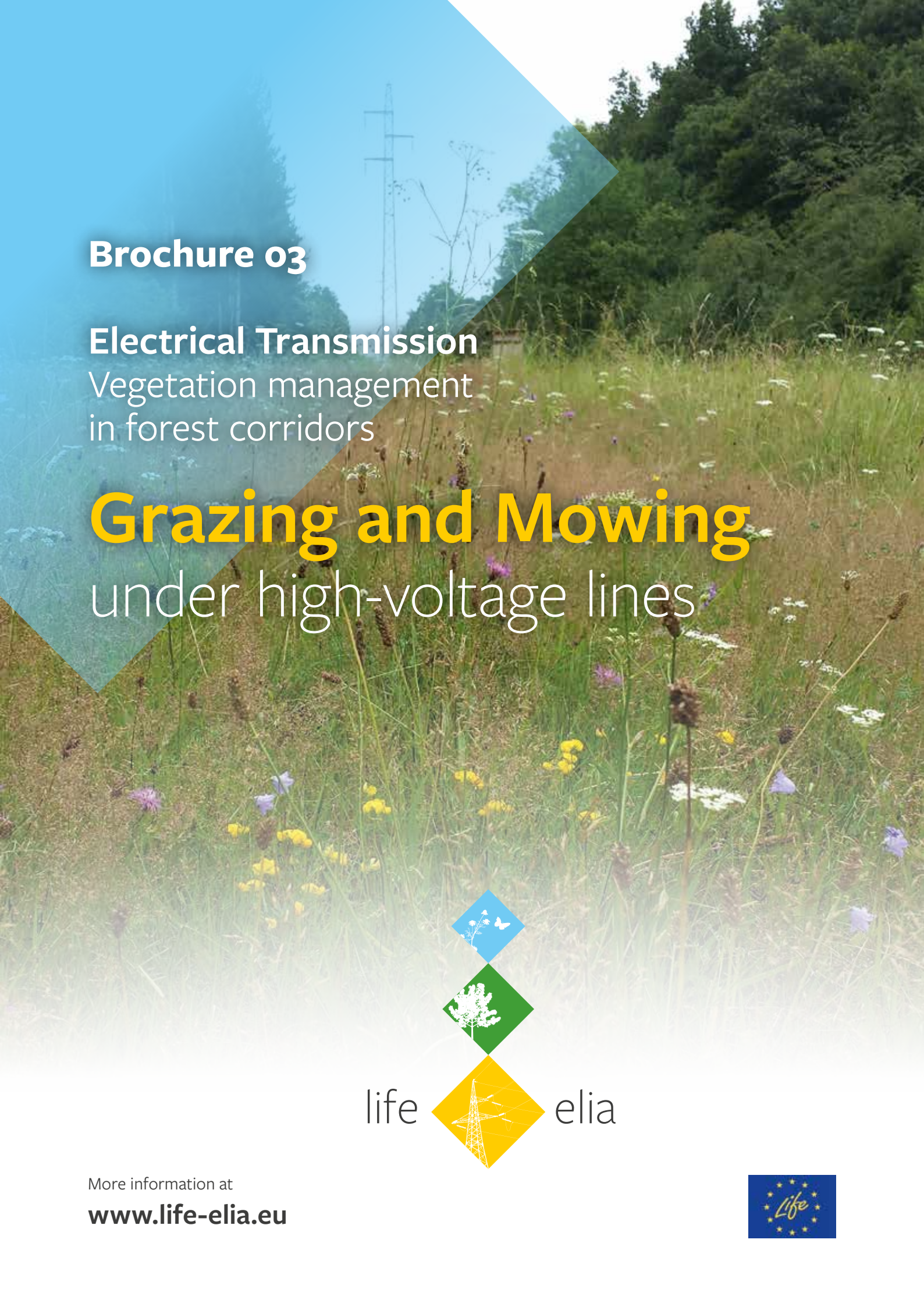

Brochure 03

Electrical Transmission
Vegetation management
in forest corridors

Grazing and Mowing
under high-voltage lines

life elia

More information at
www.life-elia.eu

Summary

The vicious circle of standard management of vegetation 4

To reduce the risk of an electrical accident due to trees as much as possible, the Transmission System Operator (TSO) often conducts regular rotary slashing of the vegetation in the forest at an early stage of growth. Paradoxically, this produces effects that promote seedlings and the rapid return of these same species that it seeks to avoid under the lines.

Grazing, a major alternative for the TSO 5

The impact of grazing is major for the TSO : it ensures that the vegetation will remain low and will no longer present a hazard for the electrical cables. The use of robust animals, advantageous for the preservation of older breeds, is all the more so in places where machines could not operate (steep or rocky areas) and maintenance was conducted by costly manual cutting.

