EIP-AGRI Focus Group

Wildlife and agricultural production

FINAL REPORT
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Executive summary

The main task of the EIP-AGRI Focus Group 'Wildlife and agricultural production' was to identify opportunities to implement innovative solutions to prevent and control damage made by wild animals to agriculture while, at the same time, protecting wildlife.

Most animal groups were included in the analysis (birds, carnivores, ungulates) and damage prevention and control measures were specifically described for each of them. The majority of losses and damages wildlife cause to agricultural production are predation on farm animals, game and fish, crop damage by wild herbivores or birds and the spreading of diseases. Damages to crops are more frequently caused by wildlife roaming freely at the edge of agricultural land where natural habitats offer ideal breeding or resting sites. Livestock is instead more often attacked by predators, the number of these predators has been increasing in recent decades even though their natural habitat has reduced. Disease spreading between wildlife, livestock and humans has also become a growing problem and biosecurity measures are often still not sufficient to avoid outbreaks. The preventive and control measures most frequently adopted in Europe are exclusion systems, particularly fencing and frightening devices, but hunting, culling, dissuasive feeding and habitat modifications are also used depending on the problem species. Some important work is also being carried out on cultural habits, trying to help farmers and others to change their behaviours, especially those that have a direct impact on human-wildlife conflicts and that can significantly reduce losses.

As a preparatory initiative to the first Focus Group meeting, the experts were asked to answer a questionnaire aiming at picturing the current, most commonly reported damages caused by wildlife to agriculture, as well as the adopted preventive measures. The information extracted from the survey allowed to identify inspiring examples and share them with the other experts during the first online meeting. These case studies and the **starting paper** served as a basis to discuss the main challenges, strengths and weaknesses of current control and prevention measures as well as opportunities for innovation to prevent wildlife damages to agricultural production. The outcomes of the discussion led to the identification of some key topics that were summarised in four Minipapers:

- Collaboration and partnerships between different stakeholders' groups
- Managing human-wildlife relationships under a territorial framework
- Farm management
- Effective instruments to reduce conflicts between farming and wildlife (HWC[1])

The analysis made in the Minipapers allowed experts to identify knowledge gaps that would require attention by future research. Innovation pathways were then explored, suggesting ideas for Operational Groups and other innovative actions and providing indications for possible research fields.
Research needs were then summarised into the following seven main areas:

- Mitigation of damages and compensation mechanisms
- Tools for data collection and data analysis to assess, monitor and control damages
- Assessment and consideration of farmers' perspective and needs
- Bridging the urban-rural gap in addressing agricultural-wildlife conflicts
- Economic sustainability of farm business models in HWC areas
- Land-based tools to improve land management to avoid conflicts
- Communication and mediation tools to facilitate dialogue between stakeholders and to enlarge participation and improve governance

[1] Human-wildlife conflicts

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With the aim of inspiring innovative actions, three main themes for EIP-AGRI Operational Groups were elaborated by the FG:

- Wildlife as a resource
- Assessment of territorial strategies for wildlife damage control
- Involving farmers in wildlife decision-making

These ideas can be implemented through different types of projects. A local, regional or national approach should be considered and ideas should be adapted based on the needs and the context in which they will be implemented.

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Introduction

Human population growth has increased the demand for natural resources. This has led to wildlife habitat degradation and fragmentation with humans and livestock encroaching on natural habitats. Wildlife is increasingly competing with humans for limited natural resources resulting in a rise in human and wildlife conflicts (FAO 2020). Wildlife, particularly carnivores, ungulates, rodents, raptors, granivores and piscivorous birds, come into conflict with people in different ways and at various degrees, especially when they damage agricultural activities by feeding (killing, browsing, grazing), digging and burrowing. Moreover, wildlife are carriers of diseases that can be harmful to people and domestic animals, but also to crops, and this is a further reason for this difficult relationship (Sillero-Zubiri *et al.* 2007). On the other hand, wildlife is considered a natural heritage and therefore worth protecting, and industrialised agriculture as well as habitat fragmentation and isolation are driving biodiversity and agro-biodiversity to an edge (Emmerson *et al.* 2016, Leventon *et al.* 2017).

Over the last decades, wildlife/human interaction and wildlife related damages to the agricultural sector have shown an increasing trend at the global scale. Public administrations encounter difficulties with regards the reduction of the impact of wildlife on agricultural production. There are growing requests for compensation for crop and/or livestock damage. There is therefore a need to identify appropriate measures to monitor, assess, manage and control this growing trend. (Cozzi *et al.* 2015).

Interactions between wildlife and farming

The double goal of preserving biodiversity while protecting agricultural land from damage caused by wildlife is challenging and raises continuous discussions. The main losses and damages caused by wildlife to agricultural production are represented by crop damage by wild herbivores and birds, predation on farm animals, game and fish, and the spreading of diseases.

Damages to crops and other agricultural production occur more frequently in areas closely bordering natural habitats where a higher density of wild animals live and roam. Most horticultural crops are susceptible to damages caused by birds, such as damage to or removal of shoots, stems, foliage, buds or fruit. Damages to infrastructure such as barns, fences and poles by both birds and wild ruminants are also frequent. The prevailing source of damages from carnivores to agricultural production is predation on livestock. Poaching, along with landscape change, habitat loss and habitat fragmentation increase the pressure on predators. This also reduces the amount of natural prey, making the interaction between livestock and carnivores more intense, forcing them to turn to domestic stock for food (Stander 2005; Jones and Barnes 2006). Today, the biggest economic impact and most serious problems caused by carnivores are on herding societies. These depend entirely on their livestock and live in the remote rural areas of the less infrastructurally developed regions of Europe where pastoralism is key for preservation of landscapes and biodiversity. However, damages are also reported from medium to large agricultural producers all over Europe.

The link between pathogens, the environment and human activities creates a dynamic situation where new diseases or new hosts emerge. New animal welfare and sustainability policies are pushing towards extensive farming systems where livestock have more opportunities to interact with wildlife. This increases the risk of transmission of pests and diseases to domestic stock making disease dynamics at the wildlife/livestock interface increasingly difficult to control (Gortázar *et al.* 2007). In general, small scale farmers, compared to medium and large farming enterprises, have a reduced resilience capacity, as well as limited economic resources, to respond to wildlife damages and absorb losses.

The plethora of stakeholders involved in dealing with the interaction between farming and wildlife, including those dealing more specifically with landscape management and planning, makes wildlife and environmental management particularly challenging. Social, economic, cultural, environmental and political aspects all need to be taken into consideration when working in this field. Figure 1 shows the main stakeholders involved and it briefly describes what their main interests are and the ease of dialogue and interaction between them.

Different groups view wildlife differently: farmers predominantly consider it a pest, others a financial and cultural resource and a public heritage to conserve and preserve. Public opinion is generally unaware of the efforts and difficulties farmers face every day. People mostly underestimate the damage caused by wildlife not only to agriculture but to farming infrastructure in general. Although farmers are at the front-line of these conflicts, all

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the stakeholders play, or should play, a different role in this scenario. It is however the dialogue between them that it is often not so obvious, with long term relationships and communications being difficult to establish and maintain.

