European Commission

"Support to the European Commission's policy on large carnivores under the Habitats Directive – Phase two"
Service contract no. **07.0307/2013/654446/SER/B.3**

EXPLORING TRADITIONAL HUSBANDRY METHODS TO REDUCE WOLF PREDATION ON FREE-RANGING CATTLE IN PORTUGAL AND SPAIN

FINAL REPORT

December, 2014

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EXECUTIVE SUMMARY






In Iberian Peninsula, the economic impact of wolf damages on cattle is high and is becoming more relevant in recent times since cattle numbers are getting proportionally higher among livestock species. In this scope, the Iberian pilot action ""Exploring traditional husbandry methods to reduce wolf predation on free-ranging cattle in Portugal and Spain" is focused on assessing cattle husbandry practices that are compatible with the wolf's presence. This project involved researchers and cattle producers from Spain and Portugal working together to examine how traditional husbandry practices can be restored or adapted to a modern context to better protect cattle in wolf areas. The Pilot action was focused in two mountainous regions in northern Iberian Peninsula, located in the Peneda-Gerês National Park (Portugal) and Cantabrian Mountains (Spain) which are a clear example of areas with cattle-wolf conflicts. In both regions, high wolf densities occur in a human-dominated landscape where livestock husbandry, and especially cattle production, is an important economic activity. The work developed in this project covered four different tasks:

- Identify and characterize the conflict by conducting a review on wolf damages to cattle and on husbandry and protection methods.
- Field evaluation of cattle depredation and husbandry methods by conducting local interviews to cattle breeders
- Workshops for knowledge and experience transfer,
- To identify the best practices for damage prevention.

. Based on the results from a total of 60 interviewed cattle breeders in both study areas of Portugal and Spain and three participatory worshops, several main conclusions can be drawn:

- Cattle breeders, in average, run exploitations with less than 100 individuals of mostly beef cattle;
- High regional variability in husbandry practices, effort in damage prevention methods and incidence of wolf predation;
- Most cattle is under free-ranging grazing in communal land, especially during summer, although a limited number of breeders apply damage prevention measures and a regular vigilance effort;
- In general, subsidies are an important share of the economic income of the cattle breeders in mountain areas.
- The level of wolf predation on cattle (i.e. nº of wolf attacks) is related to the abundance of wild prey and procedures adopted in cattle husbandry (free-ranging vs attended cattle management; age of calves in mountain pastures; number of cattle per breeder; distance of grazing areas from villages).
- Cattle breeders recognized that currently there are a higher number of cattle in free-ranging grazing with no vigilance, including during winter, compared to several decades ago where cattle, especially calves, were subject of a higher effort for vigilance as cattle were attended during the day and confined during the night.

Several constraints related to cattle husbandry and wolf predation were identified, such as

- social, economic and political issues that lead to a huge conflict mostly in areas with recent wolf recolonization;
- most cattle breeders have their animal's free-ranging and with no vigilance during summer or all year around (as in Peneda-Gerês, Portugal).
- cattle breeders often lack information on the best procedures to assure damage prevention and have misperceptions on the effectiveness of these measures, especially in what concerns the use of livestock guarding dogs.
- breeders, in general, are not willing to improve their procedures or effort to actively prevent wolf attacks, unless they have technical and/or financial aids.

To minimize cattle-wolf conflict there is the need for a strategic dialogue between stakeholders aiming to promote ways and means to minimize, and wherever possible, to find solutions to conflicts arising between cattle breeding and the wolf presence. A general solution to minimize cattle-wolf conflict at a medium term is the recovery of wild ungulate populations, both in abundance and species richness, to act as an alternative food resource to livestock. However, the main short-term solution to minimize cattle-wolf conflict is to apply adequate procedures to prevent wolf damage on cattle, which should be mandatory to benefit from compensation for wolf damages and from EU aids for livestock production in wolf range. Best practices for wolf damage prevention on cattle should involve adequate vigilance and confinement, correct herd management and the use of several methods for cattle protection, such as:

- Promote attended grazing of cattle with the presence of shepherds or livestock guarding dogs (LGD) and prevent free-ranging grazing during the winter
- Promote nocturnal confinement of cattle in structures that efficiently prevent access to wolves (e.g. barns, fences), and with the presence of LGD
- Assure an efficient vigilance and protection of cattle more vulnerable to wolf predation, such as debilitated animals, pregnant cows and calves.
- Promote confinement of calves with less than 3 months old in structures that efficiently prevent access to wolves (e.g. barns, fences), and with the presence of LGD
- Use of Livestock guarding dogs well educated and kept always with the cattle since up to 2 months old, in order to assure strong social bonding with cattle
- Evaluate and promote the use of other alternative methods for cattle protection such as aversive (e.g. electronic shock collars or sound activated collars) and disruptive (e.g. lights, sounds or pyrotechnics) stimulus applications to prevent wolf predation.

This project was successful in bringing together several stakeholders to identify procedures for a common goal: achieving a sustainable coexistence between wolves and the livestock industry.

1. WHY THIS PROJECT? THE WOLF-CATTLE CONFLICT IN IBERIAN PENINSULA

1.1. GOALS AND SCOPE OF THE IBERIAN PILOT ACTION

In 2013 the European Commission financed a set of four pilot actions that were intended to address areas of conflict between large carnivores and people and to promote interactions between stakeholders. One of these pilot actions is the the project "Exploring traditional husbandry methods to reduce wolf predation on free-ranging cattle in Portugal and Spain", started in October 2013 and with one year duration, aimed to address the conflict that arises from wolf damages on cattle in the Iberian Peninsula. This pilot action on Large Carnivores at the population level was developed within the project entitled "Support to the European Commission's policy on large carnivores under the Habitats Directive- phase 2" (contract nr. 07.0307/2013/654446/SER/B.3), financed by European Commission and executed by "Istituto di Ecologia Applicata" with the support of "Large Carnivore Initiative for Europe (IUCN/SSC LCIE)".

The Iberian pilot action is focused on assessing traditional cattle husbandry practices that are compatible with the wolf's presence. **This project involves researchers and cattle producers from Spain and Portugal working together to examine how traditional husbandry practices can be restored or adapted to a modern context to better protect cattle in wolf areas**. With this approach, we intend to bring together several stakeholders and maximize efforts for a common goal: achieving a sustainable coexistence between wolves and the livestock industry, by exploring traditional knowledge and practices.

The Pilot action was focused in two mountainous regions in northern Iberian Peninsula, located in the Peneda-Gerês National Park (Portugal) and in the Cantabrian Mountains (Spain), which are a clear example of areas with cattle-wolf conflicts. In both regions, high wolf densities occur in a human-dominated landscape where livestock husbandry, and especially cattle production, is an important economic activity. The work developed in this project covered four different tasks:

- **Identify and characterize the conflict by conducting a review on wolf damages to cattle and on husbandry and protection methods**. We aim to characterize this conflict in both a socio-economic (e.g. economic and social impact, compensation values) and ecological perspective (e.g. kill rates, wolf-prey relationships), and whenever available, to analyse the data at both national (Portugal/Spain) and regional levels (pilot areas);
- **Field evaluation of cattle depredation and husbandry methods by conducting local interviews to cattle breeders** to characterize the intensity of wolf depredation on cattle, according to socio-economic parameters and to the use of damage prevention methods.
- **Workshops for knowledge and experience transfer**, namely a national workshop per country and one international workshop to involve and inform stakeholders and achieve a guided discussion between all participants on the problems related to wolf-cattle conflict and the best practical solutions.
- **To identify the best practices for damage prevention in order to produce documents directed to different audiences**: a guide of best practice management, addressed to local and national managers; and a manual for best practice implementation, addressed to livestock producers and focusing on technical details of damage prevention and mitigation measures that are known to be efficient.

The Iberian Pilot action was conducted in collaboration with NGOs and national/regional administrations from Portugal and Spain, promoting the involvement of other current projects aiming to address similar topics in the Iberian Peninsula. The team members involved in this project were:

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1.2. THE WOLF-CATTLE CONFLICT IN PERSPECTIVE

The degree of conflict arising from wolf damages to domestic animals is mostly ruled by human-related factors, such as the economic impact of wolf attacks, the socio-cultural background of livestock owners and the efficiency (or lack of it) of practices used to prevent wolf damages. Management and conservation implications of these issues are particularly relevant when wolves occur in human-dominated landscapes, such as the Iberian Peninsula, and in settings where wolf depredation affects livestock species with high socio-economic value, such as cattle.

The coexistence between wolves and livestock breeders is a modern concept. Until recent decades no one had raised the need for this coexistence, since the aim of farmers -supported by the rest of society- was to eradicate wolves. Many European countries managed to eliminate their wolf populations in the XXth century, and other countries -such as Spain and Portugal- were about to do it. But finally, after the 70s or the 80s of the twentieth century, European societies decided to conserve their wolves, and a partial or total protection was issued. Since then, wolves have increased and the conflict has grown for several reasons. By one hand, the increasing number of wolves causes more damage to the livestock. On the other hand, the livestock husbandry practices had changed considerably with a decrease in the effort for vigilance and damage prevention. In addition, there are tensions between the sector of the society that wants to conserve wolves and the sector that wants to reduce wolf numbers or to eradicate them. Before the wolf protection, in the 70s or the 80s, there was an economic conflict, but not a social conflict. Wolves caused economic losses to farmers, but the society unanimously decided how to address the problem: killing all the wolves. There was an agreement among farmers, hunters, governments and the rest of the society. The environmentalists did not exist yet, and there were just a few scientists ahead of their time proposing modest conservation measures, intended just to prevent the total extermination of wolves. There were no compensations or subsidies to livestock, but the government paid bounties to encourage the extermination of wolves by means of hunting, trapping and poisoning. All the society worked in the same direction: against wolves and for livestock. In addition, the livestock was very well protected because the labor force was very high (children worked from an early age), each breeder owned just a few heads of livestock and they were too valuable to be left unprotected.

Today, things have changed. A sector of society protects the wolf, which has recovered causing more damages, especially in the areas of recolonization. In addition, there is now a conflict between pro-wolf and anti-wolf sectors, which sometimes is very visible in the media. The Administration, instead of spending money on poison and bounties for killing wolves, spends it on subsidies to livestock and compensation for damages. These subsidies, the lower market price of the meat and the milk (partly caused by the subsidies themselves), the higher valuation of leisure time and the increasing number of heads of livestock owned by each breeder have promote a decrease in livestock protection by breeders, and an increase of the damages caused by wolves. The preventive measures can reduce the wolf conflict. If we manage to reduce wolf damages, the animosity of the breeders and the money spent by the Administration will also reduce, so the wolf conservation will be easier. This can be particularly relevant in areas where wolves become extinct for decades and are now naturally recolonizing.

This project aims to address this topic at a population level in the Northwestern Iberian wolf population, which is shared by Portugal and Spain, by focusing in two project areas with extensive cattle-wolf conflicts: the National Park of Peneda-Gerês, in the north of Portugal, and the Cantabrian Mountains, in northwestern Spain.


