

CDP Carnivore Damage Prevention news



Issue 11

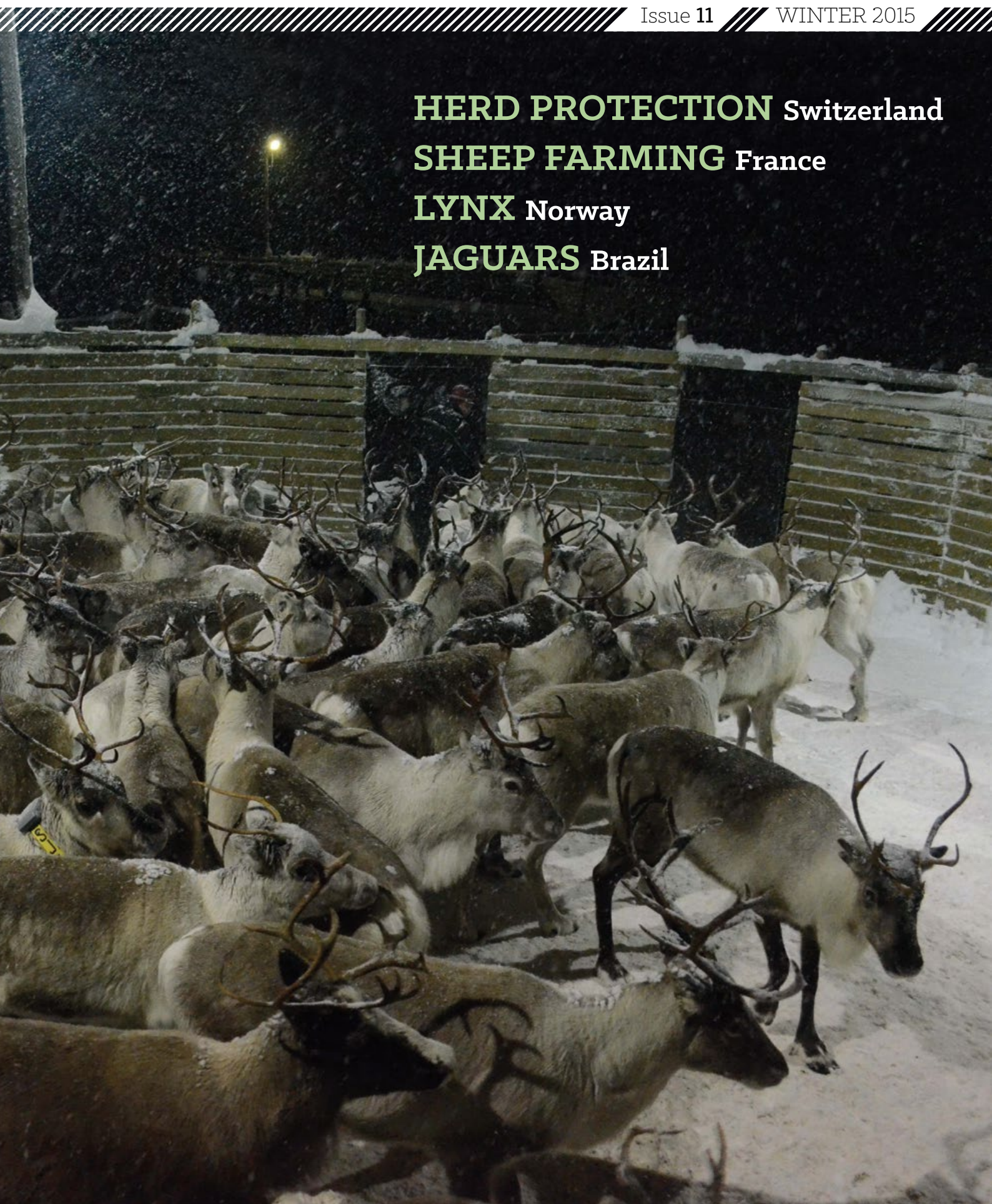
WINTER 2015

HERD PROTECTION Switzerland

SHEEP FARMING France

LYNX Norway

JAGUARS Brazil



or a permanent shepherd, but, if local conditions permit, also in herds on permanent pastures that are not surveyed by a shepherd.