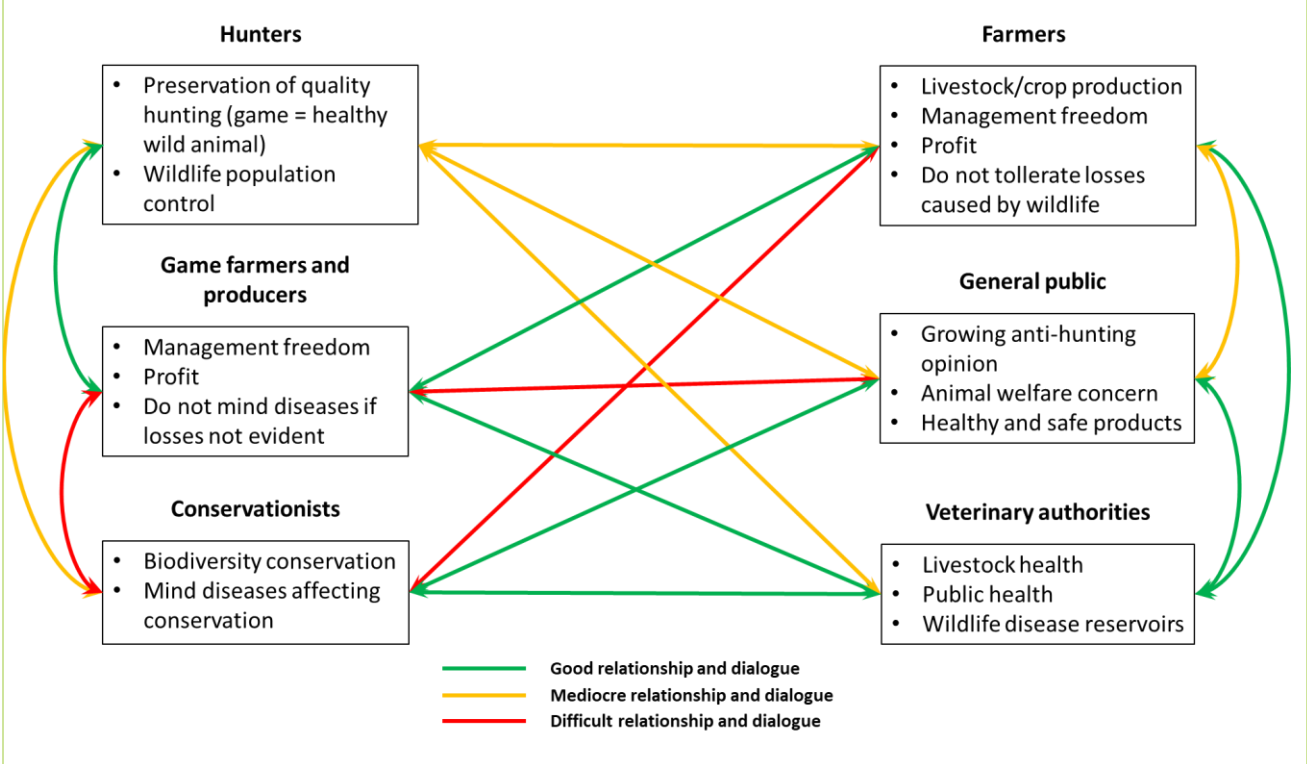

Figure 1: Interests and relationships between the main stakeholders involved in managing wildlife/livestock interaction (NB: the figure only attempts to provide an average description of the situation and does not represent the reality of every single country or region)

To respond to this situation and to define effective strategies for the future, it is necessary to identify ideas for research and innovation activities that could be developed and tested in the field by the different stakeholders and to develop guidelines for best practices that could help to solve practical problems. It is also necessary to explore new ways to improve communication channels, share information and build trust between different stakeholders.

The main question that the Focus Group addressed was ***How to promote innovative and sustainable practices to prevent and control wild animal damage on farms while at the same time protecting wildlife?***

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A group of 20 experts from across Europe (See **Annex A** for the complete list of members) discussed this main question and worked on the following specific objectives:

- **Map the most common types of damage caused by wild animals**, particularly mammals and birds, on farms across Europe.
- **Identify strengths and weaknesses of available solutions at the farm level** that can help prevent, monitor and control wildlife damage to agricultural production.
- **Identify good farming practices**, within a wider wildlife management approach, that contribute to limiting harm to the local fauna.
- **Identify opportunities to implement innovative solutions at farm or at landscape level** through forms of collaboration (including with foresters, hunters, and others).
- **Identify needs from practice and possible gaps in knowledge** that may be solved by further research.
- **Suggest innovative solutions and provide ideas** for EIP-AGRI Operational Groups and other innovative projects.

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Brief description of the process

The Focus Group (FG) on Wildlife and Agricultural Production was launched by the European Commission in Spring 2020 as a part of the activities carried out under the European Innovation Partnership 'Agricultural Productivity and Sustainability' (EIP-AGRI). The overall aim of this FG was to explore practical innovative solutions to problems or opportunities in this field and to share experience and knowledge among relevant actors (researchers, farmers, advisers etc.). The main outcome of the discussion of the EIP-AGRI Focus Group were the identification of needs for research that could contribute to solving the practical problems of the sector and ideas for innovative projects like Operational Groups. The final goal is for these ideas and innovative solutions to be taken up on the ground, to be tested in the field and to produce "guidelines" that could be adopted by all the stakeholders, including decision makers, so as to improve the situation and reduce existing and future conflicts.

20 experts from 15 European countries worked together for around 10 months. Because of the outbreak of the Covid-19 pandemic in 2020, they worked and met remotely.

The Focus Group met online twice. The first meeting was held online in three sessions on the 5, 6 and 20 May 2020, and the second meeting was held online in two sessions on 13 and 14 October 2020.

A '**starting paper**' served as the initial reference to support the meeting and kick-start the discussion. The starting paper was prepared by the coordinating expert with inputs from the FG experts. Since data of human-wildlife conflict control methods are scattered and incomplete, the starting paper included results of a preparatory survey run by the FG experts to identify and describe the most common damages caused by wildlife to agriculture and the preventive measures adopted to limit and resolve the problem in Europe.

During the first series of online meetings the discussion focused on the Focus Group's objectives and process. The discussion paper was introduced and the outcomes of the online survey presented. The group experts shared real life examples of the problems they have dealt with and the different ways to manage them. The main challenges, strengths and weaknesses of current control and prevention measures were hence extensively discussed. The group also took a first step to identify the main opportunities for innovation to prevent wildlife damage to agricultural production.

The outcomes of the discussion on innovation opportunities led to the identification of key topics that have been investigated deeper by the Focus Group experts. These key topics were condensed in four Minipapers that experts prepared to further analyse key issues in the debate by the FG.

The list of Minipaper topics selected and the list of contributors are available in **Annex B**. These Minipapers focus on four main topics:

- Collaboration and partnerships between different stakeholders' groups
- Managing human-wildlife relationships under a territorial framework
- Farm management
- Effective instruments to reduce conflicts between farming and wildlife (HWC)

During the second online meeting, the four Minipapers were presented followed by a discussion on outstanding issues and research needs. The scope was to identify if the research needs described in the Minipapers sufficiently covered the most important aspects and highlighted missing elements before making a prioritisation of research needs.

To reduce agricultural/wildlife conflicts, the FG identified innovative management practices focused on agro-ecological and social principles such as environmentally sustainable activities, participatory approaches to decision-making and communication platforms. Once the experts had identified the principles, they discussed the challenges and opportunities, and provided practical examples and fields of application.

The Focus Group experts identified and organised, according to priority, the following macro-areas of research needs:

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- Mitigation of damages and compensation mechanisms
- Tools for data collection and data analysis to assess, monitor and control damages
- Assessment and consideration of farmers' perspectives and needs
- Bridging the urban-rural gap in addressing agricultural-wildlife conflicts
- Economic sustainability of farm business models in HWC areas
- Land-based tools to improve land management to avoid conflicts
- Communication and mediation tools to facilitate dialogue between stakeholders and to enlarge participation and improve governance

Finally, the experts discussed the needs for research and Operational Group ideas identified in the Minipapers and suggested three main areas for innovation projects and EIP-AGRI Operational Groups:

- Wildlife as a resource
- Assessment of territorial strategies for wildlife damage control
- Involving farmers in wildlife decision-making

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State of the art: prevention and control measures

Today, wildlife is not more invasive, more dangerous or crueller than in the past, although sometimes more abundant, but human activities have expanded so much into and at the border of natural and semi-natural landscapes that encounters and interactions have increased. Human/wildlife conflicts have hence become a common occurrence. However, different species have different psychological impacts, causing different reactions and resulting in more or less severe responses or hostile attitudes depending on the species, even when the consequences of their actions are the same (FAO 2010).

Before taking action, it is always necessary to check with local and/or national wildlife authorities to determine if targeted species are protected and if permits can be granted for removal or any other actions planned. A complete understanding of the biology of each of the targeted species is also fundamental.

Wildlife damage management must indeed be based on sound economic, ecological, and sociological principles and carried out as positive, necessary components of wildlife management programmes. Actions must be justified, environmentally safe, humane, and developed in the public interest. Many species, sooner or later, require management actions to reduce conflicts with people, livestock, or other human or production activities, including wildlife species and conservation. There are few easy "silver bullet" remedies. Integrated wildlife damage management strategies, using a variety of techniques to dynamically target problem individuals or species, are usually preferred and most effective for long-term management.

The analysis of the situation in Europe, as described by the FG experts, showed that carnivores are the principal problem for livestock farmers, while wild ungulates are, in terms of numbers, the ones causing the most damages, especially to crops, with indirect damages also caused to livestock due to the spread of diseases. Birds are instead particularly problematic for crops, but they also cause damages to infrastructure. The current ways to control these damages vary from country to country and according to the different situations and legal frameworks.

Carnivores mainly require direct actions from the farmers, with special attention posed to protect the herd with fencing or other excluding/dissuasive means, including dogs, but also carcass and waste removal from the field. Controlling wild ungulates with both excluding and dissuasive devices is effective, but whenever damages are too high or frequent, culling may be the fastest and most effective control measure. This requires coordinated action from multiple stakeholders. Birds, however, are generally more difficult to control, their behaviour changes over the different seasons and some of them are migratory species. The fact they fly and can quickly move from one area to relatively distant one does not facilitate their control. Excluding devices can be effective, as well as trapping and culling, but a more promising approach seems to be acting at a landscape level. Habitat modification and a broader environmental/landscape approach are good controlling methods that can be applied to multiple species while looking at more sustainable and more publicly accepted ways to limit damages and conflicts.