A win-win relation with local stakeholders 16

Purchase or lease of farmland for grazing or mowing is far from easy in many European countries. By opening the electrical corridors to “agricultural”-type management, the TSO is initiating a new concept of the line that includes local partners. Some farmers clearly take an interest in this type of ecological management, as do private owners of animals and hunters interested by mowing of the firing line in the corridors. It’s a win-win relation that is part of a sustainable partnership.

Parameters to take into account in grazing 9

According to the type of environment and the local opportunities, grazing must take into account the following aspects: soil preparation, types of animals, types of fencing, dates for grazing, and maximum number of animals onsite. These choices are made during the set-up phase, and the methods for long-term management are specified in the site management plan.

Mowing, an efficient way of meeting several objectives 14

When the vegetation is mowed in the electrical corridors, it is done in general either by a hunter wanting to maintain a firing line with good visibility and ensure a source of herbaceous food for game, or by a farmer wanting to take advantage of a new source of hay. The meadows to be mown can be sown with seed mixtures originating from nearby meadows rich in biodiversity, thus guaranteeing the greatest possible plant variety. Visually, the integration of the line into the landscape is more harmonious with the colours of this new vegetation.

An advantageous cost-benefit ratio 20

The return on investment of grazing activity is 6 years. Over 30 years, this activity is half as costly as standard rotary slashing in a normal situation, and five times less costly than manual cutting in difficult operating situations. And this is a worst-case scenario; that is, foreseeing complete replacement of the fencing after 15 years.

A matter of local opportunity and adequate resources 8 & 16

For the TSO, this new approach of vegetation management must be accompanied by both a competence for conciliation with the local famers and tools for agreement/contracting that will facilitate the implementation of these alternative management activities. The possibility of enlisting European financial subsidies for agriculture in these sometimes less-profitable areas may also be an asset to consider for the TSO.

LIFE Elia
Development of electrical transmission network right-of-ways as active vectors favourable to biodiversity

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1

Introduction

This brochure has been drafted by LIFE Elia-RTE's team. This 6.5 year project (2011-2017) is financed by the LIFE programme of the European Union, the Walloon Government, Elia and RTE, the latter two Transmission System Operators (TSOs) in Belgium and in France respectively.

The main objective of the project is the conversion of forest right-of-ways along the routes of high-voltage lines into ecological corridors in Belgium and in France. The restoration activities aim to establish innovative practices for managing the vegetation in these green corridors in the forest, and to raise awareness among various publics of the importance of biodiversity in these linear habitats.

2

Vegetation management under electrical lines

In forest areas in particular, management of vegetation is essential. The natural growth of seedlings and other new growth must be controlled at all times to guarantee that no current interruption will occur due to arcing from the line.

This precaution applies below the cables, but also on either side of them, to take account of swaying due to the wind, lengthening during the warmer months, and the risk of trees falling on the cables. Depending on the precautionary measures established by the TSO and the configurations of the terrain, this can result in a safety corridor over 50 m wide to be maintained.

But alternative solutions for vegetation management do exist. They allow electrical safety to be ensured while taking account of biodiversity and involving local partners. This brochure details one of these in particular, implementation and maintenance of grassy open areas by grazing or by mowing.

Standard vegetation management

Rotary slashing is most commonly used to maintain the corridors of the high-voltage network in the forest. This maintenance technique is carried out periodically using a sufficiently powerful tractor. This work is repeated every three years on average but the periodicity depends on the vitality of the local vegetation. This frequency of passage is set by the operator and allows work to be done quickly on trees of small circumference.

The result of the operation is ground cleared of vegetation and covered with wood chips. Inspection of the worksite is therefore easy and the provisions of the specifications are minimal.

3.1. Advantages of rotary slashing

This management practice has the following advantages:

- rotary slashing is well mastered, as it is familiar to the TSO's patrollers, contractors and forest managers;
- the procedure reassures the operator, for whom understanding the dynamics of vegetation is not the primary job. No trees = no electrical risk;
- the opening up of the environment ensures a feeling of accessibility and easy visibility over the entire line (maintenance and intervention in the works);
- a clear demarcation of the "frontier" between the neighbouring forest and the electrical corridor maintained by the TSO.

3.2. The drawbacks of rotary slashing

Rotary slashing has the following drawbacks:

- the exposure of the soil results in:
- germination of the seeds produced by nearby trees or by the seed bank stimulated by the exposure to light
- a total disappearance of competition, favouring so-called pioneer species of trees, which grow rapidly
- the root network of the cut trees will produce very vigorous sprouts
- the slight tilling of the soil and the shredded material generated by rotary slashing contribute to establishing ideal conditions for growth of the trees that the operator wishes however to limit.

