given the origin of the sediments, it is necessary to clear and terrace the land to organize the crops (although we do not observe here the large, terraced slopes of other islands such as La Gomera).

A final example of a landscape related to agricultural activity is that of the *subtropical fruit trees agrarian landscape* class:

10. Open-air tropical pineapple and banana crops in irrigated greenhouses on the coastal platform of the El Golfo valley (Frontera). This is the most recent agricultural landscape on El Hierro. Its creation has been possible thanks to the availability of water for irrigation from the seventies of the last century and the “*suelos de prestación*” (transported soil) from the plateau of Nisdafe. Both elements have transformed these recent former “*malpaíses*” (aa lava flows) into a landscape of intensive agriculture whose production of bananas and tropical pineapples (and a few hectares of other tropical fruits) are mainly exported (Fig. 5).

Finally, as it could not be otherwise on an island with a long pastoral tradition (mainly sheep), we find up to five landscapes dominated by the livestock component (livestock-agricultural, or livestock-forest). These are the classes of *livestock landscapes*:

11. Livestock landscape of the Dehesa Comunal (Frontera, El Pinar). Livestock landscape unique in the Canary Islands, the Dehesa Comunal is a surviving remnant of a common grazing area established during the period of the Lordship in the old landowning regime. The area of the Dehesa Comunal covers some 4500 ha in the western part of the island. It corresponds to the steep slope on the leeward side that descends from 770 m above sea level to the sea.

Fig. 5 Tropical pineapple cultivation was the last significant crop to be incorporated into the agricultural landscape of El Hierro barely half a century ago



The distribution of El Cres and the Colonization Plan of the Dehesa Comunal that was approved in 1943 by the government of Franco's dictatorship brought some changes in this unique livestock landscape. The new distribution affected 300 ha of the Dehesa Comunal. This area corresponds to the higher, wetter and deeper soils of the Dehesa Comunal. El Cres was also divided into plots and given to the farming families of the region. After a few years of cultivation, the agricultural activity disappeared, but today the walls separating the plots and some livestock activities are still preserved (Martín 2006).

In the rest of the Dehesa Comunal, the Colonization Plan also ended up failing, as only a few infrastructures were carried out (small reservoirs, access tracks, parceling with stone walls, small reforestations). As in El Cres, the remains of the walls separating the plots built in the middle of Franco's colonization policy can still be seen today in the landscape, which is abandoned or underused (Martín 2006).

12. Livestock landscape of the Nisdafe plateau (Valverde). The deforestation of the green woodland (fayal-brezal and laurisilva) and its subsequent ploughing in the seventeenth century (Galván 1997) gave rise to this unique landscape of livestock farming. The basalt walls of the enclosures and the cattle trails, built to control the livestock, still mark today the vision of this landscape whose pastures are in an advanced state of abandonment.

13. Landscape of the tagasaste shrub-grassland plantations of the Isora "*lomadas*" (flat surfaces between ravines) (Valverde). Although they are distributed all over the island, these plantations of tagasaste (and tедера - *Bituminaria bituminosa*-, to a lesser extent) preserve a dominant landscape unit in these "*lomadas*". These plantations were probably started at the beginning of the twentieth century, but it was not until the middle of the twentieth century that they reached their maximum size in the middle of Franco's colonization policy. Today, they have been abandoned, although there are many livestock owners on the island who use this legume in times of scarcity of natural pastures or prolonged annual droughts.
14. Livestock-forest landscape of the green woodland of Fayal-Brezal ("*monte de dentro*") (Frontera, El Pinar). There is recent oral evidence of the use of the *Monteverde* for livestock in the areas where it is still preserved (Lorenzo 2011; Sánchez 2018). Sheep, but also goats and pigs took advantage of the grass growing under the forest canopy. Today, this practice has almost disappeared.
15. Livestock-forest landscape of the pine forests at the summit ("*monte de fuera*") (El Pinar). Similarly, the herbaceous species that grow under the island's pine forests have been used for livestock since time immemorial. Today, it is in disuse, but it is not uncommon to see sheep and goats in the forest of the leeward peaks.

Paleo-landscapes and agrarian landscape enclaves

This categorization includes paleo-landscapes or extinct agrarian landscapes and agrarian landscape enclaves or those with minimal current extension, since elements already in ruins can be observed or some residual extensions of them are still preserved. They are interesting because they provide information on the richness of the island's agro-cultural heritage. Table 1 contains a description of these extinct and/or reduced enclaves.

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