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PROJECT: BIRD RELEASE (REpelLEnt Auto-SystEm)

Birds can destroy up to 25% of harvested areas, but pesticides used to deter them pose human and animal health risks. An EU initiative introduced a cutting-edge alternative to the extremely costly, inefficient and harmful methods currently available. Farmland in northern Europe teems with life each year during winter, when the numbers of overwintering geese from the Arctic Circle reach their annual peak in the millions "*a nightmare for farmers whose grasslands, meadows and wheat crops get trampled and grazed by the birds*".

The BIRD RELEASE team developed an autonomous bird deterrent system called **AVIX Autonomic Mark II** that harmlessly scares away over 80% of birds in a designated area. AVIX Autonomic Mark II consists of an autonomic robotic laser that provides round-the-clock coverage of the location that needs protection from birds. When a bird enters a field, it's immediately detected by a software-powered camera that continuously scans the area. Based on the birds' movement characteristics, a pattern is then identified to aim the diode laser. Birds perceive the approaching laser as a physical danger and avoid the area. Importantly, the birds do not become accustomed to the laser. The system's modular design can integrate other bird detection systems. It can be incorporated into integrated pest management farming, and also add or omit parts based on customer needs.

After validating and certifying the system, AVIX Autonomic Mark II went into production and is now being sold all around the world. It is primarily sold to farmers with grasslands, wheat, orchards and vineyards because they suffer the most damage.

Source: **https://cordis.europa.eu/project/id/766610** (Horizon 2020 - Grant agreement ID: 766610)

Photo credit: **https://www.avix.com/**

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PROJECT: Improving coexistence of large carnivores and agriculture in southern Europe

The presence of wolves and bears in densely populated Europe often conflicts with human activities, posing threats to the conservation of these two protected European species. The COEX project tackled the aspects of wolf and bear conservation related to the conflicts these species have with the human activities such as livestock raising and agriculture.

During the project, 245 livestock guarding dogs belonging to local breeds were given to farmers and constantly checked for good health and effectiveness. A University degree project was also dedicated to the study of the behaviour of the Abruzzo dogs. The results show that this breed is indeed highly suited for the protection of flocks, but education of the dogs greatly influences their effectiveness.

The beneficiaries of these measures were highly satisfied and declared that "*preventive measures are really effective to protect against predators, they give protection to livestock and so people gain in quality of life.....*". There was a significant reduction in damage suffered, varying between 20 and 100%. Although the overall problem in the project areas may not have been totally solved, the damage has certainly decreased and, in some cases, has gone down to zero.

Source and photo credit: Report prepared under the Life Nature project "Improving coexistence between large carnivores and agriculture in Southern Europe" (LIFE04NAT/IT/000144)

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Strength and weaknesses of different approaches

Different approaches can be undertaken to reduce agricultural/wildlife conflicts. It is indeed necessary to improve the understanding of the agricultural context and rural situation of each area, especially from policy makers and people who do not live nearby. This would help to leverage the opportunities that wildlife brings to a certain territory, both from a tourism and a hunting/game meat perspective. It is also important to improve the "acceptance" by farmers of the risk they face when dealing with wildlife that can however be compensated in case of losses and by a diversification of revenue streams. Here the list of the approaches that have been identified:

- Leveraging wilderness potential
- Sustainable wildlife harvesting
- Changing farmers' behaviours
- Habitat modification and management
- Advisory and extension support services

Leveraging wilderness economic potential

For a broad group of stakeholders, including farmers, food-producers, hunters, general public, conservationists and commercial operators, it is important to create value in the territory they live in and in the goods coming from the area. Wildlife can be used to market territorial products, whether directly linked to wildlife-related production, such as meat or leather, or by using wildlife as a branding option for local products (i.e. cheese or meat) or other activities. Promoting the acceptance of wildlife can revive the economy of rural areas and attract people and investments for long-term business activities. Tourism, hunting, manufacturing, game meat processing and several small enterprises can all benefit from such initiatives. Such opportunities should, wherever possible, be developed with local stakeholders and should be promoted and made available also to smaller farmers that face major difficulties to expand or convert their businesses.

This approach is however not easy nor quick to implement, and the need to protect local agriculture and pastoralism remains. Indeed, a strong political commitment is necessary, as well as investments in marketing and promotion. Pitfalls also exist and they should be addressed and considered before and during the implementation of any of these initiatives. Increasing the number of people and business in an area, and focusing the attention on a few flagship species may lower the attention on the entire ecosystem of an area, including on less economically valuable species. An integrated multi-stakeholder approach is key to the long-term sustainability of these initiatives, that will not need to adopt drastic corrective actions in response to new problems that arise after a few years.

What can be done	Strengths	Weaknesses	Conditions for success
Marketing wildlife/wilderness in territorial products and services	Promote acceptance. Commitment of local authorities and all stakeholders	Difficulties in creating a clear link between wildlife and products/services.	Clear understanding of existing consumer preferences. Unique selling point.
Sell game meat and other game products	Sustainable and effective hunting of wildlife. Good communication amongst stakeholders	Conflicts between hunters, farmers and other stakeholders. Lack of communication	Willingness amongst stakeholders to collaborate An understanding of the role of each stakeholder
Wildlife-based tourism	Promote acceptance. Good knowledge of "problem" species and their commercial potential	Poor management of wildlife populations. Uncontrolled number of tourists	Create a market and the value around the "problem" species

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PROJECT: The "Fonds d'Intervention EcoPastoral" (FIEP) launched a programme to establish the brand "Pé Descaous" for cheese made out of sheep milk

Yannick Lamazou has been working as a mountain shepherd in the National Park of the Pyrenees (Lapachouaou hut) for 12 years and he produces his cheese in the brown bear area. Following the results of a marketing survey showing the interest of local cheese makers, the Fonds d'Intervention EcoPastoral (FIEP is a Pyrenees association) launched a programme to establish the brand "Pé Descaous" for cheese made out of sheep milk. "Pé Descaous" is a nickname of the bear in Basque and means barefoot "Le va-nu-pied". Yannick is one of the 14 "Pé Descaous" cheese producers who want to preserve their way of life and cultural cheese-making, and who are in favour of the conservation of bears. A plaster moulding of a bear paw is printed on the cheese so that the product supports the shepherds as well as the bears. The promotion of the cheese was also part of the LIFE Coex programme. The branding of local products that are linked with large carnivores can help to raise awareness and interest for the conservation of wolf, bear or other carnivores. This can also be an opportunity for tourism. For example, cheese made of milk from sheep or honey that is produced in a bear area can be branded with the names and/or symbolic elements of the protected species.

Selling cheese using the symbol of bear brings added value to a product from the bear area and it brings more income to the shepherds. The creameries are happy to buy cheese with the bear footprint produced by shepherds who respect their environment and the presence of bears in the Pyrenees also allows shepherds to benefit from financial support from the Government.

Source: https://www.eurolargecarnivores.eu/ (LIFE EUROLARGECARNIVORES - LIFE16GIE/DE/000661)

Photo credit: Beatrice Jouenne /WWF

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Sustainable wildlife harvesting

Farmers and hunters should work closely with conservationists, veterinary and public authorities, but also with general public, to establish more effective hunting practice within the broader environmental and territorial management strategies. Hunting seasons for example, especially for ungulates, are not always adapted to the animals or to the damages they cause. They are often linked to reproductive cycles of the animals. The intensification of hunting levels when agricultural activities are most susceptible may be adopted to allow more effective and more targeted responses to specific situations. However, such initiatives, which often rely on voluntary inputs, still require high investments in terms of time and money to be effectively implemented.

Economic and human resources must be deployed to carefully evaluate the situation and allow to draw management strategies that should be continuously reviewed. It indeed requires extensive and relatively intensive "close-to-real-time" monitoring of wildlife populations. Besides this, it is necessary to have a sufficient number of hunters that are trained and available to work within this framework. Most hunters find it difficult to adapt their practice to the actual ecosystem status and to participate in culling operations or targeted harvesting which are different from traditional hunting activities. A well-regulated control of harvesting procedures and law enforcement must hence be adopted to avoid undesirable side effects on ecosystems with disruption of population dynamics.

Although the legislation regulating hunting is very different across Europe, a more farmer-oriented approach is desirable. Farmers that are directly involved and responsible for hunting decisions on their land and that could directly benefit from wildlife harvesting have a more responsible approach and develop a less hostile attitude towards wildlife.

Trapping, for certain species, is a valid lethal alternative to hunting. It can be selective and allows to harvest a larger number of animals at the same time compared to hunting. Loading and culling operations can be scheduled, giving the opportunity to organise slaughtering activities in advance. This approach facilitates the work and guarantees safer food for final customers as well as the creation of a viable value chain for wildlife derived products.