These aspects are thus part of a sort of vicious cycle in which the growth of the trees that pose a problem is in fact promoted by the method of management by rotary slashing.

There are also other disadvantages related to regular rotary slashing:

- destruction of the fauna and flora present in the parcel (although a maintenance work period outside 1/4 to 31/7 reduces this impact)
- a negative visual impact
- compaction of the soil due to regular passage of heavy machinery
- multiplication and spread of certain invasive species (e.g. Japanese knotweed) by unintentional dissemination and transport of fragments
- regular enrichment of the soil due to the decomposition of the shredded material, which contributes to lack of variety in the flora
- considerable management costs

4 Alternative vegetation management: grazing and mowing

In order to maintain low grassy vegetation, it is necessary to have local management, conducted by local partners.

4.1. Grazing

Management by grazing consists of confining herbivorous animals in the forest high-voltage line corridors so that they graze the vegetation. Grazing thus allows young tree shoots growth to be controlled.

Vegetation turns into a more grassy vegetation due to repeated passage of the animals.

This grazing most often involves hardy animals that demand very little care (veterinary treatment, deworming and food supplements, for example) and have an undemanding diet.

Management of these grazing areas is entrusted to local breeders who work with:

- cows
- horses
- sheep
- goats

4.2. Mowing

Management by mowing consists of mowing the grassy vegetation each year. This mowing is done by a local farmer who can have the hay, or by a hunter wanting to maintain a feeding ground or a firing line. To obtain greater plant diversity, the ideal is to export the hay. This contributes to soil depletion, allowing establishment of more diversified vegetation.

Jean Delacre, manager of the "La Haie Gabaux" nature reserve, Walloon Region, Belgium

There's a reason why I've always called our high-voltage lines "butterfly highways". The one in Doische, which crosses the Natagora nature reserve of La Haie Gabaux, is highly important in safeguarding the marsh fritillary (*Euphydryas aurinia*). This rare butterfly needs the devil's bit, a plant growing in the forest trails, to reproduce. I could only approve the LIFE Elia initiative that will allow us to improve the edges so important to numerous species, including our reptiles, and to dig several ponds to extend the existing network in the region.

Setting up the grazing and mowing

5.1. Selection criteria for this type of management

Grazing and grazing serve to keep the electrical corridors in open environment even though in a forest context. These methods are completely suitable for management of the natural habitats restored by LIFE or already present below high-voltage lines (see brochure no. 6). Grazing can also be implemented to fight the spread of invasive species (see brochure no. 5).

Nonetheless, to implement either mowing or grazing, the following conditions must be met :

- finding interested local stakeholders to manage the land, mainly farmers but also in some cases hunters
- having a sufficient area to ensure some profitability for the local manager
- having easy access to the sites in order to allow operation of farm machinery (monitoring, mowing, water supply, moving the livestock)
- being located relatively close to villages to allow inspection of the area and to limit travel for the manager.

The administrative formalities

The administrative formalities should be planned in parallel with the implementation of the action. Depending on the national or regional legislation, there are sometimes formalities that allow a farmer to lawfully declare as “farming areas” the parcels in forest areas. These formalities must be considered before the restoration work. Generally, the “preservation of biodiversity” objective allows the necessary authorisations to be obtained more easily.

5.2. A certain type of farming

Forest soils are less productive for animal breeders. The agricultural yields derived do not always allow them to generate a substantial income there.

This is why the farmers showing their interest for areas under high-voltage lines have small farms for the most part and are often already involved in a management type that is ‘gentler’ and more respectful of nature.

Additionally, the low yield of the land, and so lower economic return, can be offset by agro-environmental premiums (see insert) if the conditions necessary for granting them are fulfilled.

MAEs, an incentive for ecological management

In Walloon Region, a farmer may receive MAE (Mesures Agro-Environnementales [Agro-Environmental Measures]) subsidies varying from 200 to 450 €/ha/yr. These subsidies have been instituted by the European Union to compensate for the loss of revenue related to farming in unprofitable but ecologically significant environments. The terms associated with these subsidies (observance of a grazing/mowing calendar, no use of fertiliser or phytosanitary products, stocking densities to be observed, incentives for robust local breeds, etc.) guarantee that biodiversity is properly taken into account in managing these natural environments.

In each European country, these subsidies may be allocated differently (on expert recommendation, by contract, etc.).

5.3. Management by grazing

5.3.1. Conditions

Grazing can be implemented under most of the conditions encountered in forest corridors. The soil can be wet, stony or steep, conditions that sometimes make this alternative management the sole method that can be applied.