STOP
LOBO

1.3. TRADITIONAL AND CURRENT HUSBANDRY METHODS

The main husbandry methods for extensive grazing of cattle used in Iberian Peninsula can be classified in three main types:

i) Confined grazing: Cattle are left unattended and usually confined by stone-made walls or fences in high-productive areas such as meadows along river valleys and fields near villages. This practice is more frequent in mountain areas and used mostly during winter.

ii) Attended grazing: Cattle are attended by shepherds and/or Livestock Guarding dogs. This practice is conducted mostly in high-productive areas in the proximity of villages only during the day or in mountain pastures during summer, where traditionally shepherds attended cattle by employing different regional types of shelters for livestock confinement and protection during the night. In these areas, simple stone corrals with adjacent stone huts were commonly used as nocturnal shelters for cattle and shepherds in order to ensure a more efficient protection and surveillance of cattle herds and calves towards wolf predation, during seasonal grazing in the summer.

iii) Free-ranging grazing: Cattle are left unattended with irregular or no vigilance at all, during summer or even all year-round including winter. This is a current practice across Iberian Peninsula and in the mountain areas of North Iberia reflects the fact that cattle breeders have been investing less time and effort to efficiently and actively protect their livestock from wolf attacks.

Traditional husbandry practices in North Iberia.

Some 50 or 60 years ago, most of the families of the villages had some livestock, but far fewer numbers than the livestock owned by producers nowadays. Since the herds of every family were very small, they were gathered and taken to the communal pastures usually guarded by one or two shepherds from the village, who worked in rotation. The number of days that the villagers worked out shepherding the flocks was proportional to the heads of livestock they owned.
Calves did not leave the village until they were around 6 months old, and they always spent the night in the village. The adult cows, whenever they were not used for work were taken out in confined grazing near villages, normally during late afternoon and early morning, and returned to spend the night in the village.

Cows without calves and heifers grazed in mountain meadows during summer and spent the night there. They were watched by one or two shepherds (working in shifts), who slept near cattle in stone-made shelters. Usually, they did not use LG dogs (which were reserved for sheep and goats), and they were rarely attacked by wolves. The calves and other livestock (e.g. sheep and goats) more vulnerable to wolf predation, spent the night locked in the villages.
There are differences in the number of heads of livestock owned by the breeders. Nowadays, since there are fewer people living in the villages and due to economic aids to cattle production, each producer in average have much more cattle, accounts for more space for cattle grazing in the summer communal pastures and also, own more meadows which provide hay enough to feed a higher number of livestock units in winter. In the past, the ratio people/ heads of livestock was far much higher, the labor force was very abundant and the value of every head of livestock was very

high for their economic income. Thus, the vulnerable livestock was never left unprotected to avoid wolf attacks or robbery.
In the past wolves and bears were heavily persecuted and wild ungulates were very scarce. In addition, the people living in the mountain villages used to have a subsistence economy. Poverty and the lack of perspectives forced most of them to migrate to the cities.


Current husbandry practices in North Iberia

In the mountainous areas of North Iberian Peninsula and in particular the two main study areas of this project, the general cattle husbandry methods are similar. However, there are regional differences in the effort applied in vigilance and confinement, especially during winter.
Both in the Cantabrian Mountains and Peneda-Gerês region, the producers usually breed beef cattle under extensive grazing. The dairy cattle are uncommon except in Covadonga area (N Spain), where a few dairy cows are milked by the producers in summer for cheese production.
In the Cantabrian Mountains, cattle are normally confined to stables or barns during winter, and they are fed with hay, whereas in Peneda-Gerês most breeders leave cattle unattended in free-ranging grazing during the day all year around, including in winter.
In late autumn and early spring in Cantabrian Mountains, and also in winter in Peneda-Gerês (depending on the weather and of the grass availability) the cattle spend several hours grazing out in the meadows close to the villages. During these periods of the year, cattle are usually locked in the stables to spend the night. In the Cantabrian Mountains, cattle breeders control reproduction so most births occur in these months. From May to October, cattle are taken to the mountain pastures far from the villages (sometimes up to 10-15 km). In this season, cattle are not guarded by shepherds and in most cases they are not protected by livestock guarding dogs. A few births occur in this season, and the calves are left in the mountain pastures with their mothers. In general, breeders visit the cattle in the mountain once or twice a week, but some breeders do it every day.


1.4. WOLF DAMAGES TO CATTLE

Extensive grazing of cattle makes it vulnerable to wolf predation. The occurrence of cattle as a food item in wolf diet varies across Iberian Peninsula, depending on the husbandry practices and prey availability. In areas with high availability of wild ungulates, wolves rely mostly on wild prey which comprises more than 60% of wolf diet. However, in many regions as most of the wolf range in Portugal, livestock is the main source of food for wolves, with cattle comprising up to 30% of wolf diet (Figure 1). Thus, the incidence of cattle in wolf diet seems to depend on wild prey availability and cattle vulnerability giving the husbandry practices employed by breeders.

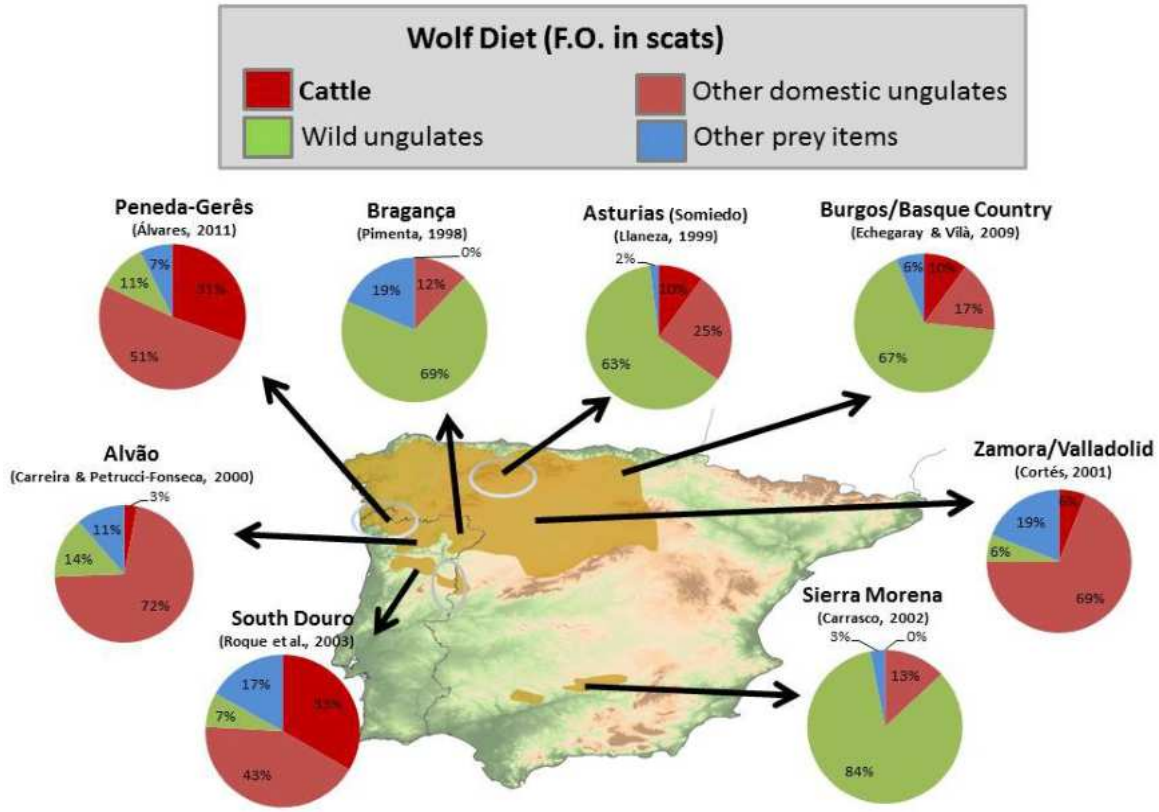


Figure 1 - Geographic variation of wolf diet in the Iberian Peninsula, emphasising the relative importance of cattle (wolf range represented in orange)

The incidence of cattle in wolf diet is not always reflected in wolf damages, suggesting that cattle consumption results not only from wolf predation but also from scavenging (e.g. South Douro area in Portugal). Thus, wolf predation on cattle in the Iberian Peninsula is rather localized, where one of the highest proportions of cattle in both wolf damages on livestock and compensation value occurs in Peneda-Gerês (Portugal) and in Cantabrian mountains (Spain) (Figure 2). In these two mountainous regions in northern Iberian Peninsula, cattle constitute a significant share of wolf kills and, particularly, of compensation values due to their greater economic importance in comparison with other livestock species (Figure 2).

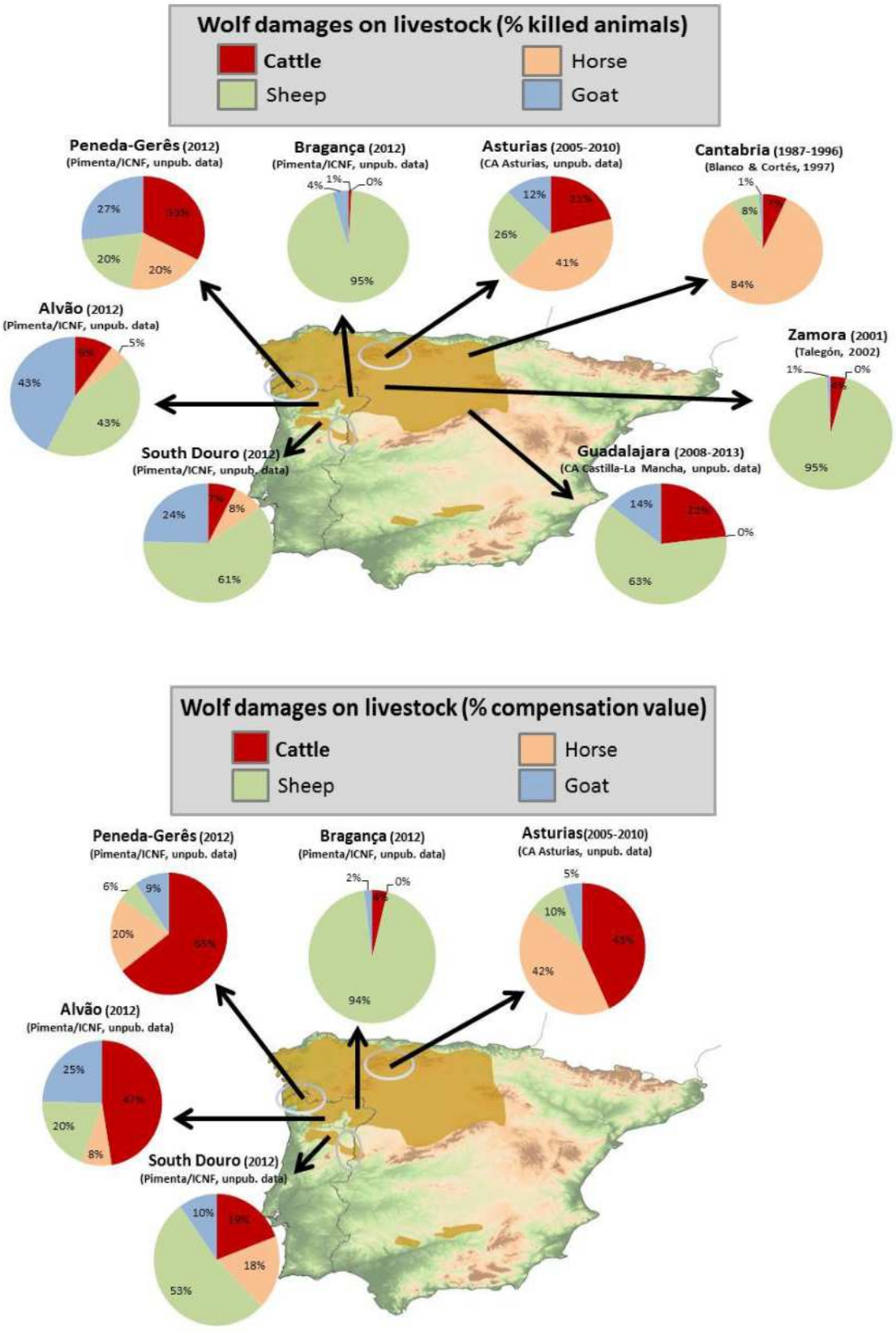


Figure 2 - Geographic variation of wolf damages to livestock and damage compensation value in the Iberian Peninsula, emphasising the relative importance of cattle (wolf range represented in orange)

