# relevance to Scotland. Three Dimensional Farming: Agroforestry in Spain and its

Philip Gordon; Woodland Trust Scotland (email: philipgordon@woodlandtrust.org.uk)

Kate Holl; Scottish Natural Heritage (email: Kate.Holl@nature.scot)

### Introduction

on primary production and local processing of a variety of forestry and agricultural products. supported by the largely native trees and flora. Yet like most of Scotland these are marginal lands, in a well populated landscape. What is striking, especially in spring, is the abundance of wildlife million hectares where it appears that there is little distinction between forestry and farming. You summers in contrast to our cold, wet winters. with poor soils, the difference being that the limiting season for crops and livestock are the hot, dry can travel on roads for hour after hour and pass through woodland of low but varying tree densities Across parts of south-west Spain and southern Portugal there is an area of approximately 3.5 to 4 This landscape supports a strong rural economy based

unrecognised in terms of additional public financial support to the local landowners. impacts, substantial areas of dehesa have survived largely intact due the success of this land use in extensification in farming and forestry, as well as rural depopulation. Yet despite such influences and hence valued by local people. The dehesa has not been immune from the impact of agricultural Spanish for "fenced" or "enclosed". The origins of the dehesa are considered to be centuries of The dehesa is the name given to this cultural landscape and land-use, which derives from the environmental benefits are coming increasingly into focus. Yet to date these still go largely southern margins of Europe where climate change is about soil loss, fires and droughts, the wider sustaining income from the land in marginal areas where alternative options are limited. Here at the production subsidies under the Common Agricultural Policy in terms of both the intensification and much of the world, the woodland component of the habitat has survived because it is used and management and grazing of natural Mediterranean, primarily oak, woodland. As is the case across

dehesa using largely native species of trees and livestock and the local processing of primary margins of Europe, learn anything from this? We might be interested in how the management of the In terms of rural economies and climate change mitigation, can we in Scotland, on the northern conservation to be in a place where land-use integrates diverse rural skills and livelihoods with nature Additional payments should be going to landowners for the environmental benefits. It is refreshing production can be almost viable economically on basic European agricultural grant payments.

participants, including the author, to spend a fascinating week of study in the region, based at the owned by the environmental organisation Fundación Monte Mediterráneo and managed by 500 hectare Dehesa San Francisco. Ernestine Lüdeke. In May 2019, through the Erasmus + programme, ARCH enabled eight This article is informed by visits to the area and to the Dehesa San Francisco, a farm in Andalucía

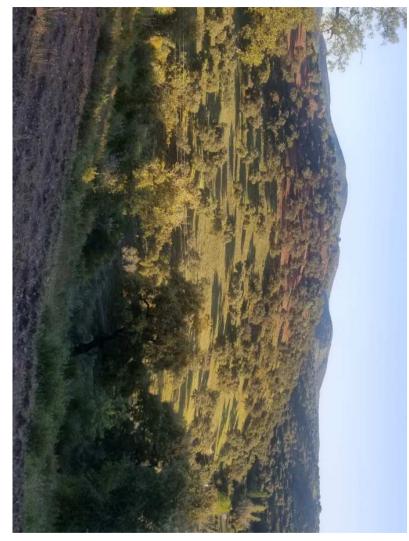


Photo 1: Typical dehesa

## **Geographical Location**

fertility and gently undulating topography within the provinces of Andalucía and Extremadura (in or current and historic land-use practices. the boundaries may be less distinct and the factors determining change may be due to climate, soils fertility, especially to flatter fertile arable cropping areas, can be well defined. However, elsewhere Spain) and Alantejo (Portugal). The boundaries of the dehesa where there are abrupt changes in The geographical area of the dehesa (montado in Portugal) landscape coincides with areas of low soil

### The Land-use

suber) and holm oak (Quercus ilex) with additional minor tree and shrub species. The livestock are tree-cover to sustain the long-term value of the habitat, and relies upon practices developed over traditional management of the dehesa is complex in terms of management of livestock numbers and shrub layer, which comprises a significant proportion of different Cytisus species. However, the mainly sheep (principally native Merino) and cattle (native breeds such as Retinto or Berrenda) as many generations. limit the spread of wild fires. This is achieved by cropping or grazing to limit the development of a well as Iberian pigs. The management of the land is heavily influenced by the need to prevent or (2019)), as it combines trees, crops and livestock. The commercial tree species are cork oak (Quercus The dehesa is a form of agroforestry referred to as an agrosilvopastoral system (Soil Association