What can be done	Strengths	Weaknesses	Conditions for success
Culling with different techniques (including shooting) as opposed to annual harvesting within agreed quota limits	Rapid control of overpopulation	Significant disruption of population dynamics. Undesirable side effects on ecosystems. Some hunters do not easily adapt their practice	Human resources available to implement culling Knowledge of animal populations and their numbers (existing + desired). Enforcement and controls by authorities
Adaptive game harvest strategies. Intensification of hunting levels during different seasons and where lands are most susceptible	It is targeted. It helps foster better relationships between farmers and hunters. Allows relatively quick adaptation	High time investment and difficult to maintain (week in, week out). Hunting seasons are not always adapted to the animals or to the damages they cause.	Availability and flexibility from hunters. Close monitoring of agricultural lands. Use of less destructive means of hunting (e.g. without dogs)
Involve landowners (e.g. farmers) in developing and implementing hunting strategies.	Add incomes and possibly a source of food to the landowner. Should be conducted in strict contact and cooperation with hunters	Lack of knowledge about hunting from the landowners. Not all species are allowed for hunting and the landowner does not always have the hunting rights in all countries.	Control and regulation by competent authorities. Sound and accepted protocols. Focus on problem species and population numbers

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		Could create conflict with other activities in the countryside (agro-tourism)	
Trapping and capture of live animals	Useful to control a population outside hunting seasons. Animals are trapped alive and slaughtering can be organised at dedicated facilities	It is rather expensive. It can be perceived, by certain groups, as additional cruelty against wildlife.	It requires people and resources to be effectively implemented. Effective communication to inhabitants and society

Did you know?
In 2001 the European Commission launched the "Sustainable Hunting Initiative", aimed at promoting dialogue and co-operation between environmental organisations and hunter organisations in order to achieve and enhance sustainable hunting under the Birds Directive.
Ref.: **https://ec.europa.eu/environment/nature/conservation/wildbirds/hunting/index_en.htm**

PROJECT: Wildlife Estates Label

The European Landowners Organisation ELO is one of the organisations responsible for the "Wildlife Estates Label" (WE Label). WE has a targeted mandate focusing on a territorial approach. It aims at establishing a network of outstanding estates and to classify them according to 5 types of territory throughout Europe. These types of territory are based on simple principles of good management and conservation of wildlife that adapt to the different hunting management in the various regions of the EU.

The Wildlife Estates (WE) Label was created in 2005, when key actors from national authorities and private organisations from areas related to nature conservation and land management took the opportunity to develop a philosophy entwining the concepts of wildlife management and sustainable land use. Since then, the project has expanded progressively to promote biodiversity conservation in the face of emerging political, economic and social concerns at both the EU and local levels. Since its creation, the WE Label has been facilitating collaboration between private and public actors in order to illustrate that the work undertaken by land managers is very much in line with biodiversity conservation. This has included the creation of National Delegations to engage with both private and public actors, such as NGOs, administrative bodies, universities, independent scientists and even businesses.

In October 2018, the WE Label was represented in 19 countries with 362 labelled estates covering 1,700,000 ha in various biogeographic regions.

Source and photo credit: **http://www.wildlife-estates.eu/**

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Changing farmers' behaviours

Habits and cultural changes play a major role in reducing human-wildlife conflicts (HWC). Well-trained and well-informed farmers who have established relationships with all stakeholders are less hostile toward wildlife and more prone to change certain behaviours and farming practices to find a balance between production needs and preserving the environment.

The use of guardian dogs to protect livestock bred in extensive farming systems is an old practice that has often been abandoned for decades. Reviving its use is feasible and promising, but, on a large scale, it may have huge economic burdens. Good genetic lines take time to be selected and puppies need time to be trained. This is why, in many countries, networks of Livestock Guarding Dog (LGD) owners have been established to exchange dogs and puppies. However, in areas with high flow rates of people, this solution is not appropriate. Dogs protect their herd despite what or who gets close to it. The same applies to valuable protected species. Guardian dogs can indeed disturb other wild animals and interfere with sensible and vulnerable species. In addition to LGD, the presence shepherd can also be very effective. Although it is becoming more and more difficult to find people ready and interested to do this work, reviving traditional farming techniques is extremely important. However, in some countries, these jobs have a negative social consideration and production is often not profitable enough to pay good wages.

For crop producers it is instead important to acquire advanced land management skills and be part of a vibrant network that can help develop and coordinate wildlife containment strategies. Coordinating crop sowing to avoid bird damage requires both a local and a season dependent approach, this is why farmers need to work together as a network. This can also help to lower the general management costs by sharing farming devices and machinery (e.g. **https://www.resourceefficient.eu/es/node/981**). Planting different crops to provide forage alternatives to wildlife is also a practical strategy to reduce and avoid damages. However, this approach requires having enough land, as well as financial and human resources, to produce forage that is palatable and attractive to game outside primary farming areas.

What can be done	Strengths	Weaknesses	Conditions for success
Use guardian dogs to protect the herd	Very effective. It needs a good training of the puppies.	Dogs can be aggressive if included in the herds in the wrong way. Bad genetic lines. It may interfere with visitors and other outdoor activities, but also with local wildlife. Vulnerable to poison-baits	Good genetic lines. Proper information of tourists. Training with the herd. Measures against poison. Establishment and operation of Networks between LGD owners for exchanging dogs/puppies
Shepherd presence	Very effective	Difficult to find people interested in this type of job. In some countries has a negative social value. Production is generally not profitable enough to pay good wages	Training schools for shepherd. It needs a minimum density of human presence and infrastructures in proximity of the work place
Revive traditional farming practices (i.e. transhumance)	Quite effective. There are hundreds of years of knowledge and culture stored in many European countries. They can be supported by public policies	They depend on the sustainability and profitability of farms, thus on the final price for production.	Capacity building. Public support. Build a good social image and appreciation of what farms produce. They need to be incorporated at a local or regional scale. Need monitoring and adaptation
Coordinating the crop sowing in order to avoid damages	Currently not implemented, so efficacy and cost-effectiveness,	It requires a local approach and it is season-dependant. Some species,	Upstream research on ethology and phenology

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	both in the short and long term, should be evaluated	especially migratory birds, are strictly dependent on nature cycles. Availability of machinery. Difficulty in coordinating each farmer's schedule, as in many cases there is an overlap of operations when a farmer is engaged in different crops.	coordination between farmers. Information exchange is crucial to have an effective plan and implementation. All the farmers sow at the same time so the consumable area will exceed the daily consumption capacity of wildlife (e.g. birds)
Diversionary feeding. Game crops	It changes the presence of wildlife in certain areas and reduces damages. It provides alternative forage	It must be combined with other control measures.	Availability of individuals to monitor and maintain the initiative. Attractive feed, provided at the right time. Must be equally palatable and timing must be right
Choice of less palatable crops for primary production	Effectiveness to be assessed	Reduced harvest/value of harvest	Financial flexibility to accommodate changes in crop types

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PROJECT: Livestock Guarding Dog (LGD) network

Extensive livestock farming systems are at a higher risk of carnivore predation compared to less extensive systems, aggravated by the lack of efficient damage prevention measures. Using LGDs may reduce the loss of livestock to predators considerably and it contributes substantially towards resolving human – large carnivore conflict. According to the Kennel Club of Greece and the Fédération Cynologique Internationale (FCI), there are three indigenous Livestock Guarding Dogs (LGD) breeds in Greece: the Greek Sheepdog, the White Greek Sheepdog and Molossos of Epirus.

The establishment of LGD networks involved several steps. At the beginning, there was a preparatory phase depending on project area size. In each area, the majority of livestock breeders owning and using LGDs were identified via extensive field surveys and a database was created. In each project area, a LGD network core team was formed using specific criteria. These criteria included quality of LGDs, conflict levels according to average annual losses per farmer as well as willingness to participate and co-operate. A questionnaire was completed during face-to-face interviews with selected farmers to assess LGD quality (in terms of morphology, behaviour and effectiveness), mortality causes, health condition, guardian training methods and prophylactic measures taken by the farmers. Information gathered was used to compare the quality and efficiency of LGDs and identify the best dogs, as well as to form a database. There was then an operational phase during which dogs were donated to farmers and monitored in order to: a) fulfil husbandry needs and b) enhance overall quality of LGDs in a particular farm or project area, especially where large carnivores recovered. Throughout this process an experienced veterinarian supported the farmers by providing veterinary advice and care when necessary during the implementation of the respective project

A network of owners of LGDs has facilitated coordination among stock breeders for the exchange of puppies and adult dogs between network members. Further, the network supports good practice in livestock management, especially breeding practice, veterinarian care, and training of LGDs, and it contributes to sustaining the quality of LGDs in the area in the long term. The socio-cultural benefits of the action should also be highlighted, particularly in terms of empowering stock breeders locally and letting the owners of good LGDs receive social recognition from other animal breeders and farmers, which is common in mountainous areas in Greece.