Besides husbandry practices, cattle behaviour and ecology also play a role in the vulnerability to wolf predation. In spite of artificial selection, cattle from autochthonous breeds are likely well adapted to the ecological conditions of their grazing areas – including natural predators like wolves – and several studies have suggested that wolf predation risk is influenced by cattle spatial and social ecology, such as habitat use, group size, herd composition and anti-predator behaviour (Meriggi & Pagnin, 1994; Rio-Maior *et al*., 2005; Laporte *et al.,* 2010).

The cattle-wolf conflict is also becoming more relevant in recent times. In fact, the share of cattle in wolf damages is showing an increasing trend during the last decades since cattle numbers are getting proportionally higher among livestock species. For example, in Peneda-Gerês the share of cattle in wolf damages on livestock increased from 14% to 33% between late 1990´s and 2012, respectively (Figure 3). As a consequence, the total economic amount for damage compensation is increasing over the last years, since the average compensation value for a cattle's head is more than 7 times fold than the value for a goat or sheep.

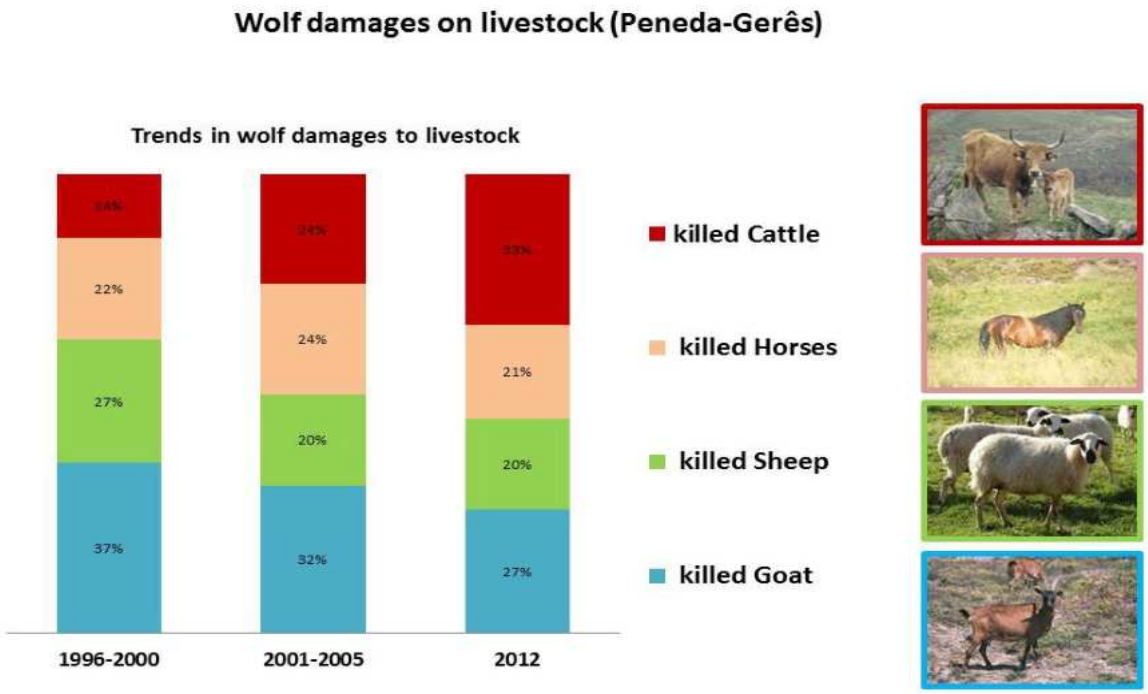


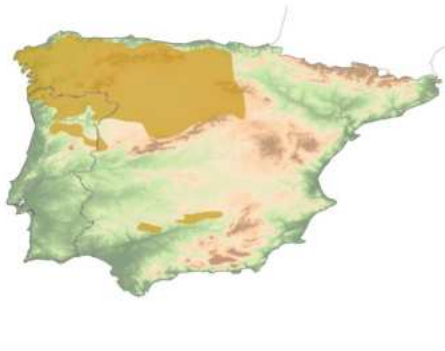
Figure 3 – Trends in the relative importance of each livestock species in wolf damages in Peneda-Gerês (source: Álvares, 2011; V. Pimenta/ICNF, unpub.data).

The economic impact of wolf damages on cattle is high. As an example, in Portugal with a wolf population estimated in approximately 300 individuals, a total of 368,000 euros were paid in 2012 as compensation for cattle killed by wolves. However, in spite of the huge conflict generated by wolf predation on cattle, the social magnitude of wolf damages to cattle is often low since just a few cattle breeders are chronically affected by predation. These evidences underline the need for a participatory approach to recommend best methods and procedures to prevent wolf damages to cattle and promote experience transfer between cattle herders regarding best practices.

2. ASSESSING WOLF-CATTLE CONFLICT AT A LOCAL SCALE IN TWO IBERIAN AREAS

2.1. CHARACTERIZATION OF STUDY AREAS

This project was focused in two mountainous regions in northern Iberian Peninsula, located in the Peneda-Gerês National Park (Portugal) and in Cantabrian Mountains (Spain). In both regions, high wolf densities of up to 6 individuals/100km^2 occur in a human-dominated landscape where livestock husbandry, and especially cattle production, is an important economic activity. As a consequence, wolf damages on livestock are frequent and although damages are compensated, there are high levels of conflict resulting in intense wolf persecution, both legal (only in Spain) and illegal.


The human population is scarce and concentrated in small villages. Most of the cattle breeders run small exploitations, where the main activity and source of income is related to livestock. In general, the farmers have 40-50 years old, are born in the area where they work and have inherited the business from their parents. Their education level is low or medium. They live in areas with high rural exodus, and where livestock industry has been decreasing in the last decades. In recent years, many farmers have shifted from sheep to cattle, which require less dedication. The current exploitations are larger than in the past due to recent economic aids for livestock production and also because, thanks to the rural exodus, the current farmers can own larger meadows, allowing them to feed more cattle in winter. In general, cattle breeders owing few animals live with medium or low income, based on the subsidies for livestock production and a subsistence economy. However, breeders with a large number of cattle can benefit from a substantial income, mostly from subsidies.

In Portugal, the project was carried out in Peneda-Gerês National Park (Minho and Trás-os-Montes province). In Spain, the project was carried out in three contiguous areas of the eastern Cantabrian Mountains: The Regional Park of Los Picos de Europa in Riaño area (León province, Castilla y León autonomous region); the Natural Park of Redes (Asturias autonomous region); and the area of Los Lagos de Covadonga, in the northern side of Los Picos de Europa National Park (Asturias autonomous region). Table 1 summarizes the main traits in the study areas related to large carnivores and wild ungulates.

Table 1 – Species of large carnivores and wild ungulates with presence in the study areas.

	Portuguese study area (Peneda-Gerês)	Spanish study area (Cantabrian mountains)		
		Riaño	Redes	Covadonga
Large carnivores (abundance)	Wolf (high densities)	Wolf (high densities) Bear (moderate densities)	Wolf (high densities) Bear (low densities)	Wolf (high densities) Bear (absent)
Wild ungulates (abundance)	Wild boar Roe deer Spanish ibex (low densities)	Wild boar Roe deer Chamois Red deer Spanish ibex (very high densities)	Wild boar Roe deer Chamois Red deer (high densities)	Wild boar Roe deer Chamois (moderate densities)

2.2. FIELD EVALUATION OF CATTLE DEPREDATION AND HUSBANDRY METHODS

Field evaluation of cattle depredation and husbandry methods was conducted in both study areas by local interviews to cattle breeders to characterize socio-economic parameters, such as: i) traditional and current husbandry methods; ii) damage prevention measures applied; iii) intensity of wolf depredation and level of conflict with wolves, and iv) main source of economic profit from cattle production (subsidies/meet marketing).

Interviews followed a structured questionnaire, which was adapted from the one used in on-going projects in Portugal, namely LIFE MEDWolf project and an on-going project on wolf damage prevention conducted by ICNF in collaboration with an ongoing PhD thesis (V. Pimenta, CIBIO/InBio: SFRH/BD/75937/2011). In Peneda-Gêres (Portugal) data from questionnaires was analyzed in relation to the intensity of wolf predation according to known damage statistics for each interviewed breeder. The number of interviews in each study area and some socio-economic traits from interviewed breeders is in Table 2.

Table 2 - Socio-economic traits and husbandry practices of the interviewed breeders in each study area.

		Study area in Spain (Cantabrian Mountains)	**Study area in Portugal (Peneda-Gerês)**
Nº Interviewed breeders		30	31
Nº of covered villages		19	17
Nº animals / breeder	average (min.-max.)	98 (16-210)	76 (6-300)
Meat vs Milk production	milk production meat production	16% (n=5) 97.7% (n=29)	0% 100% (n=31)
Economic income from subsidies	% of total income value per cattle head	22% to 38% (≈240 to 300€/cow)	39% to 94% (≈290 to 380€/cow)
Husbandry practices	confined attended free-ranging	3% (n=1) 7% (n=2) 90% (n=27)	0% 3% (n=1) 97% (n=30)
Seasonality of free-ranging grazing	only in summer all year around	100% (n=30) 0%	3 % (n=1) 97 % (n=29)
Pastures ownership for extensive grazing	communal private	100% (n=30) 0 %	100% (n=31) 29% (n=9)

Damage prevention measures	use LG dogs	30% (n=8)	10% (n=3)
	confine during night	13.3% (n=4)	3% (n=1)
	confine calves (<3months old)	16.7% (n=5)	48% (n=15)

Based on the results from a total of 60 interviewed cattle breeders in both study areas of Portugal and Spain, **several main conclusions can be drawn:**

- Cattle breeders, in general, run exploitations with less than 100 individuals of mostly beef cattle;
- High regional variability in husbandry practices, effort in damage prevention methods and incidence of wolf predation;
- Most cattle is under free-ranging grazing in communal land, especially during summer (but also during winter in Peneda-Gerês), although a limited number of breeders apply damage prevention measures and a regular vigilance effort;
- The assessment of the main source of profit from livestock (subsidies vs meet marketing) was difficult to obtain with accurate figures because farmers are reluctant to provide information about their income. Subsides are very variable, and depend very much of the number of licences owned by each breeder (portioning cows, autochthonous breeds, etc.) In general, subsidies are an important share (more than 50%) of the economic income of the cattle breeders in mountain areas, especially in Portugal. As example, in Portugal a cattle breeder with 250 individuals can benefit a total income of about 100,000 €/year/breeder only from EU aids for cattle production. For comparison, the economic impact from wolf predation is a much smaller share of the income since the compensation value from wolf damages on cattle can only reach up to 8,000 €/year/breeder.
- The level of wolf predation on cattle (i.e. nº of wolf attacks) is related to the abundance of wild prey and procedures adopted in cattle husbandry (free-ranging vs attended cattle management; age of calves in mountain pastures; distance of grazing areas from villages; number of cattle per breeder).
- Cattle breeders recognized that currently there are a higher number of cattle in free-ranging grazing with no vigilance, including during winter, compared to several decades ago where cattle, especially calves, were subject of a higher effort for vigilance as cattle were always attended during the day and confined during the night.