Significance for herd protection

The presented study is the first one evaluating quantitatively for a whole region in Switzerland the implementation and efficiency of herd protection measures against wolves. As scepticism and lack of understanding for herd protection is widespread among small livestock owners, sound information is of pivotal importance. In this respect the scientific analysis of protection measures and wolf attacks, in regions where a) herd protection is practiced and b) wolf presence is confirmed over multiple years, is invaluable for the future implementation of herd protection. In addition, the systematic evaluation of the applied protection measures provides, of course, detailed insights into the functional relationships between protection measures and wolf attacks. There is no question that this kind of information is important to successfully adapt herd protection to local conditions. For the

Gantrisch-Schwarzsee region, for instance, the exemplary analyses have shown that a successful protection, against a single female wolf, via the use of a sufficient number of livestock guarding dogs can also be achieved with permanent or rotational grazing systems without the need of permanent shepherds – if certain conditions are fulfilled (e.g. sufficient herd cohesion, open habitat). Night-time corralling, as suggested by Espuno et al. (2004) for the successful protection of small livestock in France, is, therefore, not a mandatory measure to reduce wolf attacks to a level tolerable for livestock owners in Switzerland.

No doubt, the protection of small livestock herds in Switzerland against large carnivores is, when compared with other countries, such as Italy or France, still at an early stage. The question if the presented herd protection measures will hold in the long-term, in situations where wolves are building packs, remains open. Similar quantitative assessments of the adopted protection measures will be required in order to ensure an effective herd protection under various, local conditions in the different regions of Switzerland.

Acknowledgements

The data on the wolf and on livestock losses in the region were provided by Ralph Manz and Kristina Vogt (KORA, Switzerland). Data collection in the field was conducted by the local game wardens of the cantons Bern and Fribourg. Information on the livestock pastures was provided by Felix Hahn (AGRIDEA, Switzerland). Daniel Mettler (AGRIDEA, Switzerland) helped with the translation. Many thanks to all. The study was financed by the Federal Office for the Environment FOEN, Switzerland.

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Research Article

SHEEP FARMING IN FRANCE: FACING THE RETURN OF THE WOLF

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Introduction

In order to evaluate how farmers in France can protect their livestock from wolf attacks, it is necessary to understand and take into account how sheep and goat farming is organized in the regions where wolves are returning. This work is supported by a large number of studies conducted in various regions

of France about the vulnerability of the flocks and adaptability of animal husbandry systems towards the wolf's presence. We will review historical sheep farming systems that were in use when wolves were still common, although in the process of being eradicated, in the second half of the 19th century, and subsequent developments in animal husbandry systems, freed

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A Mediterranean steppic pasture.
Photo: Jean-Pierre Legeard/CERPAM.





A collective flock on summer mountain pasture.
Photo: Laurent Garde/CERPAM.

from the wolf constraint during the past 150 years. The recent forced «cohabitation» of sheep farming with fully protected wolves cannot, in any way, reproduce past social organisations, but it is useful to try to understand how the wolf's presence was integrated in production choices and flock management modes. Indeed, flock protection cannot be reduced to a list of different methods farmers used for this purpose.

During the second half of the 19th century in France, most of the country had been cleared of wolves, although wolf populations remained until the 1930s in the Northeast and the West-Central part of the French territory (de Beaufort, 1987). Since the 1990s, a new wolf population from the Italian strain started to settle in the French Alps and to spread significantly to other regions in the 2010s (Kaczensky et al., 2013). Small ruminant farming practises have been therefore developed for more than a century without

the presence of large predators. Meanwhile, farming underwent very deep changes due to major economic and social changes. We will try to briefly describe these upheavals.