It must nonetheless always be ensured that sufficiently large areas (more than approximately 1 ha) are available, in relatively immediate proximity of villages and easily accessible. In addition, given the linear nature of the safety corridors, grazing will be recommended in sufficiently wide corridors. In this context, parallel double lines have an attractive advantage in terms of grazing areas, as they offer a wide safety corridor. As an example, a length of 200 m will be needed to reach an area of one hectare for an electrical corridor 50 m wide.

The perimeter of the grazed area in this case is 500 m (200x2 + 50x2), which is already deemed acceptable in the framework of the LIFE project. For a double line with a total corridor 100 m wide, the fence perimeter is 400 m for one hectare, which proportionally reduces the costs of installing fences. Wide corridors also offer better lighting of the parcel, favourable to the development of grassy vegetation.

5.3.2. Preparation of the site

If the land to be fenced is covered with a woody thicket, the first step consists of removing it (clearing undergrowth, minor felling). As soon as the area of land is cleared, the fencing can be installed.

When an Ursus® fence is installed (see below), additional ground levelling work, if necessary, must be performed along the layout of the new fence. This work will ensure that the fence touches the ground properly at all points, to prevent escape of the animals.

5.3.3. Choice of the type of animals

The choice of the type of grazing will depend on the environmental conditions, the local availability of the species, hunting practices or local traditions.

Cow and horse grazing under the lines can be considered in most cases when “standard” grazing conditions are encountered.

However, under some conditions of slopes or exceptional natural environments, sheep are better adapted.

Goat grazing is to be avoided, as they have the unfortunate tendency to escape, even with outsized fences.

Finally, in areas that are too damp, sheep should be avoided, as they are susceptible to a disease called foot rot.

5.3.4. The various breeds of animals

Once the specie is chosen, one must know which breed is best suited. In general, older breeds are used for their robust nature. Not only does this contribute to preserving them, but these older breeds prove to be more resistant than their cousins used in intensive production. While production breeds need veterinary follow-up and a high-quality diet, these older breeds are less susceptible to disease, more tolerant of fodder of poor quality (they eat almost indiscriminately grass, woody plants, or even brambles), they tolerate dry periods better, have fewer problems with parasites, and do not need shelter.

The most commonly seen hardy breeds in our Walloon region and nature reserves for management of natural environments are:

- for cows: Galloways and Highlands
- for horses: Fjords and Koniks
- for sheep: Mergellands, Roux ardennais and Soay

Marc Bouvin, breeder in Montmorency-Beaufort, Aube Departement, France

I have been a sheep breeder for 15 years, and I manage a flock of approximately 220 animals. My ewes already graze a Natura 2000 site for the Forêt d'Orient Nature Park and the Champagne-Ardenne Conservatory of Natural Areas.

The LIFE Elia-RTE corridor is located along the path of the animals; so it is an opportunity to have additional parcels, because access to land (in the region) is not easy. Thanks to the agreement signed with RTE, I can have a long-term vision, and that's a real asset. The 60 ewes put under the line have all lambed without any problem. The results for nature should be exceptional, given the proximity of dry grasslands of high biological value.

5.3.5. Types of fences

The type of fence is determined depending on the type of grazing.

Fences for cows and horses

Cows and **horse** grazing require installation of fences with the "standard" technical characteristics listed below:

Number of strands of barbed wire: 3 to 4 rows
Height of the fence: 1.2 m
Length of post: 1.80 to 2 m in wet soil
Minimum circumference: 40 cm
Nature of the posts: most often of split oak but can also be of chestnut or acacia for greater longevity.
Distance between posts: 3 m
Height of the wires: 25, 55, 85, 115 cm. Ideally, the fact that the wires are tightened below allows young animals to be contained more easily.

Other factors must be taken into account:

- The corner posts must be supported by struts;
- A manual tensioning system must be provided, to react efficiently in case the fence is damaged. The wire must be able to slide into its attachment;
- Attachments must be made on the hard part of the wood (no nails in sapwood);
- The fence must follow the contour of the ground as closely as possible;
- Lightweight barriers must be provided at the various access points to allow access for the vehicles of the TSO staff or the breeder;
- A catch pen is sometimes provided near one of the barriers to allow the breeder to collect his herd before loading it into a livestock truck.

This type of fence has a life expectancy of approximately 15 years, but in practice they can be used longer with good regular maintenance.

Michel Allard,
Management and maintenance of infrastructure,
Elia, Belgium

In general, Elia limits the growth of vegetation by rotary slashing in most of its electrical corridors in a forest. When the terrain doesn't lend itself to rotary slashing, the vegetation is managed by manual cutting. The work is sometimes difficult due to the slopes and rocky soil. In this context, animal grazing is a solution that allows the vegetation to be contained and so reduces the electrical risk, at less expense for Elia. But in addition, a breeder benefits from new pastures. It's a win-win solution for us and for the breeder.