Following, is presented a brief description of the main results from each study area related to husbandry procedures and level of wolf predation.

FIELD INTERVIEWS IN SPAIN (CANTABRIAN MOUNTAINS).

In Spain, 30 cattle breeders were interviewed in three different areas, separated less than 100 km, but very different in terms of cattle-wolf conflict: 20 breeders in Riaño area, 5 breeders in Redes and 5 breeders in Covadonga area.

Almost all the exploitations bred beef cattle, but some of them had in addition dairy cattle and just one breeder had only dairy cattle. Dairy cattle for milk production are bred mostly in Covadonga area, to produce cheese in summer. The cattle breeds were in general mixed and diverse. Five of the 30 interviewed breeders had an Asturian authoctonous breed (“casina” cows), which are more adapted to mountain habitats, receive higher rates of subsidies, but produce smaller calves. Based in the results from the questionnaires, the main cause of cattle mortality was the diseases of the small calves, followed by diseases in adult cows. In Redes area, the main cause of mortality was accidents of the cattle when they search for grass in very steep and rocky areas at the end of the summer, when the grass becomes scarce. Based on data obtained during interviews, the annual mortality rates of cattle by wolf depredation were very variable. In Riaño and Redes it was 0.68%,

i.e., 7 times fewer than the other mortality causes. But for the breeders of Covadonga, the wolves killed 3.34% of the cattle which spent the summer in the mountain pastures, i.e, five times the wolf-caused mortality in the two other areas.
Regarding damage prevention measures, during winter cows from all interviewed breeders are in stables or barns, so they are not accessible to wolves. In early spring and late autumn, they graze in the meadows near the village during the day and spend the night inside. There are not damages in these conditions. All the predation events occur in the summer pastures in the mountains. In the three areas of Cantabrian mountains, the breeders manage the cattle reproduction in order that most of the birth of calves occur in late winter or early spring; in this way, they are larger and less vulnerable to wolf predation when they area taken to the summer pastures. Nevertheless, when the cows give birth after May, when cattle are already grazing in the mountains, the calves remain in the mountain with the rest of the cattle. In Covadonga, the breeders did not take small calves to the mountain pastures, in order to avoid the attacks of wolves. In fact, they sell the calves when they are less than one month old, before moving to the mountain pastures, to avoid the risk of wolf depredation although in this way they make less money from selling calves. In addition, in this area breeders spend the summer in mountain huts with the cattle, not as a procedure to prevent wolf predation but mainly to be able to regularly milk cows from cheese production.

Livestock Guarding dogs were used by 30% (N=8) of the breeders, all located in Riaño and with beef cattle. According to interviewers Dogs were not used in Redes because of the remoteness of the summer pastures. The data collected during field interviews suggest that livestock guarding dogs can be effective to prevent wolf predation on cattle in the summer pastures in the mountains. In fact, eight of the 19 extensive beef cattle breeders interviewed in Riaño area used mastiff dogs for livestock protection and had less wolf damages compared with the 11 breeders that did not use dogs (Table 3).

Table 3: Number and percentage of interview cattle breeders from Riaño area with wolf damages in the previous 12 months, considering the use of Livestock guarding dogs (LGD).

Cattle breeders	With LGD	Without LGD
Without damages	6 (75%)	4 (36%)
With damages	2 (25%)	7 (64%)

Other damage prevention measure taken by a breeder in Riaño area is to put a rock salt in the field in order to bring the cows together when he notices that the wolves are harassing the cows. The breeder considers that when the cows are clumped together they defend better the calves against wolves.

The mortality on cattle caused by wolves in Covadonga was 5 times higher than in Riaño and Redes together. This seems not to be related with husbandry methods, since in Covadonga the breeders avoid to take the small calves to the mountains and the shepherds spend the summer with the cattle in mountains huts. Wolf densities are also similar in all areas, so the obvious difference between areas is the availability of wild prey, which is much lower in Covadonga than in the other two areas. The level of wolf predation on cattle seems to depend mostly on the availability of wild prey, which is the most obvious conclusion of our study in the Cantabrian Mountains.

In addition, in Riaño area, the shepherds who used mastiff dogs had clearly less damages than the herds with no dogs. Regarding other factors, the patterns of wolf caused mortality are very similar in the three areas. All the damages occurred in the summer pastures, which are about 5 km from the

villages; and all the cattle killed by wolves were calves <7 months old. Although we just have a few data, it seems that the smaller are the calves, the more vulnerable to wolf depredation.

Several problems and constraints related to cattle production were identified among interviewed breeders, which were very different depending on the area and were not always focused on wolf damages (Table 3). In general, the main constraints identified in the field interviews in the three areas in the Cantabrian Mountains, were:

- I n **Riaño area,** where wolves have been always present in an area with high wild prey density, the main problem perceived for cattle industry were livestock diseases (mainly tuberculosis and brucellosis), which produce high economic losses and is a threat for the cattle business. Many producers think that the increase of wild ungulates (red deer and wild boar) is the main cause of these diseases.
- In **Redes area,** where wolves also have been always present in an area with high wild prey density, the main problem was the invasion of pastures by the scrub. The farmers would like to burn the scrub to recover the meadows, but the regional administration does not allow it.
- In **Covadonga area**, the situation was very different since the wolf was perceived as the main problem to cattle industry. In addition, there are other minor problems, such as the invasion of the pastures by scrubs. But even this problem is indirectly caused by the wolves, according to the breeders, as they claim that the reduction of sheep and goats caused by the wolf depredation is responsible for the invasion of the scrub. In this area wild ungulates are scarce and the wolf was absent until the mid ninenties. Since then, they have been increasing and they are now considered by the farmers as a pest.

Thus, wolf predation is not perceived as a main problem, except in Covadonga area. This is because there are two main differences between Covadonga area and the two other Spanish areas. First, in Covadonga wolves appeared in recent years, so the husbandry methods are not fully adapted to the wolf presence. In addition, the red deer are absent and other wild ungulates are scarcer in Covadonga, and probably the wolves have to rely more on livestock. An example from Riaño area, where wild ungulates are very abundant, supports this assumption: one producer of Covadonga area takes 8 cows and 8 calves every summer to Lechada valley (Riaño area) and in spite that a pack of wolves breeds every summer there, and that the cows and calves are grazing unguarded day and night for more than three months (without shepherds, LGDs or any other preventive measure), they have not been attacked by the wolves during the 10 years they have been there. Nevertheles, the cattle that this producer takes to Covadonda area during summer suffer a lot of wolf damages. This suggests that the abundance of red deer and other wild ungulates is a key factor on the reduction of cattle depredation.

Table 3 – Main constraints related to cattle production perceived by breeders in Cantabrian Mountains, Spain (percentage of interviewed breeders that mentioned each constraint)

Riaño Area (n=20)	Livestock diseases (85%)
	Administrative restrictions for producers (25%)
	Rural exodus (25%)
	Wild ungulate overabundance (20%)
	Low price of meat and milk, and high price of fodder (15%)
	Conflicts among producers (15%)
	Shortage of pastures (5%)
	Wolves (5%)

Redes Area (n=5)	Pastures invaded by scrubs (80%) Low price of meat and milk, and high price of fodder (60%) Unfair competition with new farmers (40%) Livestock diseases (20%) Smallholdings (20%) Obsolete stables (20%) Few veterinarians (20%) **Wolves** (20%)
Covadonga Area (n=5)	**Wolves** (100%) Pastures invaded by scrub (100%) Overabundance of Wild boar (40%) Unfair competition with new farmers (20%)

FIELD INTERVIEWS IN PORTUGAL (PENEDA-GERÊS)

In Portugal, 31 cattle breeders were interviewed across Peneda-Gerês National Park. All exploitations bred beef cattle, mostly belonging to autochthonous breeds ("barrosã" and "cachena" cows), which are more adapted to mountain habitats, receive higher rates of subsidies but produce smaller calves. The majority of interviewed breeders (>90%) mentioned diseases as a minor cause for cattle mortality, comprising 1 or 2 animals/year and reaching up to 5% of owned animals in two of the interviewed breeders.

Almost all interviewed breeders have free-ranging cows, not only during summer but also during all year around, including winter. In fact, only in one case cattle was not in free-ranging grazing, but instead they were grouped in a communal herd and attended by a shepherd during the day. Until 2010, this communal herd was also attended by shepherds during the night that stayed in traditional mountain huts with the cattle for their vigilance against wolf predation as it was commonly used several decades ago, but since then the animals spent the night alone and confined in mountain meadows surrounded by stone-made walls. The damage prevention measure most commonly used (by almost half of interviewed breeders) was the confinement of new-borne calves up to 3 months old. The use of Livestock Guarding dogs with cattle was recorded only in 10% (n=3) of the interviewed breeders in Portugal, both in free-ranging grazing and inside enclosures.

Comparing official data of damage compensation for each interviewed breeder in the last five years (2009 to 2013), as the number of killed animals/year and compensation value/year, allowed us to assess accurately the effect of several husbandry practices in the risk of predation by wolves. Several procedures used in cattle husbandry practices seem to influence the level of wolf predation. This is the case of the number of animals owned by each breeder, which can reach up to 300 animals per breeder (Figure 4A). Breeders with less than 50 animals comprise 61% of visited farms and 10% of reported wolf attacks (considering the period between 2009 and 2013), while breeders with more than 100 animals comprise 22% of visited farms and 72% of reported wolf attacks. Also the distance of predated cattle from shelter, as an indicator of the range occupied by grazing cattle in communal areas and which is related with the number of owned animals, has a positive relation with the level of wolf damages suffered by each breeder (Figure 4B).