Source and photo credit: CDPNews (http://www.medwolf.eu/) and Demonstration of Conservation Actions for *Ursus artcos* and habitat type 9530 in Northern Pindos N.P., Grevena Prefecture, Greece (LIFE PINDOS/GREVENA - LIFE07 NAT/GR/000291)

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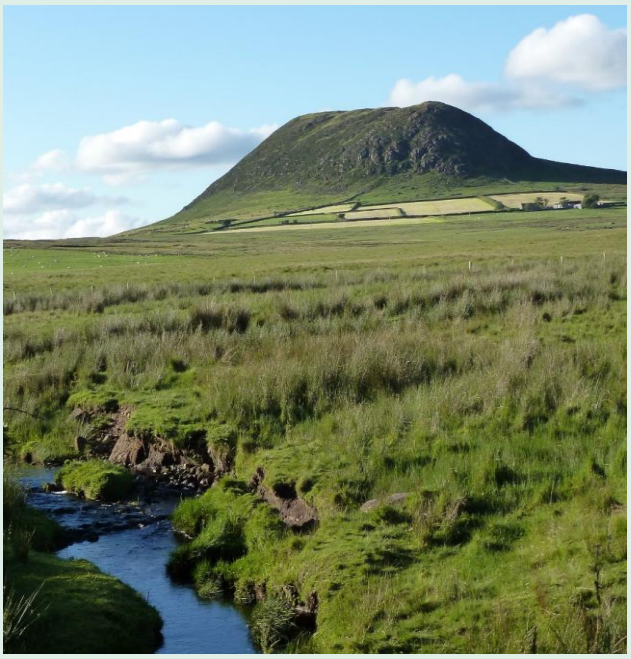
PROJECT: The Conservation of Breeding Curlew in Ireland (EIP-AGRI Operational Group)



In Ireland, the Curlew has been identified as a conservation priority in the Government's Prioritised Action Framework (PAF) and is Red Listed in the Birds of Conservation Concern. The National Parks and Wildlife Service (NPWS) commissioned a National Breeding Curlew survey in 2015. This study, completed in 2017, found an estimated >90% population Curlew decline since the 1970s. Habitat loss and degradation are key factors in this decline; however, in addition, as with other studies across the breeding range, very low levels of productivity as a result of predation were recorded, with many pairs failing at the nest stage and very few young fledged. Without significant intervention, Irish breeding Curlew may become extinct in the wider countryside within the next 10 years. Conservation action to prevent this was therefore urgently required. This project aims to prevent further losses to the Irish Curlew population through the protection and enhancement of known Curlew breeding sites in Ireland, and also to educate and compensate farmers and rural dwellers for creating and managing Curlew habitats in two focus areas, Lough Corrib in County Galway and the south Leitrim bogs.

The main project activities include determining Curlew Breeding outcomes by assessing the behaviour of adults and monitoring for the presence of juveniles and fledged young and trialling the use of temporary electric fences at nest sites. Farmers/landowners training on predator control is a strategic part of the project and it aims to control generalist predators at known nest sites and reduce the number of attacks. By enhancing habitats through capital works, the project aims to trial a hybrid agri-environmental scheme combining a results-based approach with some prescriptive elements specifically for Curlew.

Source: https://ec.europa.eu/eip/agriculture/en/find-connect/projects/conservation-breeding-curlew-ireland - Irish rural development programme 2014-2020 (EAFRD funds)

Photo credit: https://www.daera-ni.gov.uk/

funded by European Commission

Did you know?
The North Sea Interreg PARTRIDGE project illustrates the importance of conflict prevention, rather than damage control, in ensuring coexistence between agriculture and wildlife. The project aims to show-case how new and improved management solutions can improve biodiversity and ecosystem services by up to 30% by 2023 at 10 demonstration sites across the North Sea Region (NSR).
Reference: **https://northsearegion.eu/partridge/**

Habitat modification and management

Habitat modification, including fencing and the use of exclusion devices, is amongst the most effective methods. However, its effectiveness brings huge conservation and sometimes economic burdens. Eliminating suitable roosting sites and cover, like dense tree areas, that might attract birds is an option, but it has a major impact on the environment. Fencing large areas is generally very expensive and difficult to do, especially in mountainous and forested areas. In addition, fencing disrupts the natural habitat and isolates animal populations, impeding the natural movements and migrations of numerous species, not only the problematic ones. All these collateral damages must be considered and finding the right support and approval from all the stakeholders is not easy. Wire and electric fencing are definitely effective, but rather than fencing huge areas, it is more reasonable, although not as effective, to secure the animals inside or electric fence them at night. Fencing extensive areas is not only costly, but it is difficult and expensive to monitor and maintain. The use of repellents and/or scaring devices does not really fit with habitat modification, but the attention toward the possible side effects on the environment and on other wildlife must be the same. Use of both repellents and scaring devices on large areas must undergo approval by different stakeholders and all the positive and negative effects should be carefully evaluated before decisions are made.

What can be done	Strengths	Weaknesses	Conditions for success
Fencing	Efficient. Modular, flexible could be applied in layers. Good solution in small and medium farms. Effective for multiple species	May be expensive. May only divert wild animals from one place to the other. Can create habitat fragmentation. This measure alone might not be 100% effective	Availability of sufficient funding and human resources for installing and maintaining Knowledge of animals' behaviours.
Electric fencing	Modular, flexible could be applied in layers. Useful as a predator deterrent as well as herbivore excluder (multiple-species). Some types could be moved even on a daily basis without leaving permanent infrastructure footprint	Dependent on a charger, requires maintenance, not always reliable. Very effective habitat fragmentation, it limits movements of multiple species and access to visitors. It has high investment/maintenance costs and it may not be affordable for large farms	Planned by an expert at least the first time. Proper maintenance by the users
Landscape management (birds): decoy plots to distract birds from crops (alternative food resources) destruction of favourable habitat (roost, nesting areas)	Effective in the USA (blackbirds), not tested in Europe	Lack of knowledge to choose strategies in the European contexts (adaptation to species, crop, landscape). Side effect on biodiversity, especially for the destruction of favourable habitats. It requires coordination at the landscape level	Upstream research to choose the convenient strategy ("blind tests" very costly at this scale) inclusion in a broader project at the territorial level (landscape, biodiversity…)

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Repellents (birds)	Easy and effective, especially for certain species and on a small scale	The approval of new products is costly. Limited efficiency on large areas. Birds can be repelled and fly to other farms causing problems.	Upstream research on product efficacy. Coordination between farmers: good information exchange necessary
Scaring device (birds)	Easy to apply and to change location. Potential introduction of new technologies: drones, artificial intelligence for reactive devices	Birds get used to standing devices. Birds can be scared and fly to other farms causing problems elsewhere. May annoy neighbours or visitors, as well as local wildlife.	Coordination between farmers (first condition: information exchange). Use of approved devices to avoid causing problems to wildlife and people

PROJECT: ULTRAREP (EIP-AGRI Operational Group)

The presence of wildlife is becoming more and more significant in Tuscany (and across Europe), causing serious damage to agro-forestry entrepreneurs, with consequent loss of income. The most striking species are the wild boar (70% of the damage), the roe deer and the deer (a total of 20% of the damage).
The general objective of the ULTRAREP project is the experimentation of an ultrasonic system to protect crops attacked by wild ungulates. The project also includes models for monitoring the socio-economic and environmental impacts of the new systems and the transfer of the experience gained in Tuscany to other Operational Groups within the National Rural Network (NRN) and the European Innovation Partnership in Agriculture (EIP-AGRI).
The main objectives of the project are the protection of agricultural and forestry activities in situations of conflict with wild ungulate fauna, the monitoring of the operating conditions and the effectiveness of the device in critical environmental conditions (heat, rain, intense cold, snow, etc.) in order to be able to replicate the use of the devices in other homologous locations of Tuscany and the study of the economic, social, environmental and tourist effects that can be obtained with the massive application of the devices. The project also expects to evaluate the best instruments to develop a proper territorial planning for protection from ungulates extended to the whole of the Tuscany Region and establish how this experience could be transferred through the NRN and EIP-AGRI.

Source: https://www.ultrarep.it/ - Project funded by sub-measure 16.2 under the PSR-GO 2017 call of the Tuscany Region Rural Development Programme 2014 – 2020 (EAFRD funds)

Photo credit: https://www.ultrarep.it/ and http://www.natechescape.com/

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Advisory and extension support services

Amongst the possible strategies to reduce direct and indirect damages caused by wildlife, there is also the implementation of specialised advisory or extension support services. These may include teams of experts able to quickly visit the farms to help in key moments or the development of training and continuous assistance programmes for farmers.