### The Tree Element

Woodland management is targeted at creating a low-spreading tree-crown that can be pruned to Typically in the dehesa tree densities appear to range between 35 and 80 stems per hectare.

regeneration of the woodland does occur where grazing densities are lower (see Photo 2), this be almost 100%, but perhaps more typically appears to be between 50% and 70%. Whilst natural shape. At typical densities of 60 stems per hectare in mature areas on fertile soils, canopy cover can increases the risk of fire. practice is not widespread as it also leads to the development of an understorey of shrubs that

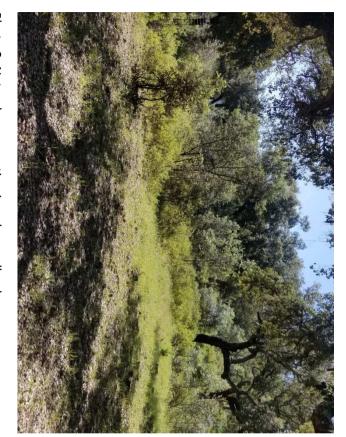


Photo 2: Natural regeneration in oak woodland

Woodland regeneration is typically, therefore, by planting, this being generally at about 60 stems per hectare in high mesh guards (see Photo 3). These guards protect against cattle and wild deer.



Photo 3: New planting

The useable tree products are likely to have been more varied historically, but nowadays are primarily cork sold commercially, acorns as feed for the grazing pigs, and firewood. Other products include olives from wild or cultivated trees.



Photo 4: Cork graded for sale

trees explains the focus on management to optimise canopy-cover rather than stem numbers. The other role for the tree-cover is shade and shelter for livestock. The variety of functions of the

## **Livestock and Crops**

reduce costs of buying in feedstuffs. Livestock products, in addition to meat and breeding animals, according to the seasonal habitat conditions. Arable cropping on slightly better soils may in some contained within extensive internal fenced areas that allow a degree of manipulation of the grazing, Historically, the livestock are likely to have been herded, but under current practice they are from acorn-fed pigs). are wool (Merino is a high-quality product) and ham, in particular the jamón ibérico de bellota (ham areas be for commercial grain production but at Dehesa San Francisco this is for livestock-feed to



Photo 5: Retinto cattle

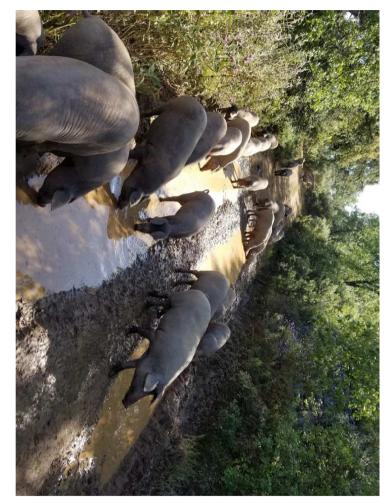


Photo 6: Iberian pigs

Mountains, resulting from extensive cattle grazing substituting for the traditional herded sheep also helping to counter the loss of grassland habitats to scrub encroachment in the Cantabrian transhumance using road transport of animals. The re-establishment of these sheep movements is movements as well as being dictated by economics and the lack of summer feed in the dehesa, undertaken on foot, taking many weeks along the network of drove routes or "cañadas". These Up until the 1960s there was a practice of moving sheep north during the summer to areas of the northern areas. Part of the recent focus at Dehesa San Francisco has been to develop systems of fulfilled an ecological role in terms of maintenance of grassland habitats and associated wildlife in pasture in cooler and wetter central and northern mountain ranges of Spain. Traditionally this was

the re-establishment of this practice is not proving easy. depopulation is having severe impacts on villages and communities. Obtaining funding to sustain grazing. There is a social element to this work, in providing rural jobs to the north of Spain where



Photo 7: Merino sheep

## The Role of Cooperatives

operate at a local and provincial level, both in terms of marketing of produce and as agents of A significant factor in securing the future survival of the dehesa is the various cooperatives that

slaughtering, butchering, wool grading and marketing can take place at the either level according to second-level cooperative comprises as number of first level cooperatives. Activities such as the opportunities. There are two levels of cooperative. The first-level cooperative comprises farmers or producers. The

promotion and certification of high value products such as merino wool or jamón ibérico de bellota. level to assist farmers in adjusting livestock numbers to pasture availability and quality. Also the cooperatives. They also offer a service to allow government satellite data to be used at the farm Initiatives such as the transhumance project are to an extent financially supported by the