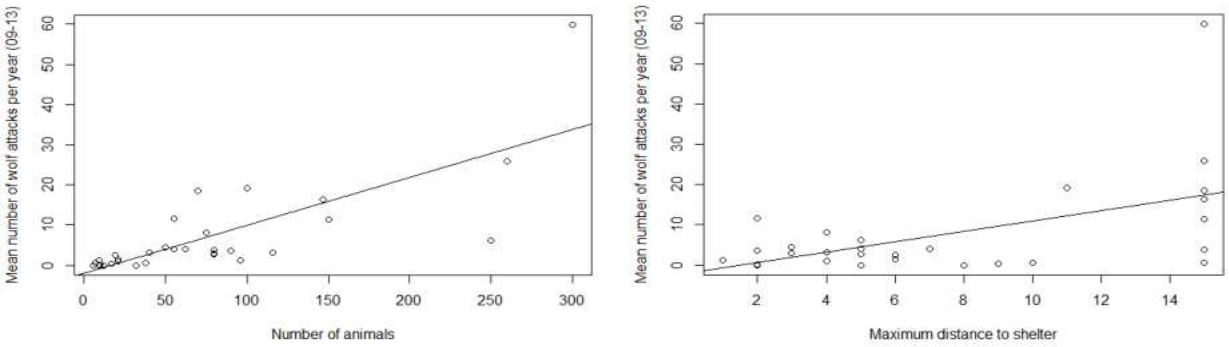


Figure 4 – Relation between average number of wolf attacks/year/breeder and both the number of animals/breeder (A) and the distance to shelter (B) in Peneda-Gerês (Portugal).

Several other husbandry procedures also show an evident effect in the level of wolf damages on cattle (Figure 5). In general, among interviewed breeders, the impact of wolf predation was much smaller in the following cattle husbandry procedures, which often are intrinsically related:

- nocturnal protection during winter and summer, by using barns or fenced areas
- presence of calves in mountain pastures only after the age of more than 3 months old
- grazing areas located less than 1-5 km from shelter (e.g. barns, fenced areas)
- use of private meadows for grazing rather than communal lands, located far from villages

Table 4 –Wolf damage impact (in terms of number wolf attacks/year/breeder and compensation value/year/breeder) according to procedures used in cattle husbandry by interviewed breeders.

		Average number of wolf attacks/ year/breeder between 2009-2013 (average = 7.1; n=31)	Average value of damage compensation/year/breeder between 2009-2013 (average = 3,284 €; n=31)
Nocturnal protection in winter	**None** (n=8)	**17.3**	**8,332 €**
	Barn/Fenced (n=23)	**3.5**	**1,528 €**
Diurnal protection in winter	**None** (n=26)	**8.3**	**3,843 €**
	Sheperd/Fence (n=5)	**0.8**	**377 €**
Nocturnal protection in summer	**None** (n=26)	**7.7**	**3,594 €**
	Barn/Fence (n=5)	**3.8**	**1,670 €**
Diurnal protection in summer	**None** (n=30)	**7.3**	**3,394 €**
	Sheperd (n=1)	**0**	**0 €**
Age of calves in mountain pastures	**< 3 months old** (n=15)	**11.0**	**5,316 €**
	> 3 months old (n=16)	**3.3**	**1,379 €**
Distance of summer grazing areas from shelter (range from 1 to 20 km)	**< 5000 m** (n=18)	**3.0**	**1,106 €**
	> 5000 m (n=13)	**12.7**	**6,300 €**
Distance of winter grazing areas from shelter (range from 1 to 15 km)	**< 1000 m** (n=12)	**2.1**	**758 €**
	1000-5000 m (n=15)	**8.4**	**4,006 €**
	> 5000 m (n=4)	**16.9**	**8,155 €**
Ownership of pastures	**Communal and private** (n=9)	**2.1**	**1,103 €**
	Communal (n=22)	**9.1**	**4,176 €**

2.3. WORKSHOPS FOR KNOWLEDGE AND EXPERIENCES TRANSFER

In the scope of this project, workshops for knowledge and experience transfer, namely a national workshop per country and one international workshop, were organized to involve and inform stakeholders and achieve a guided discussion between all participants on the problems related to wolf-cattle conflict and the best practical solutions. The main goal of these workshops was to improve dialogue between stakeholders and to promote experience transfer between cattle herders in order to gather knowledge on the cattle husbandry practices more compatible with the presence of wolf and most suitable for each region.

Following the field interviews to cattle breeders to collect information on husbandry methods and the level of conflict, the National workshops were organized in each study area and aimed for a participative discussion with local cattle breeders and other local stakeholders (local associations related to livestock production and wolf conservation, local administration institutions, wolf researchers) to identify problems and solutions related to cattle-wolf conflict. The Spanish workshop involved a set of communications related to damage prevention methods more suitable to prevent wolf predation on cattle, particularly the use of Livestock Guarding Dogs (Appendix A). The Portuguese workshop involved a participatory discussion where an independent moderator guided the discussion in working groups incorporating representatives of different stakeholders such as of cattle breeders, local associations and conservation technicians (Appendix B). The international workshop involved the participation of Spanish and Portuguese managers to share experiences on the use of damage prevention methods and achieve a guided discussion between all participants on the best practical solutions (Appendix C).

Both national workshops were considered to be usefull and productive by the participants, as it was evident in the results of the opinion survey conducted in the Portuguese Workshop (Appendix D). The workshops were also featured in media from Portugal and Spain, such as regional TV, radio and several newspapers (Appendix E).

Following, is presented a brief description of the procedures and results from each workshop, with more emphasis for the National workshop conducted in Portugal, where a participatory working session was organized with the aim to gathered the main concerns of cattle breeders and identify constraints and solutions related to cattle-wolf conflict.

NATIONAL WORKSHOP IN SPAIN (SOBRESCOBIO, ASTURIAS).

	Spanish workshop
Location	Sobrescobio (Asturias; Redes Natural Park)
Date	24th of July 2014
Nº of participants	46
Stakeholder groups represented	27 cattle breeders: 7 regional unions of cattle breeders; 4 representatives of regional governments; 2 representatives of protected areas (Picos de Europa National Park and Redes Natural Park); 5 wolf researchers; 4 representatives of local administration (mayors); 2 representative of Rural Development Projects
Organization	LCIE (JC Blanco) Autonomous Region of Asturias City Council of Sobrescobio

The National workshop in Spain was held in Sobrescobio (Asturias) on 24th of July 2014. Previously, the Ministry of the Environment had supported this workshop in a meeting of the Spanish Wolf working group held in Madrid in December 2013 with all the autonomous regions. In that meeting, a representative of the Ministry asked the regions to support the workshop. Finally, the autonomous region of Asturias decided to co-organize the meeting. The council of Sobrescobio provided the auditorium, and the autonomous region of Asturias called other autonomous regions, breeders' associations and unions, convened the press and regional TV and paid a lunch for 45 people. The Ministry of the Environment paid the travel and accommodation expenses for the speakers.

The workshop had a total of 46 participants representing different stakeholder groups, in which cattle breeders were the more represented. This workshop was dedicated to the damage prevention measures for cattle, and in particular, the use of Livestock Guarding Dogs. The Spanish workshop was structured with sessions on different topics, with a 10 min presentation followed by a long debate among cattle breeders. The topics had been previously selected after reviewing the concerns raised by the 30 interviewed breeders in three areas. During the workshop the cattle breeders had the main role, and three presentations on prevention measures were performed by local breeders, who talked about their positive and negative experience on different methods (Appendix A).

The presentations and the discussions were based on the preventive measures to avoid cattle depredation in the Cantabrian Mountains, and the perception of breeders in the three areas where the interviews had been carried out. A cattle producer from León province presented his personal experience on the use of mastiff dogs with free-grazing cattle, emphasising the tips to solve the usual problems posed by dogs. In addition, a dog expert biologist reviewed the scientific literature on the use of guarding dogs with cattle. The breeder union ASAJA presented one project carried out by producers to implement preventive measures for free-grazing cattle in Ávila province, and a biologist and a local breeder also presented the results of an experimental fence to protect cattle from wolf depredation in Galicia. A veterinarian led a debate on cattle diseases in the Cantabrian Mountains, a very interesting topic for many breeders, and the role of wildlife and Livestock guarding dogs on its transmission. At the end of the workshop, most of the breeders raised hands when asked if it had been useful to them.

NATIONAL WORKSHOP IN PORTUGAL (LAMAS DE MOURO, MINHO).

	Portuguese Workshop
Location	Lamas de Mouro (Minho; Peneda-Gerês NP)
Date	16th of July 2014
Nº of participants	40
Stakeholder groups represented	12 cattle breeders; 10 local associations related to livestock production and wolf conservation; 5 representatives of national authority (ICNF); 4 representatives of protected areas (Peneda-Gerês National Park); 6 wolf researchers; 2 representatives of Grupo Lobo/LifeMedWolf; 1 Moderator
Organization	CIBIO, University of Porto ICNF Grupo Lobo / MedWolf LIFE project

The National workshop in Portugal was held in Lamas de Mouro (Peneda-Gerês National Park, Minho) on the 16th of July 2014. The workshop was organized by CIBIO/InBio, a research centre from Porto University and by the Portuguese agency responsible for nature conservation (ICNF), which has been collaborating very closely in the development of this pilot action, with the collaboration of Grupo Lobo within the scope of LIFE MedWolf.

The Portuguese workshop intended to be a working meeting rather than an informative session. Therefore invited participants were sited in a round table disposition to ensure their effective participation and a moderator (Clara Espirito-Santo), from LIFE MedWolf team, was also invited to guide the working session. The workshop had a total of 40 participants representing different stakeholder groups, in which cattle breeders and local associations related to livestock production were the more represented. The invited cattle breeders were selected among the 31 that were previously interviewed during the field work in order to have representatives of different situations in the study area according to husbandry methods, number of owned animals and intensity of wolf predation.

The workshop program (Appendix B) opened with an introduction of the Portuguese Pilot Action member and of the ICNF representative. Then, the cattle breeders were invited to make a short individual presentation about their experience, focusing on the following topics:

i) Cattle farm location and number of animals;

ii) Cattle husbandry practices used (night and day protection during summer and winter; pasturing areas/distances from shelter; the age calves start to go pastures; economic profit: selling/subsidies);

iii) Level of conflict with wolf (predation impact, attitude towards the wolf);

iv) Main problems related with the conflict wolf-cattle breeding and possible solutions.

These communications allowed to characterize the current relation between cattle husbandry and wolf presence in this region, allowing an experience and knowledge transfer between all the participants of the workshop. After these presentations, it took place a communication of a

technician of a local agricultural organization about the existing European aids to the livestock farming activity and the constraints related to wolf predation and damage compensation. This was the only expert communication that took place in the workshop and it was included for two main reasons: i) it is one of the main aspects that needed clarification among cattle breeders; and ii) the European aids are closely related with the evolution of livestock farming and consequently with the level of wolf damages. As expected, this communication was of vital importance, namely because of the high level of confidence that local cattle breeders have with the invited expert and by stressing the importance of having a productive and sustainable livestock farm not excessively dependent on subsidies.