Developments in sheep farming in Southern France over the past 150 years

Until the years 1870s wethers (castrated males) were bred for their wool, which had a high economic value, and for their manure, then the only fertilizing resource for agriculture (Lacroix, 1988). In Provence, as in Languedoc, flocks were often very large, like nowadays. Records show that some owners possessed 500 to 2,000 head (Archiloque, 2003; de Beaufort, 1988). But very small-size flocks were also frequent, owned by farmers operating within a subsistence farming system associating sheep farming with the production of various crops. In this case, these were usually taken care of by a family member, often a child. During summer, flocks are herded to the alpine

pastures (transhumance). Smaller flocks were brought together to form larger herds, as they can be found now (Gourdon and Gourdon, 2014). These large flocks, and only these ones, allowed for the implementation of efficient protection systems to protect the sheep against predators. A group of professional shepherds was in charge of the herd by managing the grazing of the animals, penning them at night and ensuring their protection by sleeping nearby the herd in small mobile wooden chests (Gourdon and Gourdon, 2000), similar to those still used in Romania (Garde, 1996). But at the time, gathering the sheep at night had an economical purpose: the retrieval of manure (de Reparaz, 1978). This made protection easier, as this was integrated into the production system. The

same applied, and still applies, to the dairy sheep farming from regions enjoying a more favourable climate and more abundant grass. This last point is important: in an arid mountain area, only hardy animals with low needs, such as castrated males or dry sheep, can bear the constraints of night gathering, as gathering the sheep at night means they have less time to graze and have to travel more every day. Also, the sheep were accompanied by a traditional livestock guarding dog, with its spiked collar, the Provençal dogou (Laurent, 1962). Moreover, the traditional herd protection was also possible, or maybe mainly possible, because of a strong pressure of destruction on wolf populations (Rigaud, 1997; Viala, 2007).

At the end of the 19th century several major changes occurred simultaneously: the collapse of the wool trade due to the competition of new countries (free trade treaty of 1860); rural migration from the mountains to cities, releasing subsistence cultures for fodder production; wolf eradication. Sheep farming then underwent major changes: farmers turned to the production of meat lambs to cover a new commercial outlet, the newly expanding city populations. Ewes needed better nutritional conditions compared to wethers. Instead of being gathered at night, they were free to graze for a longer period during the day and to settle at their chosen bedding site, a new practice



A rebuilt hut for two shepherds on a collective summer pasture.
Photo: Dominique Baron/CERPAM.

that geographers of the time considered beneficial to the land (Briot, 1907). Gradually, small mountain farmers increased the size of their flocks taking into account however the availability of the surrounding fodder for hay harvest for wintering. At the same time, labour, that was formerly abundant and cheap, became rare and expensive, subject to an increasingly demanding labour legislation. However, the traditional practice of shepherding on summer pastures was maintained. As night penning and manure collecting were abandoned, a single shepherd was sufficient to take care of the flock. Guard dogs were no longer used. These farming practices, which had to adapt to economic deep organizational changes during 100 or 150 years, are now suddenly confronted with wolves' packs on their grazing lands.

How is sheep farming organized nowadays? Sheep farming organization is very diverse and adapted to different local environments (terroir) and marketing opportunities. This organizational diversity is directly linked to landscape biodiversity (Lécrivain et al., 2001; Poux and Romain, 2009), and it might be said that public policies, which tend to produce standard practices, should be more supportive of the diversity of livestock systems and grazing practices by maintaining open landscapes and forests by grazing and hay production.

The following sections will describe livestock farming systems in relation with their vulnerability or resistance to the wolf constraint. The method used for this purpose is the ‘vulnerability diagnosis’, resulting from a series of interregional surveys, which describes the physical and human factors influencing the organization of production for a single farmer or a group of farmers. The vulnerability diagnosis aims at identifying vulnerability factors facilitating wolf access to the flock depending on the daily herding circuits and the way the flock is managed by day or at night. It evaluates existing protection measures and studies the feasibility of implementing a protection plan relying on mobile fences, livestock guarding dogs, various equipment devices and the associated labour. This method has been described by Dodier and Gouty (2007) and CERPAM et al. (2008). The complete study methodology can be found in Garde et al. (2012). Until now, 250 farms were studied in the last ten years in different French areas: Provence, the Northern and Southern Alps, the Massif Central, the Jura and the Vosges mountains. Each survey takes from 2 to 5 days to be completed.