Most of the approaches described above require the commitment of the government. It is indeed necessary to have government involved in those programmes that require continuous long-term support, both for the economic requirements and for the time necessary to realise them, and that are unsustainable for private or non-governmental organisations. This is, for instance, true when we deal with compensation schemes. Compensations do not solve the problem of conflicts, but it is a mechanism that, in addition to one of more other measures, builds trust from the farmers and puts them in the situation to better tolerate losses and damages. Compensation, however, does not bring benefits to anybody, it is only a side instrument that costs money and it is implemented to reduce personal uncoordinated actions against wildlife. Other initiatives, like the development of agri-environmental schemes or the promotion of insurance to cover damages require a government buy-in, since without an adequate support from public bodies, they cannot be developed and maintained.

What can be done	Strengths	Weaknesses	Conditions for success
Set efficient and fair compensation systems for lost livestock and/or to compensate damages caused by wildlife in general	The basis for social acceptance. Lower the conflict. Joint public/private insurance system	Cost. Not sustainable in the long run. Does not address identity issues (loss is not only a matter of money) and genetics. Frauds create mistrust	A clear understanding of direct and indirect damages. Identification of appropriate monetary and non-monetary (e.g. helping repair damaged fences) compensation options. Use public funds to pay for losses.
Specialised advisory or extension support services (e.g. teams of experts moving quickly to the farms to help farmers in key moments)	Farmers can learn from trained and skilled people. Measures are better adapted to local situations, but use wider knowledge. Intervention is quicker, so there are fewer losses. A great opportunity to train specialists and other farmers	It is expensive in terms of human and technical resources, so needs to be collectively supported. It could be overloaded during certain times of the year	Public commitment and funds. Transfer of knowledge and experience (capacity building) to personnel of competent services and management bodies (Parks, Forestry Service, local governments etc.)
Farmers can receive advice and support on dealing with wildlife and creating added value through collaborative tools such as Agricultural Land Stewardship. [2]	Helps to implement agreed solutions Improves long-term sustainability of farms Promotes active and innovative measures Link farming decisions with consumers and social supporters It could be operating at local and regional scales	It is slow to address immediate problems It is restricted to agricultural activities with added natural value	Adequate monitoring and adaptation

[2] A contract between farmers and social groups can be established to maintain High Nature Value (HNV) farming. Besides guidance and advice, farmers receive additional services for their commitment, economic compensation, improved markets, complementary tourism activity, investments RSP (Result-Based Payments)

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Further remarks

Any of the approaches described in this report should ideally be developed in an organised way, collecting requirements and information before being designed and then implemented, but, more importantly, data on the ongoing process, as well as on the outcomes of any initiative, should be collected and analysed. These data should preferably be available at national and, if possible, European level to guarantee a broad database of information that could help monitor the situation and, more importantly, share experience and acquired knowledge amongst different stakeholders and different regions.

Data is necessary to find a common ground about the magnitude of a problem and to develop simple estimates of both annual damage levels and wildlife population trends. Wildlife-agricultural conflicts should indeed be included in wider land-based policies that consider territory as a whole, addressing, at the same time, conservation of biodiversity, wildlife damages, protected areas, agricultural activities, hunting, tourism and other land uses.

At the same time, **social issues** should also be considered as a priority. Wildlife damage was more intense in the past, but people and farmers were adapted and able to keep producing even at a great human cost (e.g: staying with the animals the whole day, building effort-intensive dry-stone fences, pooling surveillance with neighbours, etc). Today, it is difficult for farmers to apply similar working solutions because of land abandonment, rural population decline, low business profitability, and the fact that their role is not always understood and they may lack social support. Improving social conditions means that farmers and land managers can be better prepared and more capable to find and apply solutions.

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Recommendations

As a result of the work done during the FG activities, while exploring available knowledge, practices and technologies, the FG experts looked at what is missing and what still needs to be addressed in the future. Based on this analysis, they proposed innovation pathways, suggesting ideas for Operational Groups (OGs) and provided indications for possible research fields.

Most of the ideas for future research have been prioritised into the following areas:

- Mitigation of damages and compensation mechanisms
- Tools for data collection and data analysis to assess, monitor and control damages
- Assessment and consideration of farmers' perspective and needs
- Bridging the urban-rural gap in addressing agricultural-wildlife conflicts
- Economic sustainability of farm business models in HWC areas
- Land-based tools to improve land management to avoid conflicts
- Communication and mediation tools to facilitate dialogue between stakeholders and to enlarge participation and improve governance

Research needs from practice

Despite conflicts between agriculture and wildlife having a long history and despite the human/wildlife interface having always had issues, some solutions to conflicts and damages caused by wildlife are known, while many remain unresolved. Together with innovation brought to agriculture and with the changing landscape and the density of animals living next to human beings, conflict scenarios have continuously evolved. Moreover, farmers' needs are not homogeneous either within the same farming type (i.e. livestock owners or fruit producers) or in different geographic areas (i.e. farming in a rural area on the mountain or next to the sea close to urban areas). The needs of different farmers may be completely in conflict with each other. All this diversity should be investigated and solutions adapted to the different scenarios to better respond to the majority of farmers in the same area.

New research is needed to allow results to be quickly translated into practical application and tested to be either discarded or applied at a large scale or in different contexts. Although farmers often think about dealing with these problems by themselves and that research does not meet their needs, a lot of work has been done to address this. The FG experts were invited to identify research needs from practice and propose possible directions for further research.

Amongst the seven research fields above, a detailed list of ideas and actions are described below and ordered according to priorities identified by the experts. Other identified research needs can be found in **Annex C** and are further articulated in the Minipapers.

Mitigation of damages and compensation mechanisms

1. The creation of a compulsory or subsidised insurance system should be explored and tested to be compared with traditional compensation schemes. Evaluate how to move risk management from government control to private sector and if this could be more practical and efficient.
2. Investigate whether common occurrences could be covered by insurances while extraordinary situations could be addressed with compensation. Analyse the most efficient and common measures in place across the EU/World to compensate farmers for their losses.
3. Evaluate the possibility to make stakeholders collaborate with an insurance compensation fund and evaluate the costs of prevention compared to compensation.

4. Assess the interest of insurance companies toward establishing insurance schemes that can compensate damages and losses caused by wildlife to agricultural operations as well as schemes that better adapt and respond to evolving situations such as wildlife demographic trends and climate change.

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5. Develop new and effective insurance schemes based on analysis of (real-time) data collected. It would be advantageous to create a system of data validation where "experts" are directly involved in order to establish trust.

Tools for data collection and data analysis to assess, monitor and control damages

1. Explore new ways to carry out environmental monitoring and to collect real time data (sensors, remote sensing, drones, etc.) that can help decision-making. The use of local and geo-referenced data to allow mapping and more accurate analysis, and upscaling data from the farm level should be explored.
2. There is a lack of reliable data and constant feedback regarding the efficiency of culling activities and compensation policies. It is necessary to investigate how to effectively and promptly integrate data from the field in order to reduce time for compensations while increasing trust from farmers in these instruments.
3. People living in rural areas and farmers often do not trust official data, choosing not to participate in data gathering and sharing. New ways to involve farmers, and all concerned stakeholders, in gathering and feeding data must be investigated. New tools to collect, interpret and validate data, including the use of a crowd-sourced (citizen science) approach and possibly validation by experts (participatory platform) should indeed be developed and tested.

Assessment and consideration of farmers' perspectives and needs

1. Explore how to improve communication channels and dialogue with farmers and agricultural businesses. Improvements in consultation strategies (bottom-up solutions) are needed as well as in providing prompt and useful feedback once information has been processed and before legal or operative decisions are taken. Any decision that is not shared and accepted will never achieve the expected results.
2. Identify new ways to make farmers, foresters, hunters and others participate in the preparation of legislation and policies related to farming and rural activities as well as to wildlife management. The participatory approach is the only way to have a broad commitment to work together towards shared objectives.
3. Explore how to get farmers to build stronger collaboration networks (especially at local level where conflicts may arise due to personal issues) in order to have a proper voice and representation in decision-making. Land planning and land management are amongst the most important fields where farmers should be listened to and represented.

Bridging the urban-rural gap in addressing agricultural-wildlife conflicts

1. Perform a complete study of the different legal conditions, related to agricultural and wildlife interaction, across the EU, ideally producing a "live" repository to be updated in real time. Such a study could help reduce the burden of conflicts in certain areas and promote the adoption of better practices based on the experience of other countries.
2. Conduct a survey on the views of EU citizens on issues relating to agricultural-wildlife conflicts. Responses should preferably be categorised by the type of landscape in which the respondents reside (urban, semi-urban, rural etc.) to better map the reality and to bridge the gaps in understanding the causes of agricultural-wildlife conflicts.
3. Develop an agroecological framework to link food production (from rural areas) with consumption centres (mainly in urban areas) in order to create added value for farmers and generate extra revenues to implement better measures to deal with wildlife. Monitoring of the entire process should be organised within the framework.