After the lunch break with all participants, a group work session was conducted. Six working groups with five participants each were created by randomly incorporating representatives of different stakeholder groups such as of cattle breeders, local associations and conservation technicians. Each of these working groups gathered during 30 minutes to identify 3 main problems between cattle husbandry and wolf presence, which they wrote in post-its. Then, after returning to the meeting room, a speaker representing each group transmitted to all participants the problems identified and the *post-its* were fixed on a placard by the moderator under the problem title. During this phase the moderator tried to pool together similar problems identified by different groups and to find a common title under which the different post-its were fixed, with the consent of all participants after an active discussion. A total of 7 main problems were identified, and were then randomly sorted by the 6 workings groups, which gathered once again to identify possible solutions for that specific problem, which were then presented to all participants and discussed.
The problems related to cattle husbandry and wolf presence that were identified as well as the solutions proposed are listed below grouped under the main topics agreed by all participants of the workshop:

Inadequate husbandry practices

Reasons:

- Excessive number of animals per breeder
- Deficient surveillance and protection of the animals

Possible solutions:

- Improve the protection of the animals against wolf attacks by: i) reducing the number of animals per breeder (50 to 100 animals per breeder) and per grazing area; ii) confining the animals every night; iii) promoting the use of livestock guarding dogs; iv) promoting the use of fences (permanent or temporary)
- Improve accesses to pastures in order to allow a more regular surveillance of the animals
- Improve current structures for livestock management or construction of new ones (e.g. water points, fences, barns)
- Harmonization between individual and communal management in order to facilitate the improvement of husbandry practices and minimize wolf damages.

Lack of structures to confine livestock

Reasons:

- Lack of places and structures to confine and protect livestock, namely the more vulnerable ones like cows with calves.
- Bureaucracies in the licensing for building these structures.

Possible solutions:

- Improve local organization to implement communal structures for cattle protection and handling.
- Improve the coordination between the different entities with responsibilities in territory planning (e.g. D.R.A, ICNF, Counties, Communal areas)
- Improve the celerity of licensing processes for building these structures.

Wolf predation on calves

Reasons:

- Lack of remains from calves killed by wolves doesn´t allow the right for damage compensation.
- Loss of the rights to benefit from some agricultural aids, namely the ones related to the breeding cows.

Possible solutions:

- Ensure that births always occur in enclosures to prevent wolf predation and where calves should be keep for some months until are weaning and earring (e.g. few months old)..
- Explore the possibility of insurances to cover the situations where there are no remains from livestock killed by wolves.

Scarcity of wolf wild preys

Reasons:

- The scarcity of wild preys increases wolf predation on livestock.

Possible solutions:

- Promote wild prey population monitoring and selection of suitable areas for their occurrence
- Promote reinforcements and reintroductions of wolf wild prey (roe-deer and red deer) whenever necessary, namely in collaboration with hunting associations
- Promote conservation awareness campaigns and environmental education to prevent poaching
- Promote surveillance of poaching by police authorities

Lack of flexibility in wolf damage regulation to deal with different local realities

Reasons:

- Lack of flexibility in the current legislation to identify local solutions

Possible solutions:

- Zoning of the different types of traditional livestock management
- Implementation of measures to prevent wolf attacks according to each region
- Evaluation of alternatives to direct compensation (e.g. insurances, payments for the risk), namely in areas where lost animals are difficult to find.

Lack of coordination between the entity responsible for wolf damages (ICNF) and the entity responsible for agricultural aids (IFAP)

Reasons:

- Difficulty to replace the animals lost in wolf attacks within 20 days as established in Rural Development Program to benefit from agricultural aids (*namely in finding registered animals with the same characteristics in the market*).
- Wolf attacks are not considered a case of major force in order to extend the period to replace the lost animals to benefit from agricultural aids.
- The delay in ICNF decision regarding the right of compensation for wolf damage makes even more difficult to the breeder to fulfil the requirement of replace the lost animals in the established period of time.

Possible solutions:

- Wolf damages should be considered by EC as a justification to extend the established period of time to replace the lost animals in order to benefit from agricultural aids.
- The period to fulfil the obligation of replacing the animal should start counting only after the process of damage compensation is concluded.
- Share of responsibilities between the two entities concerned to the wolf damages process: ICNF should verify wolf damages and IFAP should attribute the indemnities for damage compensation.
- Improve the celerity of all wolf damage compensation process.

Lack of organization in communal areas used for livestock grazing

Reasons:

- Impossibility of partition of communal areas does not allow a proper management of livestock grazing and wolf damage prevention
- Deficient management of communal areas.
- Unregulated attribution of the rights to use communal areas.

Possible solutions:

- Promote the participation of all inhabitants and cattle breeders in the general meetings regarding the management of communal areas.
- Promote the existence of a board of management of the communal areas.
- Promote the elaboration of Communal Areas Management Plans to establish compromises for the use of these areas.

- Promote a higher level of organization in communal areas management in order to allow a sustainable technical support without compromising individual management of each area.

The main conclusion of this workshop was the recognition by all participants that a great deal of the cattle-wolf conflict results from a lack of organization at several levels (individual, communal and institutional) which constraints the use of adequate husbandry practices to prevent wolf damage and in lack of participative planning. Participants showed to be very satisfied with this initiative and transmitted that they would like to be more involved in the planning and implementation of the measures to reduce wolf predation on livestock, according to the results of the opinion survey that was conducted in the end of the meeting (Appendix D). This workshop was the first participatory meeting in the scope of wolf management and conservation in Portugal and, as expected, resulted in an improved dialogue between researchers, NGOs and cattle breeders, which shows that this kind of initiatives should be replicated.

INTERNACIONAL WORKSHOP (CASTELO BRANCO, PORTUGAL)

	International workshop
Location	Castelo Branco: MedWolf area (Portugal)
Date	28th of October 2014
Nº of participants	21
Stakeholder groups represented	4 regional unions of cattle breeders; 2 national unions of cattle breeders 1 representative of Spanish administration (Castilla la Mancha); 2 representative of Portuguese administration (ICNF); 8 representatives of Grupo Lobo and ESACB/LIFE MedWolf; 4 representatives of Iberian Pilot Action (CIBIO, LCIE/IEA)
Organization	LIFE MedWolf Grupo Lobo LCIE ICNF

The International workshop was held in Castelo Branco (Portugal) on the 28th of Octuber 2014. The International workshop was organized in the intervention area of MedWolf LIFE project, where a strong wolf-cattle conflict is raising, as wolves are recolonizing the region and increasing damages in free-ranging cattle. This workshop aimed for a more technical discussion and experience and knowledge sharing related to damage prevention from different areas in Iberian Peninsula (Appendix C). This workshop was focused on the exchange of experiences and best practices between this LCIE Pilot Action and the MedWolf LIFE project, and the Spanish and Portuguese managers (researchers, wolf managers and livestock/agricultural associations), helping to put the regional cases (LCIE-PA and MedWolf) into perspective, and to give stakeholders a chance to raise issues of concern and gain feedback on the major problems surrounding the wolf presence, with a view also on the future, considering the expected wolf expansion. To achieve these goals the workshop included presentations and discussions, which were facilitated, to keep them in a nice working rhythm, and achieve greater understanding.

3. PROBLEMS AND CONSTRAINTS RELATED TO WOLF-CATTLE CONFLICT

In Northern Iberian Peninsula, farmers have many of the same problems that in other rural societies of Europe and North America. The mountain areas are often poor and lack the services, employment opportunities and leisure activities that cities have. Teens often complain of boredom, and young couples have less education opportunities for their children. Public transportation is often lacking, making it difficult for people without vehicles, who tend to have low incomes, to get to workplaces, stores, and other venues. As a result, their economic development is impaired. Agricultural subsidies supplement their income, but they have complex effects, which also influence the relationship between livestock, breeders and predators. In this very complex mixture of economic and social problems, the intensity of wolf predation on livestock is very variable in different areas and often plays a very minor role.

Several constraints related to cattle husbandry and wolf predation were identified according to the results obtained in the field interviews to cattle breeders and the guided discussion generated during the workshops.
A great deal of the cattle-wolf conflict results from **social, economic and political issues** which frequently are not reflected in the actual intensity of wolf predation. In fact, although wolf predation often involves a small share of livestock mortality, it generates a huge conflict mostly in areas with recent wolf recolonization, and where wolf predation is often perceived as a scapegoat for other problems affecting livestock production and rural development. Besides, livestock industry is currently highly dependent on EU aids which allow a high number of animals per breeder, without promoting an effort for adequate vigilance to prevent wolf predation and the need for using damage prevention methods. The lack of organization at several levels (individual, communal and institutional) also hampers the use of adequate husbandry practices to prevent wolf damage on cattle.
There is a **high regional variability in the incidence of wolf predation which raises the need to evaluate locally the use of the most adequate damage prevention methods**. In fact, wolf predation risk on cattle, and consequently the level of conflict, is associated to several factors that vary regionally, such as ecological conditions (e.g. abundance of wild prey; incidence of livestock diseases; persistence and abundance of wolf populations) and husbandry practices (e.g. age of calves in mountain pastures, distance of grazing areas to village, confinement during winter, number of cattle per breeder).

The use of preventive methods by cattle breeders also faces several other problems. Currently, **most cattle breeders have their animal's free-ranging** that are frequently scattered over large

areas and with no vigilance during summer or all year around, making very difficult their protection by livestock guarding dogs or the implementation of other measures.
Many cattle breeders are **not willing to improve their procedures or effort to actively prevent wolf attacks**, unless they receive technical and/or financial support to apply them. This is mostly because the direct compensation of wolf damages has been given regardless the use of adequate prevention measures. Besides, the compensation of damages does not fully solve the problem, because breeders are not paid by the serious disturbance caused by wolves nor by the wounded and missing animals. Also, the breeders still believe that the best method to prevent damages to the livestock is to kill wolves, and that implementing preventative measures means to accept the presence of the wolf. In Spain, where wolf hunting and control is permitted (even in the National Park of Los Picos de Europa), farmers prefer to push the administrations for higher levels of hunting and control than investing money and effort in preventive measures.
Finally, breeders often **lack information on the best procedures** to assure damage prevention and have misperceptions on the effectiveness of these measures.

The use of livestock guarding dogs as a damage prevention method for cattle seems to be effective based in the results from field interviews in Riaño area (Spain). However **several constraints for the use of LGD** were mentioned by cattle breeders:

- In some areas, livestock guarding dogs were not used because summer pastures are not accessible by 4-wheel drive vehicles, and farmers have to walk from 15 to 90 minutes to reach them. Therefore, bringing food to the dogs is difficult, which could be partially solved with automatic dog feeders, although the food carriage would still be a problem.
- It is more difficult to develop a social bond of the pups with cattle than with sheep and goats, making dogs less prompt to stay with cattle herds in mountain pastures. The insufficient bonding and the roaming are the main causes of the problems described by the breeders who did not to use mastiff dogs. For example, cattle breeders claimed that the dogs leave the cattle and go with tourists, they come back to the villages, they prefer tractors than cows and they chase the game species
- The maintenance of livestock guarding dogs is expensive, and therefore in the areas where damages are not high, money and work spent on dogs outweigh the losses they avoid. In the Cantabrian Mountains, farmers claim that the cost of maintaining a mastiff dog per year equals the value of a calf (600-700 euros). Therefore, the loss of two or three calves per year is equivalent to the maintenance cost of two or three mastiff dogs.
- The large dogs can scare hikers and tourists in protected areas and this triggers the complaints of these groups. In the Cantabrian Mountains, the users of protected areas are in general used to see and to accept the presence of livestock guarding dogs. Anyway, in tourist-inhabited areas, aggression by LGDs towards companion dogs, hikers, bikers and other land users may occur and is unacceptable. In the event of outright aggression toward other users of public lands, the particular LGD involved should be removed from duty on public lands. In these areas, the use of signals to alert and educate users to the presence of LGDs has been recommended (see VerCauteren *et al.,* 2012). Education of humans is needed to encourage their respect of fences, and so they avoid alarming LGDs by disturbing the livestock being protected.
- In addition, some breeders claimed that animal health regulations ban the presence of LGDs in the stables because they can transmit brucellosis to cattle. This concern was discussed in the workshop of Sobrescobio (Spain) with a veterinarian of the regional government of Asturias, although no one could confirm whether this rule is in force in the autonomous regions of the Cantabrian Mountains. The dogs can transmit brucellosis to cattle, but this would only happen when there are so many cows infected in the herd that the actual risk posed by the dogs is negligible.