Fences for sheep and goats

Sheep (and goat) grazing is highly advantageous in situations of steep slopes or rocky environments, precisely where a rotary cutter cannot operate and so where maintenance is done by manual cutting (more complicated and more expensive).

The fences can be either fixed or mobile.

Fixed fences are fine-meshed fences of Ursus® type from 1.2 to 1.4 m high and from 2 to 3 mm in diameter. A barbed wire can also be placed inside the enclosure as close to the ground as possible to prevent the sheep forcing the fence. The posts used are of oak, chestnut or acacia, and are split or round, sunk every 3 m. On the most difficult terrain, metallic corner pieces can also be used to be able to penetrate the ground. They also increase the durability of the fence.

The drawback of such fences is that they hinder the passage of a number of species (wild boar in particular). Whereas temporary installation of a barbed-wire fence can be considered during logging, for example, in the case of Ursus® it is clearly more complex. It is therefore sometimes more difficult to gain acceptance of this type of fence from the various participants in a forest, and so it is best to propose an alternative mobile fence.

Mobile fences are temporary installations allowing a herd to be moved quickly. They are made of electrified meshes connected to a generator, itself connected to a battery that can be coupled to a solar panel. These fences are moved depending on the availability of food. Their installation requires meticulous brush clearing of the perimeter to be enclosed.

These installations have a very limited impact on the landscape over time and prove to be an alternative in the event that an owner/manager/hunter is reluctant to install a fixed fence.

Summary of the possibilities and estimate of the costs

The table below summarises some land characteristics for the types of livestock:

	Dampness	Slope	Type of fence
Cow and horses	Several breeds adapted to humid areas	Preferably on flat or hilly land	Barbed-wire fence
Sheep	Most breeds are sensitive to humidity	Highly suitable for important slopes, cliffs, etc.	Fairly costly Ursus® fence, hinders the circulation of wild fauna and farming Gallagher type mobile fence

For information, the average price of installation of the fences is approximately 4 to 5 €/m excluding VAT for cow/horse fences and approximately 8 to 12 €/m excluding VAT for sheep fences. Some additional equipment will be installed on the fence: barriers (4.5 m wide) and gates for passage of the various users (patrollers, mountain bikes, riders, hikers, etc.).

A mobile fence comes to approximately 1.8 €/m, to which must be added purchase of an electrifier (price varying from 200 to 400 €/piece).

5.3.6. Other facilities

Other facilities can be provided:

- a water source (tank or trough) can be installed to allow the animals to drink,
- a catch pen to collect the sheep before loading them into a livestock truck.

5.4. Management by mowing

5.4.1. Conditions

To be able to mow an area, the following three conditions must apply at a minimum:

- → flat or gently sloping land
- → soil sufficiently dry and load-bearing at the right period
- → the absence of large rocks, debris from branches or other obstacles

5.4.2. Preparation of the site

If a hayfield is established in a wooded area, the wood must be felled and the branches removed first, with the aim of removing a maximum of organic matter. The wood will be recovered insofar as possible and the branches will be either heaped nearby (offering shelter for microfauna) or exported in chips and used as energy biomass (this operation is most often expensive, but can be self-financed in some cases by the value of the wood).

Then, a rotary cutter must be passed over the cut area to remove the last sprouts of woody species and level and break up the stumps and superficial roots as much as possible.

Depending on a diagnosis of the habitat, if conditions are good and the work is sufficiently meticulous, grassy vegetation can already re-establish itself after this operation. The following year, mowing will be sufficient to definitively remove the last woody plants. This mowing is performed with heavy equipment (pasture topper, flail mower, etc.). It can also be requested that the hay be exported in order to contribute to soil impoverishment, always favourable to expression of biodiversity.

If the surface of the soil is still too uneven, if it is still scattered with pieces of branches, it is then necessary to rework the soil in depth with heavy equipment allowing the roots and the soil to be ground up to 40 cm deep (rotary cultivator or Merry Crusher©).

5.4.3. Harrowing, sowing, rolling

The in-depth cultivation of the soil is followed by harrowing to level the soil and break up the clods of earth. This operation is most often performed by a farm tractor also equipped with a seeder and Packer roller allowing the depth of operation of the harrow to be regulated, the soil to be compacted a first time, the earth to be more finely broken up and possibly the seeds to be lightly covered. In a single passage, the soil is thus harrowed, sown and rolled.

Finally, it is sometimes recommended that the soil be rolled with a smooth heavy roller when the soil has been worked in depth (over 10 cm). The upwelling of water that occurs naturally by capillary action is in fact broken up by cultivation. Passage of the roller slightly decompacts the soil and so recreates moisture conditions favourable to germination and development of seedlings.