Economic sustainability of farm business models in HWC areas

1. Perform cost/benefit analysis (possibly based on real data) of adopting new farming strategies or including new revenue streams in traditional farms linked to the valorisation of wildlife. This can help farmers to make informed decisions.
2. Develop management prevention plans that address challenges caused by both mammals and birds. This will help farmers to increase biosecurity, reduce conflicts with wildlife and increase the profitability margins of their businesses.

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3. Traditional farming practices are sometimes insufficient to guarantee a sustainable business; diversification of farm incomes, when possible, should therefore be promoted. New ways to grant farmers with hunting rights (full or partial) on either private or state properties should be investigated to help bridge the gap and even to improve dialogue with hunters and other stakeholders.

Land-based tools to improve land management to avoid conflicts

1. There are still many structural constraints and a lack of proper land-based planning tools. These were mainly developed for other scopes rather than wildlife-agriculture issues. It is necessary to develop more accurate tools and test their impact in real multi stakeholder scenarios. There is also a need to develop and test proper protocols for farmers and land managers that can look at HWC issues with a broader prospective and that offers more sustainable long-term solutions with a holistic approach.
2. Investigate the implementation of measures included in rural development programmes (RDP) supporting mitigation of conflicts between farmers and wildlife. Special emphasis should be given to understand the reasons that made application of such measures successful in certain cases and unsuccessful in others.

Communication and mediation tools to facilitate dialogue between stakeholders and to enlarge participation and improve governance

1. Create a European platform to connect farmers, researchers and all the stakeholders to gather and exchange knowledge more efficiently. It should preferably relay and be connected to local centres to better account for context-specific issues, and ensure accessibility, credibility and visibility of the information for farmers. Data standardisation would be necessary to correctly interpret and compare information from different countries.
2. Identify new methods to improve the interest and commitment of the different stakeholders, especially farmers, looking for those who have special interests in a particular area. Work should focus on identifying why people would like to get and stay involved.
3. Analyse the role of mediators to resolve conflicts and manage difficult relationships once dialogue is a priority. Members of the different stakeholder groups are usually not suitable for this role and external people should be identified. Some professionals can play a better mediator role in each situation by leveraging their experience in mapping interests along with stakeholders and establishing new communication channels based on common grounds rather than conflictual topics.
4. Map the main strategies adopted to resolve conflicts and tensions between the different stakeholders. This would allow mediators to have a better understanding of the most common problems and use previous experience to address the lack of understanding between interest groups in adopting more effective solutions.

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Ideas for innovation projects and EIP-AGRI Operational Groups

With the aim of inspiring innovative actions, three main themes for EIP-AGRI Operational Groups were elaborated by the FG. The ideas cover different types of projects, but a local, regional or national approach should be considered, and ideas adapted accordingly, based on the needs and the context in which they will be implemented.

Theme: Wildlife as a resource

Wildlife harvesting, whether through hunting, trapping or culling activities produces large quantities of wild meat every year. Although most of this meat does not undergo stringent official veterinary controls that would allow commercialisation at the EU level, most of the meat is consumed locally by those who harvested it, or by those in their immediate social circles. However, not all of the meat is taken advantage of, and may be wasted or discarded. Hunters may even forego the chance to hunt animals, including so-called "pests" when they have no use for the meat that would be harvested. On the other hand, farmers and small/medium abattoirs, especially those located in rural areas, have the infrastructure to process this meat and they could be active players and primary beneficiaries of this value chain. There are good opportunities to profit from processing game meat and selling it.

The OG should explore possibilities for farmers and other stakeholders to create additional sources of revenue from game meat, and thus get a value from wildlife that can compensate losses due to wildlife damage. To do so, it is crucial to establish a system that guarantees meat that is safe for consumption and allows it to be commercialised. Promotion and marketing of wildlife products is important and requires that special attention be given as listed below.

The project would require involvement of hunters, farmers, researchers and government officials. The outcomes, for the main stakeholders, would be:

- Hunters: better access to the market, incentive to harvest even when no meat is needed for personal consumption, and a better acceptance of hunting activities
- Farmers: additional sources of revenue that can compensate losses due to wildlife damages
- Slaughterhouses: new revenue stream and market diversification
- People: added value to the meat (low fat, healthy meat), branding opportunities
- Pet owners: high quality meat in pet food on the market

The activities of the project would include:

- Explore the possibilities of providing farmers with game slaughtering and processing facilities and with the proper sanitary certifications and control measures necessary for marketing the product;
- Explore existing and new value chains to commercialise the meat;
- Establish a strategy to deal with a non-constant source of meat and the provision of small quantities;
- Establish quotas for meat that goes to the market;
- Identify means of branding/marketing;
- Identify the best marketing channels and commercial operations.

Application idea

A local business organisation can create, within its community, a selling point (shop or restaurant) where game products can be sold to both local consumers and visitors. This place will soon become well known between the people as a place where the meat from "our forests" and "our farms" is for sale. In Poland, hunting clubs have the right to sell whole wild animals to people (Myronenko 2015) and this is becoming a new method of informing and providing people with quality game meat.

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Theme: Assessment of territorial strategies for wildlife damage control

The double goal of preserving biodiversity while protecting agriculture from damages caused by wildlife seems contradictory, becoming, for many natural resource managers, a win-lose situation. Either the goal is set on protecting biodiversity and consequently accepting wildlife damages that affect agricultural production (and other human activities) or, conversely, prioritising agriculture production or other industrial activities with disregard and marginalisation of wildlife. Farmers often feel the presence of wildlife species on agricultural fields as a burden, leading to a widespread belief that there should be separated areas and no wildlife should be allowed on their crop or livestock farm, especially wild animals causing damages. This way, wild animals are considered as separate and, mostly, just intruders.
Agroecology aims to develop efficient farming practices and land management tools that intentionally include functional biodiversity at multiple spatial and temporal scales, seeking for a productive coexistence with wildlife that could maintain key ecosystem services for agriculture, such as soil fertility, pest and disease control, water use efficiency, and pollination.
There is a need for a coordinated action at the territorial level since a methodology/framework for cooperation at this scale is still missing.

The project would require involvement from farmers, hunters, local inhabitants, researchers and government officials. The outcomes, for the main stakeholders, would be:

- Farmers: validate the strategy and test precise farming management practices
- Researchers: monitoring tools at territorial level (dashboard connecting data on animals, damages, etc.)
- All: establish better relationships among farmers/hunters/ecologists

The activities of the project would include:

- Propose prevention measures (e.g. synchronised sowing, sown strips)
- Monitor animal behaviour/movements and make a link with damages in the field and prevention measures
- Test new technologies and their effectiveness (e.g. drones, infrared cameras, sensors)
- Assess results over the lifetime of the project
- Develop tools for sharing information

Here, a list of actors/organisations that should be involved:

- Farmers: to test the strategy and receive feedback on the developed tools
- Farm cooperatives: to evaluate impact and results on a larger scale
- Agro-ecologists: to guarantee a science-based approach
- Wildlife managers: to include protected areas in territorial initiatives
- Hunters: to keep the wildlife numbers at sustainable levels
- Technicians from hunting organisations: to monitor the impact of scheduled activities
- Veterinarians/agricultural engineers: to assess damages

Theme: Involving farmers in wildlife decision-making

Farmers are often reluctant to engage with wildlife management. They are mostly used to being told what to do and they often complain about not having any time when asked to be actively involved in management activities. However, they have a lot of valuable information to contribute and, because they spend a lot of time in the field, they are well placed to provide up to date information on wildlife sightings, movements and activities. There is a need to find a way to better engage farmers and involve them in sharing information, monitoring wildlife numbers, observing their behaviour and assessing damages, thereby taking a more active role in wildlife management and gaining value from this participation.

The project would require involvement from farmers, hunters, NGOs, wildlife organisations, research institutions and government departments. The outcomes, for the main stakeholders, would be:

- Farmers: they will share information and experiences with other farmers, in order to facilitate the adoption of new and more effective strategies to cope with wildlife damages
- Hunters: understanding of how to try to adapt harvesting strategies to the realities of farmers

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- Researchers and governments: farmers will provide valuable up to date information to expand the knowledge base and build up an accurate picture of wildlife activity across a large area
- All stakeholders: will have direct feedback and much better engagement from farmers
- Governments: farmers will become a valuable part of the decision-making process for developing strategies to deal with wildlife on farmland.