In conclusion, the problems of cattle breeders in Northern Iberia Peninsula are complex and often difficult to address. However, a pragmatic approach should be focused on the methods to prevent wolf damages to livestock.

4. SOLUTIONS TO WOLF-CATTLE CONFLICT: BEST PRACTICE FOR DAMAGE PREVENTION

To minimize cattle-wolf conflict there is the **need for a strategic dialogue between stakeholders** aiming to promote ways and means to minimize, and wherever possible, to find solutions to conflicts arising between cattle breeding and the wolf presence. This should be achieve by exchanging knowledge, experiences and good practices on coexistence from different areas and by working together to find commonly agreed solutions to major problems.
This approach was successfully used in the Iberian Pilot action, identifying problems and solutions by working together with cattle breeders and by collaborating between Portuguese and Spanish managers, at a wolf population level. Similar participatory actions should be replicate in the future to gather knowledge on cattle-wolf conflict at a regional level and create a strong awareness among cattle breeders concerning the use of damage prevention methods.

Based in the results obtained in the Pilot action, we propose several solutions, practices and methods to minimize wolf damages to cattle under extensive grazing.

A general solution to minimize cattle-wolf conflict at a medium term is the **recovery of wild ungulate populations**, both in abundance and species richness, to act as an alternative food resource to livestock (Polisar et al., 2003). This seems particularly relevant in Portugal where wolves feed mostly in livestock and wild ungulate populations are scarce. Wild ungulate populations have been recovering by natural expansion across most Iberian Peninsula. However, in areas where wild prey are almost absent or at very low abundance, it will be necessary to promote the increasing range and density of their populations through habitat improvement and reintroduction, focusing mainly in ungulate species with lower levels of conflict with agricultural and forestry interests.

However, the main solution to minimize cattle-wolf conflict is to **apply adequate procedures to prevent wolf damage on cattle**, which should be mandatory to benefit from compensation for wolf damages and from EU aids for livestock production in wolf range. Following we propose several best practices for wolf damage prevention on cattle, based in the knowledge gathered in this Pilot action. These recommendations related to cattle husbandry and vigilance will be integrated with knowledge on the best practices for damage prevention on other livestock species (as data coming from MedWolf LIFE project), in order to produce documents, directed to different audiences, such as

Local and National Managers and livestock producers, and by focusing on technical details of the damage prevention and mitigation measures available and known to work, providing practical solution to a different array of situations, through visual material showing practical examples.

BEST PRACTICES FOR WOLF DAMAGE PREVENTION ON CATTLE

Vigilance and confinement

- **Promote attended grazing** of cattle with the presence of shepherds or livestock guarding dogs (LGD) rather than free-ranging grazing over large areas. The number of sheperds and dogs should be adequate to herd size, with 1 shepherd and a minimum of 1 LGD per 50 animals (until a max. of 5 LGD per herd).

- **Promote nocturnal confinement** of cattle in structures that efficiently prevent access to wolves (e.g. barns, fences), particularly during winter, and with the presence of LGD, especially in outdoor fences.

- **Confinement of calves with less than 3 months old** in structures that efficiently prevent access to wolves (e.g. barns, fences), and with the presence of LGD, especially in outdoor fences.

Herd management

- **Assure an efficient nocturnal vigilance and protection of cattle more vulnerable** to wolf predation, such as debilitated animals, pregnant cows and calves. In particular, it should be prevented that calves born in pastures, by assuring that pregnant cows are confined in structures that efficiently prevent access to wolves (e.g. barns, fences).

- **Prevent free-ranging grazing during the winter,** especially during the night, by assuring an efficient protection in structures that prevent access to wolves (e.g. barns, fences) and with the presence of LGD, especially in outdoor fences.

- **Avoid free-ranging grazing during summer over large distances** (< 5km from structures for confinement)

- **Promote the use of cattle breeds** (e.g. autochthonous breeds) well adapted to extensive grazing and to the ecological conditions of mountainous areas, since they often have behavioral traits that minimize the risk of wolf predation (e.g. habitat selection, herd composition, anti-predatory behaviors).

Methods for cattle protection

- **Livestock guarding dogs** can be efficient for cattle protection against wolf predation, if they are well educated and kept always with the cattle since up to 2 months old. In fact, is essential to assure a strong social bonding between dogs and cattle, to prevent the dogs to roam and leave the herds unattended. The challenge is that cows are very big and may scare the pups. To overcome this problem, one or a few small calves should be available to be with the puppies during the few weeks when they develop the social bonds with the cattle. In addition, the tendency LGD to roam and leave the cows must be actively corrected by the breeder mainly during a few months after the dogs are left alone in the pastures with

the cows. In order to maintain LGD near cattle herds in extensive grazing, food must be regularly supplied eventually with automatic dog feeders. It is desirable to have 2 or more dogs in groups as they become more confident and generally have a complementary action, being therefore more effective in preventing wolf attacks.

- **Structures for cattle confinement** should be effective in preventing access to wolves and other predators, and should always be associated to the presence of LGD. Permanent fences should have a minimum height of 1,8m and a maximum interval of 15 cm between grid elements, with a peak bent towards the exterior and buried into the ground at least 30 cm to avoid excavations. To increase protection additional electric wires could be placed in the top end and up to 1 m above the ground along the exterior of the fence. The area of the enclosure should be dependent of the number of animals to be confined and according to sanitary recommendations. In communal lands used for extensive grazing of cattle, as it is frequent in North Iberian Peninsula, it should be implemented the construction of permanent enclosures for community use in the most convenient location selected by several breeders and aimed for confinement of the most vulnerable animals, such as calves and pregnant cows. Temporary fences for cattle to be used mostly in meadows of pasture fields located near villages should be associated with a minimum of seven electric wires (max 15 cm interval near the ground and up to 160 cm height).

- **Other methods for cattle protection** should be considered for limiting cattle depredations, **such as aversive and disruptive stimulus applications to prevent wolf predation** (Shivik & Martin, 2000). An example of aversive stimulus devices (e.g. cause discomfort, pain, or an otherwise negative experience to achieve conditioning against predatory behaviors) are the electronic shock collars or sound activated collars fitted in prey animals for aversive conditioning of predators, and which could be mainly applied to calves under extensive grazing. Disruptive stimuli (e.g. undesirable stimuli that prevent or alter predatory behaviors), other than LGD, include lights, sounds or pyrotechnics that may startle or frighten wolves and cause it to retreat from cattle. Disruptive stimuli devices can be used in association with structures for cattle confinement although they can have a limited usefulness due to the effects of habituation. Although most of these methods have not been extensively applied in cattle, they may present some potential as a damage prevention method in cattle under extensive grazing and should be subject of studies to evaluate and optimize their efficiency.

APPENDIXES

APPENDIX A: Program of National Workshop in Spain

JORNADA TÉCNICA SOBRE PREVENCIÓN DE DAÑOS DE LOBO AL GANADO VACUNO

Fecha*:* 24 de julio de 2014

Lugar*:* Centro Cultural Vicente Álvarez, RIOSECO (SOBRESCOBIO), Asturias.

Objetivos.

- Crear un espacio de diálogo sobre los problemas de la ganadería de vacuno con la participación de distintos sectores sociales

- Revisar las técnicas más eficaces de prevención de daños de lobo sobre el ganado vacuno.

Programa

10.00. Bienvenida del Principado de Asturias. Objetivos de las jornadas *(opening session)*

10.20. Juan Carlos Blanco (LCIE). Resultados de las entrevistas a ganaderos de vacuno en la Cordillera Cantábrica oriental. Métodos de prevención de daños utilizados y problemas encontrados. (*cattle depredation in the Cantabrian Mountains and preventive measures. The perception of breeders in three areas*)

10.40. Luis Manuel Rodríguez (ganadero de La Robla, León). Los mastines en la defensa del ganado vacuno. Experiencias en la montaña de León. *(how to use livestock guarding dogs with free grazing cattle in the Cantabrian Mountains. Solving the usual problems. The perspective of a cattle breeder)*

11.00- 11.20 Yolanda Cortés (CBC). Técnicas de manejo del mastín con ganado vacuno. *(how to use livestock guarding dogs with free grazing cattle. Solving the usual problems. A review of the published literature)*

11.20- 11.40 ASAJA Ávila. La prevención del ganado vacuno en la provincia de Ávila. *(the ASAJA project to implement preventive measures for free grazing cattle in Ávila province. The perspective of a breeder Union)*

11.40- 12.00 Pausa Café *(coffe break)*

12.00-12.20. Ministerio Medio Ambiente. Técnicas experimentales de vallado para la protección del ganado vacuno en Galicia. *(an experimental fence to protect cattle from wolf depredation in Galicia)*

12.20- 12.40. Álvaro Oleaga (SERPA). Influencia de la fauna silvestre en la transmisión de brucelosis y tuberculosis al ganado. *(cattle diseases in the Cantabrian Mountains. The role of wildlife and mastiff dogs on its transmission. Review of the scientific evidence)*

12.40- 15.00. Debate y Conclusiones *(discussion and conclusions)*

15.00 Comida ofrecida por el Principado de Asturias *(lunch)*

Organizan: Principado de Asturias/ Iniciativa Europea para los Grandes Carnívoros (LCIE)/ Comisión Europea/ Ministerio de Medio Ambiente.

APPENDIX B: Program of National Workshop in Portugal

SESSÃO DE TRABALHO

A CRIAÇÃO DE GADO BOVINO EM REGIME EXTENSIVO NO NOROESTE:

MÉTODOS DE PROTEÇÃO CONTRA ATAQUES DE LOBO

Data: 16 de Julho de 2014

Local: Porta do Parque Nacional da Peneda Gerês, Lamas de Mouro - Melgaço

Objectivos:

- Criar espaço de diálogo sobre praticas de maneio de efetivo pecuário em área de presença de lobo;
- Identificar principais problemas dos criadores de gado na área de estudo face à presença de lobo;
- Identificar práticas de maneio que se têm revelado mais eficazes na proteção do gado a ataques de lobo;
- Estabelecer as melhores praticas à adotar na área de estudo para prevenir ataques de lobo que integrarão o documento a elaborar com orientações de boas práticas de maneio de efetivo pecuário em área de lobo.