For sowing, given that various seeds harvested in meadows of high biological value (see harvesting the seeds below) are involved, it is recommended that broadcast sowing be done with a seeder of

Vicon centrifuge type or a pendulum seeder. The use of a pneumatic seed drill often proves difficult, given the risk of jamming caused by the lack of grading of the seeds

Over small areas, sowing can also be done traditionally, by hand.

5.4.4. Harvesting the seeds

To manage a forest right-of-way by mowing while maximising diversity in flora, we recommend that the parcel be sown with a mixture adapted to the region, and so ideally harvested locally.

In this case, the seeds are harvested from a "source meadow" that harbours a wide diversity of indigenous grasses and flowering plants. The seeds are then sorted and dried. A "ready to sow" diversified mixture can also be bought from a business specialised in production of seeds of local origin.

Pascal Colomb, manager of ECOSEM, Belgium

ECOSEM is a Belgian company that has specialised in production of indigenous seeds and plants of verified regional origin (Belgium and northern France) for over 20 years. For this, we sign production contracts with farmers located in these same regions. The collaboration with the LIFE Elia-RTE project is highly interesting for us, as it has allowed us to work in a more "linear" approach to the natural habitats. Contributing to creating biological corridors, from seeds directly harvested in meadows of high ecological value, close to worksites for ecological rehabilitation, motivates us all the more. We have been able to provide our expertise and technical skills to meet this challenge and so contribute to the preservation of biodiversity and landscapes.

Seeds and plants of local origin

In numerous countries, certification programmes have been established to ensure the local origin of seeds and plants used in many projects. This certification guarantees local biodiversity, genetic diversity and the preservation of the existing resources in their natural environments. Use of these certified plants and seeds is sometimes mandatory in the framework of public projects. In Belgium, ECOSEM works along these lines in the Walloon Region, "Plant van hier" in Flanders. In France, the "Végétal local et Vraies messicoles" programme is also involved in this thematic. RTE is a partner in this approach.

It is important that the TSOs be a part of this approach of plants of local origin, a guarantee of biodiversity respectful of local characteristics.

5.5. Contract agreements

Whether grazing or mowing is involved, in the event of occupation by a farm operator, a provision agreement must be co-signed by the owner of the parcels and the operator.

This agreement specifies the provisional and free nature of the occupation on the one hand, and the management requirements on the other hand.

The provisional and free nature of the occupation is important to avoid falling under the farm lease system (Belgian law). This system offers advantageous terms to the farm operators but limits the possibilities for reallocation of the parcels to another operator or to another use by the owner.

The conditions for grazing (period, livestock densities, prohibitions, etc.) or mowing are established to guarantee maintenance and/or improvement in biological terms of the natural environment managed. This agreement also lists the unauthorised activities that can lead to exclusion of the farmer or at least non-renewal of his right to occupation.

The environmental easement, a recognition

To facilitate grants of financial aid to farm operators, it would be advantageous for the high-voltage network (and other human-made linear infrastructures) to be incorporated into the concept of the Structure Ecologique Principale (SEP, in Belgium) or the Trame Verte et Bleue (TVB, in France). This recognition of the linear structure as a vector of biodiversity would constitute a real advantage in management of vegetation favourable to biodiversity.

Long-term management of grazed and mowed areas

6.1. Long-term management plans

For grazing and mowing, a management plan is issued for the attention of the farm operator, including the instructions to be observed. Often, these instructions are related to the requirements in the specifications of the MAE subsidies (see before). Failure in observing these instructions can result in loss or even reimbursement of these subsidies, a threat that guarantees in part proper observance of the rules by the manager.

If the corridor is mowed by a hunter, to maintain a firing line or a natural feeding area for example, the provisions as to management of the site can be specified in the hunting lease, on condition that the owner has accepted this principle. The renewal of the lease can then be used to incorporate this item.

6.1.1. Livestock density and dates for grazing

To optimise management of the vegetation and biodiversity at the same time, the ideal balance in terms of livestock density should be found. The presence of too few animals results in too little pressure on the vegetation and a risk of progressive reforestation. Conversely, too great a density of animals leads to too little variety in the flora and certainly to weight loss of the livestock.

The reference for specifying the livestock density is the Livestock Unit (LU). This unit is defined as the livestock density present in a specified area for a specific period. It is expressed in LU per hectare and per year, or during the recommended period (example: 4 LU/ha for 4 months from June to September). A dairy cow producing 3000 litres of milk annually corresponds to one LU. Thus LU values are given as a guide for other species: cows from 6 to 24 months of age (0.6), cows under 6 months (0.4), and finally sheep and goats (0.15).

The livestock density will be greater at the beginning of the conversion of the electrical corridors into pasture areas (restoration phase), and can then be reduced as the density of woody regrowth decreases (management phase).