The activities of the project would include:

- Analysis of the agriculture-wildlife conflict situation, including farmers needs and solutions developed in a similar scenario
- Share the results of the analysis with farmers and their communities to fill the gaps and collect their feedback
- Develop and test an app which allows to record information on wildlife movements and damages
- Farmer trainings and one-to-one meetings with more sceptical farmers
- Establish a recipient organisation that will be responsible to receive the data and make them available to other stakeholders
- Data analysis by research organisations and government bodies, which will provide feedback and advice to respond to and limit problems

Here, a list of actors/organisations that should be involved:

- Farmers: a cross section of farmers across an area willing to participate
- Independent information broker (or adviser): to work with the farmers along the whole process. A representative of an established organisation could be perceived as having some bias by the farmers, hence the need for an independent person
- Wildlife/farming research organisations: to develop what happens at the receiving end of the data recorded by the app
- Digital data specialist: to develop the app and to research existing applications which could be adapted

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Annex A: Members of the EIP-AGRI Focus Group

Name of the expert	Professional background	Country
Triantafyllidis Alessandro	Adviser	Italy
Keena Catherine	Adviser	Ireland
Sausse Christophe	Researcher	France
Widemo Fredrik	Researcher	Sweden
Barnes Helen	Adviser	United Kingdom
Ionel Mugurel Jitea	Researcher	Romania
Robles del Salto José Fernando	Adviser	Spain
Fangauer Julia	Adviser	Germany
Ryan Mark	Representative of an NGO	Hungary
Belardi Mauro	Researcher	Italy
Odintsov-Vaintrub Michael	Other	Italy
Herrera Calvo Pedro María	Adviser	Spain
Kjellander Petter	Researcher	Sweden
Psaroudas Spyridon	Representative of an NGO	Greece
Snellman Thomas	Farmer	Finland
Talvi Tõnu	Civil servant	Estonia
Hažić Valentina	Farmer	Croatia
Peternelj Valentina	Farmer	Slovenia
Znajewski Wojciech	Representative of an NGO	Poland
Poux Xavier	Other	France

Facilitation team

Capobianco Dondona Andrea	Coordinating expert	Italy
Didicescu Sergiu	Task manager	Romania
García Lamparte Andrés Manuel	Backup	Spain

You can contact Focus Group members through the online EIP-AGRI Network.
Only registered users can access this area. If you already have an account, you can log in here
If you want to become part of the EIP-AGRI Network, please register to the website through this link

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Annex B: List of Minipapers prepared by experts

All mini-papers can be downloaded from the "Wildlife and Agricultural Production" Focus Group page on the EIP-AGRI website.

No.	Minipaper topic	Coordinator	Contributors
MP 1	Collaboration and partnerships between different stakeholders' groups	Mark Ryan	Julia Fangauer, Tõnu Talvi, Xavier Poux, Pedro María Herrera Calvo
MP 2	Managing human-wildlife relationships under a territorial framework	Pedro María Herrera Calvo	Wojciech Znajewski, Valentina Peternelj, Christophe Sausse
MP 3	Conflict management at the farm level	Michael Odintsov-Vaintrub	Mauro Belardi, Thomas Snellman, Valetina Hažić, Valentina Peternelj
MP 4	Effective instruments to reduce conflicts between farming and wildlife (HWC)	Alessandro Triantafyllidis	Spyridon Psaroudas, Jitea Ionel Mugurel, José Fernando Robles del Salto, Keena Catherine

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Annex C: Research needs from the mini-papers

Collaboration and partnerships between different stakeholder groups

Understanding and characterising human needs
Further research is needed into understanding and assessing people's needs when developing collaborative partnerships. Needs are of different kinds: quantitative, qualitative and organisational/strategic. The tasks of facilitation, mediation and brokering are time-consuming and require a certain physical presence, with frequent contact with stakeholders. Many projects are ambitious but stakeholders often lack tools and references to properly quantify the actual resources needed (human-hours, energy and money). The technical and human skills needed should be carefully assessed before trying to address any problem. Building partnerships requires the effort of several actors, representing different interests. There is hence a need to have ex ante evaluation tools available in terms of strategic management and governance.

Conflict management on the farm level

Practical welfare protocol application and precision livestock farming (PLF) technologies
Both welfare assessment and PLF are fields being extensively researched in the last two decades. However, the penetration of products to farm daily management practices is still limited, especially among extensive farmers and smallholders. Although some research has been done in reducing the complexity of protocols and technology, it is still a cumbersome approach for the user. There is still a need for further research focusing on: end users, consumer satisfaction, ease of use of the different tools, motivation for application and user feedback.

Community empowerment
One of the critical aspects of recruiting farmers with a positive approach towards HWC goes through the single farmer's empowerment. Guidelines, practices, and regulations require a population willing to execute them; otherwise, their effectiveness may be at risk. Hunting rights management and involvement in culling procedures are examples of such collaboration. Comparative research of different management systems, including evaluation of user feedback (farmer/hunter), can significantly transform the discussion from a hypothesis based on a factual dialogue.

Managing farmers-wildlife relationships under a territorial framework

Address agricultural-wildlife relationships with land-based tools
Agriculture-wildlife relationships are complex and multi-factorial. Land planning tools should be used, or new specific spatial tools created, to deal with conflicts. It is indeed necessary to explore how to better use an ecosystem-based approach. These tools are fed by data and information displayed over maps, so it is possible to use existing available research and data, to improve field information on specific subjects and use and share knowledge from local agents. This information needs to include a good assessment of wildlife damages. In any case, all this data should be displayed in maps, using a well implemented and frequently updated GIS

Effective instruments to reduce conflicts between farming and wildlife

Rural development programmes
Investigate the type, the budget size and the success of measures included in rural development programmes that promote the coexistence of agricultural activities with wildlife. It is necessary to evaluate the type of measures (prevention, non-productive investment, agri-environment scheme etc.) as well as the results of implementing these measures (reasons of success or failure, comparison between geographical areas etc.).

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The European Innovation Partnership 'Agricultural Productivity and Sustainability' (EIP-AGRI) is one of five EIPs launched by the European Commission in a bid to promote rapid modernisation by stepping up innovation efforts.

The **EIP-AGRI** aims to catalyse the innovation process in the **agricultural and forestry sectors** by bringing **research and practice closer together** – in research and innovation projects as well as *through* the EIP-AGRI network.

EIPs aim to streamline, simplify and better coordinate existing instruments and initiatives and complement them with actions where necessary. Two specific funding sources are particularly important for the EIP-AGRI:

- the EU Research and Innovation framework, Horizon 2020,
- the EU Rural Development Policy.

An EIP AGRI Focus Group* is one of several different building blocks of the EIP-AGRI network, which is funded under the EU Rural Development policy. Working on a narrowly defined issue, Focus Groups temporarily bring together around 20 experts (such as farmers, advisers, researchers, up- and downstream businesses and NGOs) to map and develop solutions within their field.

The concrete objectives of a Focus Group are:

- to take stock of the state of art of practice and research in its field, listing problems and opportunities;
- to identify needs from practice and propose directions for further research;
- to propose priorities for innovative actions by suggesting potential projects for Operational Groups working under Rural Development or other project formats to test solutions and opportunities, including ways to disseminate the practical knowledge gathered.

Results are normally published in a report within 12-18 months of the launch of a given Focus Group.

Experts are selected based on an open call for interest. Each expert is appointed based on his or her personal knowledge and experience in the particular field and therefore does not represent an organisation or a Member State.

*More details on EIP-AGRI Focus Group aims and process are given in its charter on:
http://ec.europa.eu/agriculture/eip/focus-groups/charter_en.pdf

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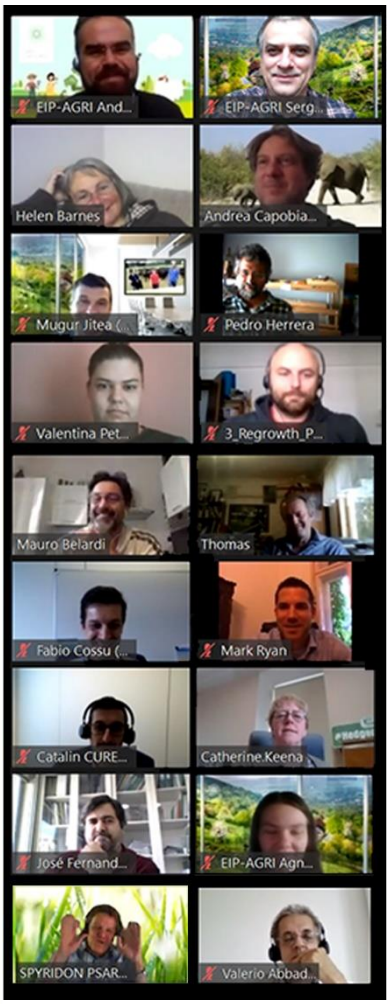

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