Sheep farming in Mediterranean regions and in the Alps

In the Alps and on the Mediterranean coast, one can find a diversity of sheep farming systems, which can roughly be divided into three or four major types, each having different levels of vulnerability to wolves’ predation. The challenge was to protect, in the past twenty years, nearly 4,000 farms and 1 million ewes and lambs.

Mediterranean lowlands and Crau steppe

In the Mediterranean lowlands, and on the Crau steppe, sheep farming can benefit from large grassland areas, allowing the production of suckling lambs. The number of animals kept can vary significantly, but an important part of this production mode consists of large flocks, from just over a thousand sheep to 2,000 to 4,000 sheep. Often, these flocks graze during a limited period in hilly rangelands (*parcours*) in addition to their natural grasslands. One or several shepherds are hired to take care of different flocks and for the lambing season. In summer time, flocks are driven to the high mountain pastures (*transhumance*). The most common



sheep breed used is the highly gregarious Mérinos d’Arles, particularly well adapted to herding such large and dense collective flocks. This type of sheep farming is undoubtedly the least vulnerable to wolf attacks, because large flocks are easier to watch and protect especially in large high mountain pastures with generally good visibility, low predation risk, watering spots, and enough shepherds’ cabins. To face predation on alpine summer pastures, the Ministry of Agriculture finances an assistant shepherd who handles the additional work, the purchase of electric fences for night penning, and the costs of three to five livestock guarding dogs per flock (mainly Pyrenean Mountain Dogs).

Mediterranean hills and southern Prealps

In Mediterranean hills and the southern Prealps, two other different types of sheep farming can be found: sheep are either kept on fenced pastures, or permanently herded by shepherds. This region, where half of all packs in France settled (ONCFS, 2014), is the most affected by wolf attacks, registering two-thirds of all recorded losses in France (Fig. 1); it is also the

region where the sheep farming system is by far the most vulnerable and the most difficult to protect.

The first of these systems relies on the production of suckling lambs and the extensive use of range-lands in the form of fenced pastures. Flocks are medium-sized, ranging from 300 to 800 head. Farms also include hay fields, making them self-sufficient for fodder; sheep spend a short period (two to four months) during winter in the barn. Therefore, meadows are also grazed in autumn in order to ensure good and safe ewe conditions for the autumn lambing. The other lambing period occurs in spring. Two or three batches of ewes are taken to pastures during spring and autumn, but since they remain small (adapted to the feeding requirements), it is impossible to employ two or three shepherds. In summer, ewes either go to the mountain pastures (*transhumance*), in the same conditions of the previous case, or stay in local summer pastures. In the later, herd protection is difficult due to the small number of head, since it does not pay off to hire a shepherd, and the wooded or shrubby cover facilitates wolf attacks. Non-electric wire netting fences, less than 0.8

m high, commonly used to control ewe movements, are not effective against wolf intrusion. If reinforced and electrified, they can be an effective protection, provided that livestock guarding dogs are also used; but adaptations of such enclosures, ranging from one hundred to five hundred hectares in size and divided in five to ten paddocks, could be very expensive



A Prealp pasture on autumn season.
Photo: Benedicte Beylier/CERPAM.