As an example, for a pasture created in a municipality in the eastern Walloon Region a livestock load equivalent to 4 LU/ha for 4 months or 8 LU for 2 months, to be applied between 1 May and 20 September during the two years of the restoration phase, is recommended. After this, the management phase will allow a maximum load of 0.5 LU/ha/yr to be accommodated onsite between 1 July and 30 September. The temporary load during these three months can be 2 LU/ha, and if the land is grazed by sheep there can thus be up to 14 sheep/ha from July to September.

To allow certain plant species to live out their entire cycle, including seed production, the grazing date is also of crucial importance.

The grazing date and load can be adjusted after a few years depending on the development of the vegetation.

All these parameters must be established by environmental experts.

6.1.2. Date of mowing and removal of the organic matter

The mowing date must be determined depending on the site conditions (altitude, exposure, and region) that set the periods for seed development. Mowing must of course be done once the plant species have finished their flowering cycle. For example, 1 July is a transition date often recommended as the possible beginning of the mowing period. Observance of this schedule also supports the series of insects that depend on this flowering. This mowing date can be adjusted as a function of the development of the vegetation after several years.

The poorer soil is in nutrients (mainly nitrogen), the greater is the diversity of plant species. The ideal is therefore to contribute to impoverishing the soil by removing the residue from cutting in the forest corridor. The hay can be used to feed livestock in winter or put in windrows at the edge of the corridor.

6.1.3. Management of non-grazed spots

In some cases, the animals will tend to leave behind woody sprouts, preferring the more palatable grasses.

At the end of one or two grazing seasons (schedule to be set by an expert) it is essential to clear these areas. This obligation can be formalised in the specifications for operation of the parcel.

6.2. Annual management

6.2.1. Monitoring the agreements

Provision agreements are most often established for a set period. At the end of this period, the occupant can request that this occupation agreement be renewed. The request is made to the owner of the grazed or mown parcel, who may or may not accept this request. It is advantageous, however, for the TSO to maintain regular contact with these managers to ensure that everything is going well and to verify onsite that management is being carried out in compliance with the management plan. This facilitates tacit renewal by the two parties.

6.2.2. Ensuring the reactivation/continuation of MAEs

Mesures Agro-Environnementales (see before) are requested for a period of five years. At the end of this period, the TSO must supervise resumption of management, either preferentially by the same operator if the work has been done well, or by another operator.

6.2.3. Maintenance and replacement of fences

Fences can be damaged by several factors: the fall of a branch or a tree, pressure by livestock, passage of game, sabotage or simple natural wear. When there are small repairs to be made, the occupant must maintain the property in good condition, in the framework of management with due care of the infrastructures. If more major work must be done and the occupant cannot afford this alone, a discussion on a case by case basis between the owner, the forest manager and the TSO will determine how the work will be financed. In this way a possible argument by the breeder claiming the farm lease, given his investment in the fence, is avoided.

The lifespan of the fences is in general guaranteed for 15 years. This theoretical period serves as a reference point for the cost-benefit analysis (brochure no. 2). In practice, this lifespan can be much longer if the fences are inspected and maintained regularly.

Stéphane Delogne, organic farmer in Bertrix, Belgium

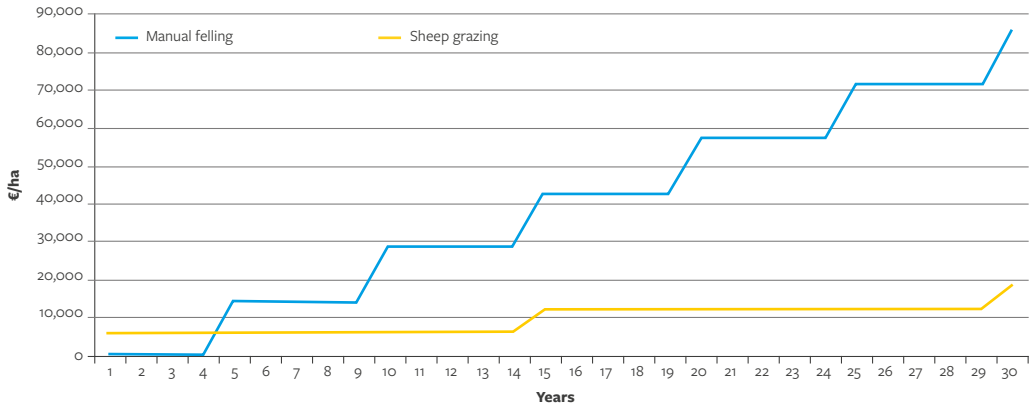
As a young farmer fascinated by nature, I am delighted to be able to collaborate with the LIFE Elia-RTE project. Six of my Highland cows graze under the electrical lines during the summer months. By facilitating my access to land, the LIFE has given me a real boost. And for me it's a pleasure and a source of pride to manage these biologically very interesting environments, all the more so as it's an excellent way to communicate on the ecological role of livestock farming, when it is integrated into nature. Hikers love it and regularly ask me about this ecological grazing.