Ordem de trabalhos

9:30h Enquadramento do workshop *(opening session)*

Dr. Francisco Álvares (CIBIO)/Drª Inês Barroso (ICNF)

9h 45 Apresentação das praticas de maneio em diferentes exploração pelos criadores de gado - Prós e contras das práticas de maneio apresentadas

(*brief communications from cattle breeders about pros and cons of their husbandry practices*)

11h 00 Pausa para café *(coffe break)*

11h 30 Continuação das apresentações *(communications from cattle breeders)*

13h 00 Almoço

14h 00 "Apoios comunitários à produção pecuária: dificuldades de aplicação em áreas de presença de lobo no Noroeste" (*european subsidies for livestock production: constraints related to their application in the wolf range in NW Portugal*)

Engª Beatriz Cacho (Cooperativa Agrícola dos Arcos de Valdevez)

14h 30 Debate “problemas/soluções” (*discussion: problems and solutions*)

16h 30 Conclusões (*conclusions*)

17h Encerramento *(closing session)*

Participantes:

Criadores de gado
Associação do Minho dos Criadores de Raça Barrosã (AMIBA)
Associação dos Criadores de Raça Cachena
Associação de Criadores de Equídeos de Raça Garrana (ACERG)
Cooperativa Agrícola dos Arcos de Valdevez
Direcção Regional de Agricultura do Norte
Câmara Municipal de Arcos de Valdevez
Câmara Municipal de Melgaço
Câmara Municipal de Montalegre
Câmara Municipal de Ponte da Barca
Associação dos Baldios do Parque Nacional da Peneda-Gerês
Associação Florestal Vales Minho Coura Âncora Vez e Lima dos Rios Coura (ATLÂNTICA)
Associação de Conservação do Habitat do Lobo Ibérico (ACHLI)
Associação de Desenvolvimento da Peneda-Gerês.(ADERE)
Associação de Criadores de Gado do Concelho de Valença e Cerveira (VALCER)
Representante espanhol do projeto

Organização

APPENDIX C: Program of International Workshop

SEMINÁRIO IBÉRICO SOBRE O LOBO
COEXISTIR COM O LOBO, UM DESAFIO PARA O FUTURO

Data*:* 28 de Outubro de 2014

Local*:* Escola Superior Agrária de Castelo Branco, Castelo Branco, Portugal

Programa

09h30 – Apresentação *(Opening session)*
Prof. Dr. Francisco Petrucci-Fonseca (GL, MedWolf) e Dr. Francisco Álvares (CIBIO, LCIE)

10h00 - Maneio de gado bovino em áreas de presença de lobo no noroeste de Portugal: problemas e soluções *(cattle husbandry practices in NW Portugal: constraints and solutions)*
Dr. Francisco Álvares (CIBIO/InBIO, LCIE)

10h30 - Manejo del ganado vacuno en áreas de presencia de lobo en la region Cantabrica: limitaciones y soluciones *(cattle husbandry practices in Cantabrian mountains: constraints and solutions)*
Dr. Juan-Carlos Blanco (LCIE - Espanha)

11h00 – Pausa para café *(coffe break)*

11h30 – Caracterização das explorações pecuárias na região raiana: risco de predação pelo lobo *(characterization of livestock breeding units in Beira region: risk of wolf predation)*
Prof. Dr. Luis Pinto de Andrade, João Pedro Várzea e Joaquim Carvalho (ESACB, MedWolf)

12h00 – A Plataforma da União Europeia sobre os Grandes Carnívoros: dialogando com todos os interessados
(the EU Platform on coexistence between people and large carnivores)
Dr.ª Valeria Salvatori (IEA, MedWolf - Itália)

12h30 – Almoço *(lunch)*

14h00 - Apresentações convidadas (20' cada) *(Invited presentations)*

Junta de Castilla la Mancha
Medidas de prevención de daños de lobo en la provincia de Guadalajara, Castilla la Mancha
(wolf damage prevention measures in Guadalajara province)
Eng.º Erundino Alonso

CONFAGRI - Confederação Nacional das Cooperativas Agrícolas e do Crédito Agrícola de Portugal
Contributos e preocupações do sector cooperativo agropecuário para a conservação do lobo-ibérico
(contributes and concerns from the cooperative agro-livestock sector regarding wolf conservation)
Eng.º António Cláudio Heitor (Técnico Florestal e de Gestão de Recursos Naturais)

ACRIGUARDA – Associação de Criadores de Ruminantes da Guarda
Eng.º Paulo Poço (Director Técnico) & Eng.º Rui Matos (Secretário da Direcção; Técnico da CAP)

ACRIALMEIDA – Associação de Criadores de Ruminantes do Concelho de Almeida
Eng.º Joaquim Fonseca (Presidente)

ACRISABUGAL – Associação de Criadores de Ruminantes do Concelho do Sabugal
Sr. José Freire (Presidente) & Sr. Ismael Carlos (Vice-Presidente)

Cooperativa Agrícola de Arcos de Valdevez e Ponte da Barca
Eng.ª Beatriz Cacho (Serviços Técnicos)

15h40 - Mesa redonda *(working session)*
Moderador: Clara Espírito Santo

17h00 – Conclusões *(conclusions)*

17h30 – Encerramento *(closing session)*

Organização

APPENDIX D: Results from the opinion survey of the National Workshop in Portugal

A total of 25 participants fill out the opinion survey. The overall mean of the responses to the main questions are presented in the following table (in a scale of 1 to 10).

Question	Mean value of responses
Level of satisfaction with the working session	8,8
Interest of participating in future working sessions	9,3
Interest in the themes discussed in the working session	8,9
Importance of the working session for the definition of livestock husbandry methods more compatible with wolf presence	8,4

When asked about the 3 more important topics discussed in the working session, the participants enumerated the following (in brackets is the number of times the topic was indicated) :

1. Livestock husbandry methods (9)
2. Aids /New Rural Development Program (6)
3. Communal areas management (6)
4. Wolf attacks /Compensation for wolf attacks (5)
5. Debate/Dialog between different actors (4)
6. Problems/Solutions related to wolf presence (6)
7. Number of animals per cattle breeder (2)
8. Licensing for building structures to confine and protect livestock) (2)
9. Autochthones species (1)
10. Livestock guarding dogs (1)
11. Replacement of lost animals killed by wolves (1)
12. Livestock production (1)

Concerning the global evaluation of the working session participants indicated the following:
Positive aspects (16 participants):

13. Participation of the different actors related to cattle wolf conflict and positive dialogue between them
14. Participation and statements of local cattle breeders with different experiences
15. Good technical knowledge of the speakers

Negative aspects (12 participants):

16. Period of the year chosen for the working session (hay harvest time)
17. The event should be open to other cattle breeders; presence of few cattle breeders per parish/municipality
18. Difficulty to dialogue with some participants
19. Few solutions in sight
20. Distant location of the event
21. Room too small for the development of the working session

The topics indicated by the participants (n=13) that they would like to be discussed in future sessions were:

22. communal areas management (5)
23. concrete protection measures to avoid wolf attacks (3)
24. to give continuity to the discussion of the topics debated in this session and to extend the discussion to the small ruminants: goats and sheep (3)
25. the importance of livestock grazing in forest fire prevention (2)
26. constraints to the construction of structures to confine and protect livestock in Protected Areas (1)

APPENDIX E: Outreach to society related to the iberian pilot action and workshops: articles, communications and appearances in media

Popular articles and presentations

Article published in Carnivore Damage Preventions News, issue 10, Spring 2014.
http://www.medwolf.eu/index.php/cdpnews.html
https://www.fc.ul.pt/sites/default/files/fcul/CDPnews_10_Spring2014%20(1).pdf.

Communication presented in 2ND STAKEHOLDER WORKSHOP ON EU ACTION ON LARGE CARNIVORES held in Brussels, 5th December, 2013
http://ec.europa.eu/environment/nature/conservation/species/carnivores/promoting_dialogue.htm

Media in Portugal

http://visao.sapo.pt/grupo-desenvolve-projeto-que-visa-minimizar-conflitos-entre-bovinos-e-lobos=f790546

http://www.rtp.pt/noticias/index.php?article=754919&tm=6&layout=121&visual=49

http://www.cmjornal.xl.pt/detalhe/noticias/ultima-hora/grupo-desenvolve-projeto-que-visa-minimizar-conflitos-entre-bovinos-e-lobos151245837

http://www.agroportal.pt/agronoticias/2014/07/22a.htm#.U9IdfWPVc3E

http://www.agroportal.pt/agronoticias/2014/07/22a.htm#.U85sA-NdVIE

http://expresso.sapo.pt/grupo-desenvolve-projeto-que-visa-minimizar-conflitos-entre-bovinos-e-lobos=f882725

http://www.ecofinancas.com/noticias/grupo-desenvolve-projeto-visa-minimizar-conflitos-bovinos-lobos

http://diariodigital.sapo.pt/news.asp?id_news=720225&utm_source=feedburner&utm_medium=feed&utm_campaign=Feed%3A+ddSociedade+%28Sociedade+%7C+Di%C3%A1rio+Digital%29

http://www.newslocker.com/pt-br/regiao/porto-uniao/grupo-desenvolve-projeto-que-visa-minimizar-conflitos-entre-bovinos-rtp/

http://revistadeimprensa.com/diarios-generalistas/grupo-desenvolve-projeto-que-visa-minimizar-conflitos-entre-bovinos-e-lobos-correio-da-manha/

http://rsspod.rtp.pt/podcasts/at1/1408/3142190_162966-1408050758.mp3 *(Interview in national radio station)*

http://www.terrasdabeira.com/index.asp?idEdicao=893&id=45353&idSeccao=8019&Action=noticia

Media in Spain

http://www.asturias.es/portal/site/webasturias/menuitem.6282925f26d862bcbc2b3510f2300030/?vgnextoid=702020ed45b67410VgnVCM10000098030a0aRCRD&vgnextchannel=dad56fc85c97d210VgnVCM1000002f030003RCRD&i18n.http.lang=es

http://avilared.com/not/10764/piden-medidas-contra-los-lobos-en-una-jornada-celebrada-en-asturias/

http://www.europapress.es/cantabria/cantabria-social-00674/noticia-cantabria-gobierno-central-ccaa-ayuntamientos-ganaderos-debaten-prevencion-danos-lobo-20140724194851.html

http://noticias.lainformacion.com/economia-negocios-y-finanzas/ganaderia/gobierno-central-ccaa-ayuntamientos-y-ganaderos-debaten-en-sobrescobio-sobre-prevencion-de-los-danos-del-lobo_qi0eBIgK0c3awAGfCCD4i6/

http://www.20minutos.es/noticia/2201951/0/gobierno-central-ccaa-ayuntamientos-ganaderos-debaten-sobrescobio-sobre-prevencion-danos-lobo/?utm_medium=twitter&utm_source=twitterfeed

http://www.lne.es/nalon/2014/07/25/ganaderos-ensayan-cercados-mastines-prevenir/1619435.html

https://www.facebook.com/LuchaEnContraDelExterminioDelLoboIberico/posts/300174810161910

http://www.lne.es/cuencas/2014/07/29/ganaderos-podran-mastines-montes-prevenir/1621164.html

http://www.tribunaavila.com/noticias/la-alianza-upa-coag-avila-traslada-a-europa-y-a-medio-ambiente-la-situacion-limite-de-la-provincia-por-los-ataque-de-lobos/1406200298

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