Photo 8: Wool being graded at a cooperative processing unit

## **Biodiversity and Ecosystem Services**

fire-hazard and the risk of consequent soil loss. The biodiversity case for traditional management of trees have been lost or grazing is sub-optimal, a dense thicket of shrubs grows which creates a high from the drying streams. Red deer are hunted for sport as are grey partridge. In areas where the Black and Griffin vultures take advantage of rising thermals. At dusk nightingales call and frogs croak rock roses and other flowering plants. Bee eaters call constantly and swoop to river-bank nest sites. Spring in the dehesa heralds the appearance of a striking variety of wild lavender, irises, orchids, and the *dehesa* is not hard to make.



Photo 9: Wild lavender

#### **Economics**

pollination deficit) are taken into account (Kay and Herzog (2019)). marketable ecosystem services (groundwater, nutrient loss, soil loss, carbon sequestration, corresponding agricultural system, whereas in Atlantic Europe agroforestry is only profitable if non-There is some evidence that Mediterranean agroforestry can be more profitable than the

sustaining. This view is based on the premise that farmers should be paid for the provision of public benefits such as fire control, prevention of desertification (soil loss) and wildlife. The route for doing continued decline in the area of dehesa in the Iberian peninsula is highly likely. marketing mechanisms. In the absence of such targeted funding then it would seem that a this, Ernestine suggests, could be through the cooperatives as the agents for other progressive The manager of Dehesa San Francisco, Ernestine Lüdeke, was clear that farms like hers can be self-

## **Relevance to Scotland**

free-ranging hens. Silvopasture is the most common form of agroforestry in the UK (Soil Association are allowed into beech or oak forests to feed on fallen nuts, and "woodland egg" production with wood-pasture in traditional parkland or policy landscapes, "pannage" in the New Forest where pigs growing of fodder crops. (2019)), which by definition is where livestock are combined with trees, and encompasses the education, culture, policy and practice between forestry and agriculture. Examples are grazing of There is some agroforestry practised in the UK, however this is against the tide of historic divisions in

management, but as yet there has been little impact from this work on wider farm management. the James Hutton Institute has been looking at integrating sheep grazing and woodland woodland in mind. Field trial research work ongoing since 1988 at Glensaugh in Aberdeenshire by land. You do not need to go far to find examples of livestock overwintering in grazed broadleaved or native woodlands, albeit this is often undertaken without the long-term sustainability of the In Scotland silvopastoral systems are perhaps of most relevance, given the limited amount of arable

challenge to also deliver from our land all that is required in terms of food, energy, timber, flood protection, soil conservation and biodiversity. The attraction of agroforestry as a land use is that it to delivering Scotland's net-zero carbon targets for mitigation of climate change. It is a massive Government objectives. In particular, rural businesses will have to demonstrate their contribution divisions referred to above. We are at a time of significant change in agriculture to meet Scottish However, what is apparent is the opportunity being missed if we cannot overcome the historic alternative land-use system that can be matched to these objectives on every acredoesn't involve tinkering with the margins of current systems that do not deliver, but offers an

lower stem densities, as well as models that specifically address the vegetation component. limit per farming business of 5 hectares and has had almost no uptake. There is a need for greater agricultural productivity below the canopy. However, this is targeted at better quality land with a with planting at tree densities of 200 or 400 per hectare, probably a little high for there to be much policy and funding support to develop and implement appropriate models at a larger scale and at There is a grant available under the Scottish Government's Forestry Grant Scheme for agroforestry

that the trees will only produce low grade timber and biomass or fuelwood. However, on better land agricultural productivity and biodiversity. In a Scottish agroforestry model there may be a concern In the Spanish dehesa the management of the trees is considered to be key in order to optimise

there could, for example, be options for integrating fruit or nut production with livestock management. In addition, woodlands on farms in Scotland are primarily valued as being part of the farm capital rather than as a source of direct revenue (Gordon 2010).

wintering of livestock. Through the adoption of more integrated agroforestry systems, there are improving livestock conversion efficiency, and reducing feed and housing costs through outmight look like in Scotland a starting point can be upland wood pasture, or existing new native time enhance environmental and economic resilience. If we need to visualise what agroforestry farming, which relate to the value of trees as shelter in terms of increasing lambing percentages, apparent - look back to Photo 1 to see an example of mature wood pasture woodlands where cattle have been re-introduced. The landscape benefits also then become opportunities to develop new and existing markets for a range of products that could at the same There is an urgent need to broaden perceptions to agroforestry beyond the benefits to livestock