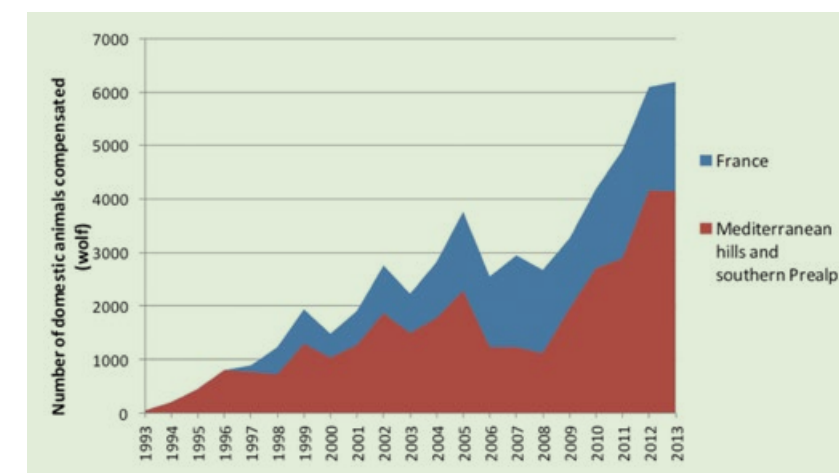


Fig. 1. Wolf damage on livestock in France and the Mediterranean hills and Southern Prealps.
Data: DREAL Rhône-Alpes.

(more than 100,000 € per farm) (Gaborit, 2012). Furthermore, Natural Parks and hunters are reluctant to accept this type of equipment because they create a barrier to wildlife movements.

In the second system, the winter period in the barn is very limited or inexistent. Sheep are herded in highly extensive systems (about one animal per hectare), since grazing areas have low vegetation productivity (usually wooded or shrubby). Lambing occurs in late winter or early spring. The number of ewes per flock reaches 500 to 1,000 or more. During all the grazing season, the number of head (ewe and lamb) can double. In such conditions herd protection is quite difficult and wolf damages are high. We should bear in mind that this farming practise was developed in a period without wolf presence, being well adapted to the breed of sheep and climate, and very interesting economically. The range provides 80% of the flocks' feed (Fig. 2).

The most commonly used breed is a local sheep subject to conservation measures, the Mourreros. To take into account their nutritional needs, linked to lactation and growth, the sheep are widely spread on pastures, so each animal can feed well (Favier, 2014). In fact, it is also a very interesting agro-ecological system to preserve landscape, vegetation and the local sheep breed. Unfortunately, in such a system, vulnerability to wolves is very high. It is harder to protect a flock in typical Mediterranean landscape, wooded and shrubby, than on alpine pastures.

This system is mainly present in the South-East of the Provence-Alpes-Côte d'Azur region. In this area,

where about fifteen wolf packs are present (ONCFS, 2014), farmers have all implemented protection measures. The increase of wolf damages in this area strongly suggests that preventive measures become less and less effective because wolves seem to adapt to them. We are facing the disarray of farmers who suffer repeated attacks and do not know what else to do. Their conviction that sheep farming is doomed has become widespread; this idea seems widely shared by the institutions responsible for wolf conservation: for example, the government proposed granting aids to facilitate the termination of sheep farming in significant wolf predation areas, during the meeting of the 'Groupe National Loup' in Paris in January 10th, 2014, provoking a strong reaction from farmers associations.

Mountain sheep farming

In higher mountain valleys, sheep farming is much less vulnerable to wolves because of the shorter period of exposure of the flock and less vulnerable grazing areas. Since the winter season lasts from five to six months (which is otherwise a major economic constraint due to the cost of fodder) the flock is kept safely indoors. In summer, sheep are gathered in large flocks, allowing the use of the same methods of protection used in the large transhumant flocks during four months (Fig. 3). Nevertheless, in some summer pastures, where small flocks graze freely, sheep are extremely vulnerable. Apart from summer pastures and the period in the barn, sheep remain in more vulnerable areas during



A batch of ewes and lambs on autumn season in Mercantour.
Photo: Laurent Garde/CERPAM.