Cost-benefit analysis

Management by grazing and mowing turns out to be less costly than the standard rotary slashing of vegetation. The results presented below are explained more fully in brochure no. 2, "Cost-benefit analysis," available at **www.life-elia.eu/en/** in the "Our publications" section.

Standard management of vegetation by rotary slashing costs on average 1,500 €/ha every three years. In areas difficult to access where manual felling is required, this amount comes to approximately 14,000 €/ha every five years.

In difficult areas where a rotary cutter cannot operate and felling must be done manually, sheep grazing is fully suitable. The costs related, for example, to manual felling and to sheep grazing (installation of the fence, repair of any damage and replacement after 15 years) are listed below.



Even considering the worst scenario (replacement of the fence after 15 years), the results show that the break-even point for this activity is reached after **six years**. After 30 years, the activity shows a cumulative cost **4.7 times less than** that generated by standard management by rotary slashing for the two cases, on large amounts. Taking into account a weighted average cost of capital (financing cost of the capital) of 5% that takes into account recosting and inflation, this activity remains 3.9 times less costly over 30 years.

The table below summarises the results of the cost-benefit analysis:

	Comparison of the costs of the LIFE activities (grazing and mowing) with those of standard management		With a weighted average cost of capital of 5%
Activities	**Break-even point**	**Comparison after 30 years**	**Comparison after 30 years**
Grazing	6 years	2 times less costly	1.8 times less costly
Grazing in difficult area	5 years	4.7 times less costly	3.9 times less costly
Mowing	6 years	4.9 times less costly	2.5 times less costly

Advantages of management by grazing or mowing

8.1.1. Advantage for biodiversity

Gentler than rotary slashing, management by grazing or mowing sharply reduces the major interventions in the forest corridor. Consequently, plant (grasses, dicotyledons, etc.) and animal (insects, birds, reptiles, etc.) species find a stable living environment there in which they can live and reproduce.

In the forest context, these linear spaces maintained as open habitats (without trees or shrubs) offer an environment for accommodation and travel for a substantial number of species. These environments, by providing light down to the lowest plant strata, diversify the forest habitats.

When grazing is used, the choice of hardy local breeds allows animal heritage to be preserved and contributes to its redeployment (example, the Roux ardennais breed of sheep of Walloon origin).

In some cases, management by grazing is used to counter the development of invasive species and in this way helps maintain local biodiversity.

8.1.2. Advantage for wild fauna and for hunting

For wild fauna, these grassy areas are especially advantageous environments as they offer a food supply partially absent from forest environments.

As the corridor is cleared, the firing linge remains fully usable by hunters in mown areas.

8.1.3. Advantage for the TSO

Where network maintenance teams had to ensure that vegetation was removed, farm operators or hunters take over. The work is thus much easier and consists only of monitoring proper observance of the specifications and maintaining contact with the local stakeholders.

Financially, the work done by the livestock or by the farm operator who mows the corridor annually is less costly than traditional management, with really substantial savings in some cases.

The involvement of local participants also contributes to a better perception of the overhead line by the residents and improves the societal image of the TSO. In terms of communication, the TSO can capitalise on these activities to highlight its commitment to the environment and the local economy.

8.1.4. Advantage for the local economy

With the establishment of these activities, the forest corridors contribute to producing added value, mainly hay and meat. Connected with the meadow areas, apiculture also generates a marketable product, honey.

For some farmers, these new possibilities prove to be beneficial in a context of land pressure that leads to an increase in the annual prices for leasing meadows. The access to land is a windfall for these farm operators already involved in an approach of ecological management of natural areas.

8.1.5. Advantage for the landscape

With colourful flowers or animals under the lines, the corridor is better integrated into the landscape than the regular clearcut resulting from rotary slashing. In some cases, the electrical corridor becomes a potential area for observation of wild fauna.

8.1.6. Advantage in the social context

On some grazed sites, schools or groups can make educational visits to understand the advantage of grazing for nature. On the touristic level, the grazing or mowing activities strengthen the landscape and environmental appeal of a municipal territory.

Areas of implementation of restorations of natural areas under high-voltage lines

In Belgium (Walloon Region):

- 155 km of electrical corridors

In France:

Seven sites distributed over the various bio-geographical regions

- Atlantic: Finistère, Seine-et-Marne
- Continental: Aube, Ardennes, Doubs
- Mediterranean: Drôme
- Alpine: Hautes Alpes

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