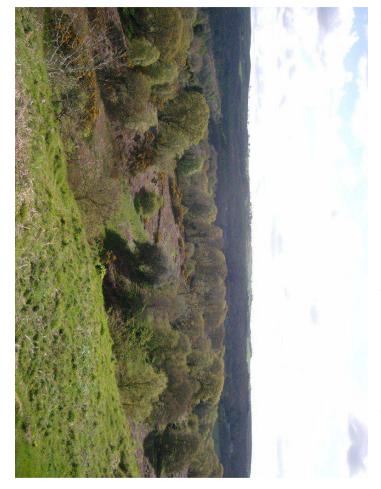


Photo 10: Wood pasture in Galloway

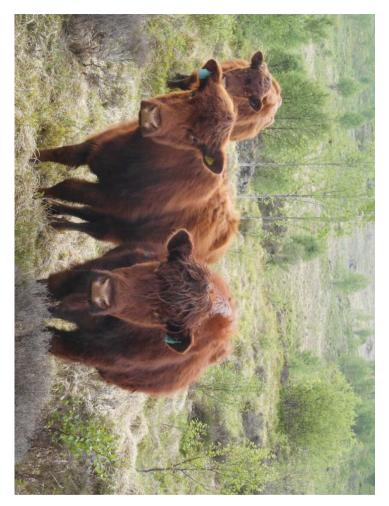


Photo 11: Luing cattle in the Trossachs grazing a developing, upland, new native woodland

another. As with other significant land-use changes, we need to go ahead and try the change from tradition in Scotland, and with many site variables, what is found to work in one place may not in 2- to 3-dimensional farming, then learn from what works, and share the experience. Agroforestry systems are more complex than single land-use systems, and in the absence of a

the future management of upland Scotland. The Spanish dehesa is inspiring as a model in helping us to realise new climate-resilient options for

https://www.youtube.com/watch?v=HucLsijB87c A short film produced as a result of the visit by Kate Holl of SNH is available at:

### References

- J. M. GÓMEZ -GUTIÉRREZ. J and M. A. PÉREZ-FERNÁNDEZ and R. SORIGUER, 1998. Grazing and woodland management in the dehesa: a silvi-pastoral system in central Spain. Forestry Commission Technical Paper 25: Grazing as a Management Tool in European Forest Ecosystems, 1998.
- P.GORDON, 2010. The impact of current policy and associated incentive regimes on woodland expansion in upland Scotland: A case study in Perthshire. Unpublished MSc thesis paper.
- European landscapes with and without agroforestry systems. Ecosystem Services, Volume 36, April S. KAY et al, 2019. Agroforestry is paying off – Economic evaluation of Ecosystem services in
- silvopastoral system linking production and nature conservation. 21  $^{\mathrm{st}}$  General Meeting of the L. OLEA and A. S. MIGUEL-AYANZ, 2006. The Spanish dehesa. A traditional Mediterranean European Grassland Federation. Badajoz (Spain), April 2006.

SOIL ASSOCIATION, 2019. The Agroforestry Handbook: Agroforestry for the UK 1st Edition (July 2019). handbook/download-the-agroforestry-handbook/ Available at https://www.soilassociation.org/farmers-growers/technicalinformation/agroforestry-

## Acknowledgements

and Kirsten Brewster who in their different ways guided and inspired this paper. Also to Ernestine Lüdeke, Mel Nicoll, Seona Anderson, Gwen Raes , Taylor Smith, Charlotte Blackler With many thanks to Penny Martin and Gerry Kennedy for editing, helpful direction and comments.

with planning assisted by the Woodland Trust Scotland. The host partner in Spain is Fundación Monte Mediterráneo. ARCH works with a consortium of Scottish organisations. This study visit to Dehesa San Francisco was funded by Erasmus + programme, enabled by ARCH

### The Authors

Philip Gordon has been a Land Manager with the Woodland Trust Scotland for 19 years. Business Centre, Perth, Perthshire, PH2 8BW Email: philipgordon@woodlandtrust.org.uk. Address: Woodland Trust, South Inch areas of grazed woodpasture. He has a long-held but under-utilised interest in agroforestry. For six years he was the Estate Manager at their Glen Finglas property which has extensive

specialising in advising on improving semi-natural woodland condition and evaluation of herbivore impacts, wood pasture and agro-forestry. Contact: kate.holl@nature.scot. Kate Holl has been a woodland advisor with Scottish Natural Heritage for 28 years