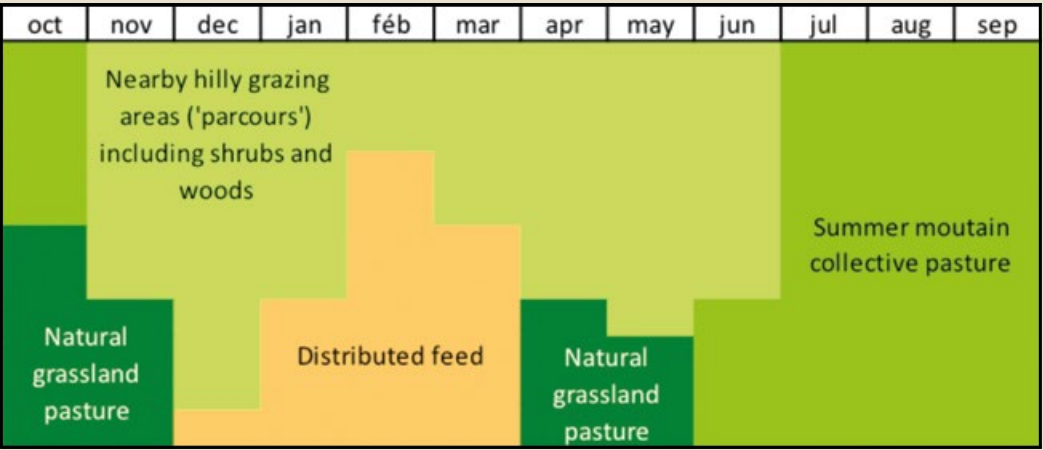
two to three months, i.e. in spring on hillsides and in autumn on meadow regrowth, after hay harvesting, down in the valley. Flocks are usually managed with mobile electric fences. Attacks may occur but are occasional events, not a permanent structural constraint. Due to the length of winter, flocks contain fewer animals (200 to 500 ewes). Lambing traditionally takes place in spring but tends to spread over a larger period to meet the demands of the consumers and of the "red label" (a national quality seal). But this trend, aiming to make lamb production more profitable (better price market), can be challenged by the need to protect at the same time batches of sheep and lambs down in the valley and in the mountain pasture.

The arrival of wolves in some other regions of France

Wolves, first confined to the Alps, are now beginning to affect animal husbandry in many other mountainous and lowlands regions, in the Northeast, Central and Southwest of France. Shepherding as described above is typical to the Alps range, although it can be found in some sites in the Cevennes and the Pyrenees. Therefore flock protection in newly wolf recolonized areas outside the Alps is a huge challenge for sheep production, considering that improving the effectiveness of existing enclosures could be very costly (see above).

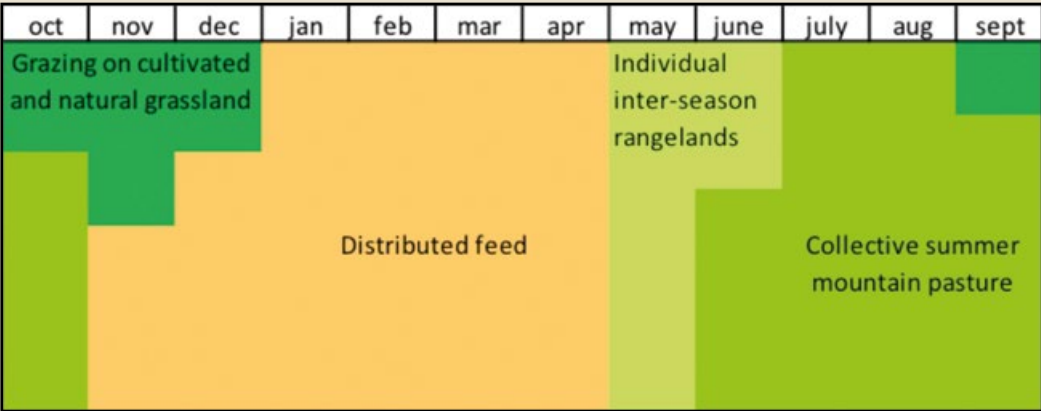
The Massif Central region is a very good example of the impact of the arrival of wolves. There are nearly two and a half million ewes in this area, i.e. three times more than in the Alps or the Pyrenees. Flocks are usually managed individually all year round. During the whole grazing period, roughly from April to November, meat sheep farmers divided their flock (few hundred ewes), to ensure at least two lambing seasons. Preventive measures have therefore to be multiplied to be able to protect all batches. Every farmer would have to be provided with a sufficient number of dogs in order to simultaneously protect several batches of grazing animals, which, with two dogs per batch, means a large number of dogs. Moreover, fences have to be reinforced and electrified: to associate dogs and effective fences is the only way to protect these systems, if human presence is not possible (Garde et al., 2012; Ministère de l'Agriculture, 2014); such a solution would not be welcomed by the

Fig. 2. Example of a feeding system for a transhumant flock of sheep in the southern Prealps with collective summer pasture (based on typical Breeding Network types, adapted) (Garde et al., 2014).



500 ewes - 575 ha AAU (20 ha natural and cultivated grassland, 550 ha rangeland + collective mountain pasture) - Pastoral index = 80% - Stocking rate = 0.13 LU/ha (excluding mountain pasture)

Fig. 3. Example of a feeding system for a mountain sheep farming with collective summer pastures (based on typical Breeding Network types, adapted) (Garde et al., 2014).



360 ewes - 82 ha AAU (25 ha natural and cultivated grassland, 7 ha cultivated cereals, 50 ha rangeland + collective summer mountain pasture) - Pastoral index = 50% - Stocking rate = 0.65 UGB/ha (excluding mountain pasture)

funding institutions, due to the high cost of securing grazing parks, or by the entities in charge of the management of the land, because it would imply a lot of partitioning. Additionally, the mosaic landscapes of the Massif Central, a patchwork of meadows, moors and woods, often used for grazing, favour wolves' approach and increases the vulnerability of flocks.

Dairy farming is a different case. Nearly one million dairy sheep are present in the Roquefort cheese production area. These flocks are much less vulnerable since they are managed in one group and return to the farm in the evening for milking. They are currently kept in grazing parks, but the animals could be managed by a shepherd, hired for the eight months of grazing – which would be a prohibitive expense for farms, typically two-person operations, or very costly in terms of public subsidies. There are in total 2,244 dairy sheep farms in this area; if wolf packs settle, protection policies should aim at a full coverage of the territory as opposed to targeting a limited number of farms serving as showcases. Furthermore, some necessary practices would have to be discontinued: for example night grazing after the milking, during hot-

ter periods, would no longer be an option. But an important aspect should not be forgotten: although flocks that are brought back in the evening for milking and managed as a single batch can certainly be protected more easily, dairy livestock – sheep and goats alike – are much more sensitive to attacks than meat-producing flocks: firstly, the individual value of an animal is higher, and secondly once the animals have suffered from stress, milk production is likely to be affected, which means a heavy loss for the dairy farmer. In other words, the risk of having an attack is lower, but the economic consequences of an attack are more severe (Bernon, 2008; Gaborit, 2012).

In the mountains of north-eastern France – Jura, Vosges – farms operate in a very similar way, but sheep farmers are much less numerous. One of the issues raised in the Vosges is the large number of tourists using the hiking trails going through enclosed parks. Leaving in these parks unattended guarding dogs with no human supervision involves unacceptable risks, and modifying the layout of fenced pastures or of trails would represent a considerable amount of work, an option that local authorities are not prepared to accept (Candau, 2012). And finally, the arrival of wolves in the plains of Lorraine and Champagne, where sheep farming is associated with cereal production, raises new questions. Studies must be conducted to identify specific risks and consider flock protection options.

Efforts towards a better income or a higher value

In all regions of France, a certain number of farmers try to be less dependent on public subsidies (which can reach 50% of the total income) and strive to obtain a higher income, either by taking to a complementary activity or by increasing the return on their products. Some farmers turn to diversification (multi-activity model): chestnut and berries production, production of animals other than sheep (e.g. cattle, poultry, or accommodation for tourists). In all cases, diversification means decreasing the number of sheep (usually 100 to 300 sheep) and it means also that less time is available for taking care of the sheep. Surveys show that these farms are very sensitive to the extra work that is necessary to protect the flock (Bonin, 2007). In case of repeated attacks, farmers might switch completely to the complementary activity. Some of them already abandoned sheep production after repeated wolf attacks.



Sheep grazing on a wooded pasture with guard dogs.
Photo: Mario Massucci.

Sheep farming in the context of small multi-activity units seems to be the most vulnerable to wolf attacks, due to the lack of flexibility in the use of labour and the fact that the option to switch to the other activities is present.

In a similar way, for those farmers who are striving to get a better value for their products through on-site processing, direct retail sale and short marketing channels, the consequences of the arrival of wolves are also heavy. On-site processing, just as on-site retail sale, causes a considerable amount of extra work. As a consequence, farmers keep fewer sheep – usually 200 to 400 ewes in a farm specialized in meat production using short marketing channels. In order to ensure lamb production over a longer period and for cash flow management reasons, there are more batches, with a small number of animals per batch. A survey conducted on a highly-performance farm using short marketing channels (selling directly to butchers) showed that it operated with 10 batches grazing at the same time, each with less than 50 animals. To protect this livestock, the farmer would need ten to twenty dogs, and would have either to employ 10 shepherds for six months or to equip the entire grazing area with secured enclo-

tures. The option of having a simplified animal husbandry system (i.e. with a reduced number of batches) has been studied; it would result in a loss of income of 12,000 € for the farmer and he would, in addition, feel demotivated, which means that this production would be abandoned (Aguer and Garde, 2011). These specialized systems do not have the necessary margins to be able to organize a form of shepherding or face the extra work entailed by the protection of the flock. They have no alternative and, should wolf attacks happen regularly, would probably be unable to go on with their economic activity. The protection is easier for dairy sheep farming using on-site processing and direct retail sale, with flocks of 100 to 250 animals managed in a single group, making the use of shepherds easier.

The farmers' concerns about the wolf situation

In France, we now have twenty years of experience of small ruminant farming in the presence of wolves. The results are diverse, but the conclusions of the animal husbandry technical services reflect the pessimistic views of sheep farmers. All, farmers and technical ser-



A protection fence on a wooded pasture.
Photo: Mario Massucci.

vices alike, have done their best, implementing the protection measures suggested and striving to improve them. It can be concluded that these means are reasonably effective in the case of larger flocks which are managed and grouped together under the supervision of a shepherd in summer pastures (alpages) and in more easily manageable landscape and vegetation patterns. Flock protection may also be attempted on the larger flocks among shepherded flocks kept on well-cleared grassland areas, used for milk ewes or suckling lambs. Finally, flocks grazing in summer pastures, which are indoors during a long winter period, and grouped in collective flocks for only about four months in summer, could also, it seems, be protected for the short duration of the offseason at spring and fall.

But in all other situations, where you have small flocks, batching, wooded or shrubby grazing land, grazing lambs, attempts to get more value from the products, a multi-activity economic model, or animals grazing freely in the mountain, the sheep farming community feels there is no solution. And it should be kept in mind that these situations represent

the vast majority of sheep farming areas where wolves are present or arriving. Either attempt to protect the flocks are failures, in situations where wolves have been already settled for a while, or the prospect of seeing the arrival of wolves is seen as creating hopeless problems. Twenty years after their first experience of wolves, farmers are both discouraged and farther from accepting wolves than they ever were. All of them, whether they belong to major trade unions or to alternatives ones, whether they have turned to short marketing channels or to organic production, increasingly fear for the survival of their activity in the event of a permanent settling of wolf packs on their grazing territory. Given this situation, technical services are helpless. Apart from giving technical advice for the introduction of livestock guarding dogs or providing special equipment to improve protection, they cannot offer a real solution to the problem: how wolf-induced constraints can be dealt with in an existing economic model that is in its present form fully integrates commercial, human and environmental factors.

A shrubby Mediterranean *parcours*.
Photo: Sabine Debit/CERPAM.

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