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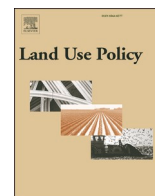
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New 'old' risks on the small farm: Iconic species rewilding in Europe

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ABSTRACT

Increasing production to meet the growing demand for food whilst conserving biodiversity and reducing pressure on natural ecosystems is a dual planetary challenge of the highest order. The world's small farmers are at the forefront of this challenge, being asked to make greater contributions to both enhancing food and nutrition security, and to the stewardship of natural assets. We focus on rewilding involving the conservation, management, and reintroduction of species, and how the praxis impacts small farmers in Europe, simultaneously being encouraged to increase food production. We present empirical data from four European case studies featuring Norwegian wolves, Scottish Sea Eagles, and wild boar in both Spain and Italy. We adopt Beck's World Risk Society concept to situate what small farmers report as trade-offs, within a broader sociological schema, to show underlying features of a new landscape.

1. Introduction

According to the World Bank, agricultural production may have to more than double by 2050 to meet increased demand for food caused by population growth, yet is expected to fall as a result of environmental damage associated with climate change (Gardner, 2013). For the United Nations Food and Agriculture Organisation (FAO, 2018), "Today's key challenge [further articulated through Sustainable Development Goals 2 and 15] is how to increase production to meet the growing demand for food, feed and bioenergy while conserving biodiversity and reducing the pressure on natural resources and ecosystems". Within the praxis of this global challenge lies an inherent tension. Food and nutrition security (FNS), both in its discourse and related policy, explicitly aims to increase agricultural production while, in many parts of the world, the promotion of biodiversity is experienced by farmers as putting the opposite pressure on their farming practices.

Food and Nutrition Security (FNS), based on the FAO 2009 FAO definition, 'exists when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life'. The logic of FNS rests on four conceptual pillars, namely, access, availability, utilisation, and stability (FAO, 2008; Gross et al., 2000). The FAO

aspiration, to reduce the pressure on natural resources and conserve biodiversity (FAO, 2018), is supported heavily by pillar four. The stability of the system has an environmental sustainability dimension, although this pillar also underpins various economic and political aspects of food systems beyond ecological management. Policy commitments to this conceptual framework notwithstanding, ongoing practices of biodiversity conservation and promotion are often misaligned with efforts to increase food production, a weakness exemplified in a negative linear relationship between wheat yield and farmland bird species across Europe (Donald et al., 2006).

Using primary interview data from small farms in four project reference regions, we capture and interpret reported tensions between competing FNS and rewilding objectives where the challenges of large increases in productivity coexist with species reintroductions and wildlife conservation goals.

Many advocates of rewilding engage with FNS concerns arguing that the circle can be squared by 'sparing farmland' for biodiversity and other environmental benefits without a net loss of food production (Lamb et al., 2016; Monbiot, 2013). Suggestions include the utilisation of much of the colossal food waste generated by current food systems (Tree, 2018) to counterbalance production losses. Alternatively, or in combination are proposals to increase net production, with gains

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elsewhere through higher yields often predicated upon advanced plant breeding technologies, exploiting less marginal, more productive land. Some reformers advocate a radical shift from livestock to arable, for example, calling for the abolition of livestock in favour of a global, plant-based diet (Reese, 2018). In addition, there are radical notions around non-agricultural food production or farm-free food including lab meat and food produced from bacteria (Monbiot, 2019). This paper acknowledges these contributions, however, our study addresses rewilding, as it is currently being practiced, especially relating to species reintroductions and wildlife conservation in Europe.

We advance this critical discourse by focusing on the interview responses from small farmers in four EU contexts where, through stakeholder participation in a research project, concerns were raised about wildlife management practices as major constraints on food production. This paper explores rewilding initiatives, highlighting related trade-offs and tensions with FNS, aiming to better understand the perspective of farmers on the front line of rewilding.

Small scale agriculture plays a key role in supporting the livelihoods of the majority of the world's poor (Hallegatte et al., 2016). The current contribution of smallholder agriculture to FNS has been recognised as both foundational to FNS in many countries and ecologically significant in all countries (Ricciardi et al., 2021). The High Level Panel of Experts (HLPE) of the Food and Agriculture Organisation (FAO) find:

"The contribution that smallholder agriculture makes to world food security and nutrition is both direct, in as far as it links production and consumption for many rural households, and indirect because (a) it is provisioning domestic markets with the main food products, (b) it does so in a potentially resilient way, and (c) because in many countries smallholder agriculture functions as an important social safety net." (HLPE, 2013, pp. 11–12).

This contribution 'in many countries' is relevant in the European context. In the case of European small farms, even though large-scale agriculture and corporate supply chains dominate the food system across Europe, recent research indicates that in some regions and for some products, small farms make important contributions both to production and to local food availability (Arnalte Mur et al., 2020; Galli et al., 2020; Hernández et al., 2021; Rivera et al., 2020; Šūmane et al., 2021). In addition, it is recognised that small farms in Europe play an important role in providing rural jobs and livelihoods and maintaining the social fabric of rural areas, thus contributing to the objective of balanced territorial development (EU, 2011; Davidova and Bailey, 2014; Davidova et al., 2012; Tisenkopfs et al., 2020).

For millennia farmers have de-wilded spaces, pushing back the wilderness, controlling wildlife and engineering landscapes, to produce ever greater quantities of food supporting rising global populations (Dow et al., 2005). Everywhere that human civilisations have flourished, farmland has prospered at the expense of wilderness. Today, despite the world's relentless, growing demand for food, a widespread reversal of this trajectory is gaining momentum. Outfield pasture and even arable land are being both actively and passively converted to forests or natural reserves where wildlife, including iconic predators such as bears, wolves, and eagles, are being reintroduced or conserved and protected (Boitani and Linnell, 2015). Terms like 're-wilding', 'nature restoration', and 'nature gardening', have entered environmental discourse, signifying programmes aiming to support and expand wildlife populations (e.g. Hall, 2014), with the primary aim of repairing degraded nature, but also being promoted variously as delivering wider socio-economic benefits, from natural flood management (Ianoş et al., 2019) to carbon storage (Matthews et al., 2020), and in the form of recreational and human well-being (see Cerqueira et al., 2015; Cortés-Avizanda et al., 2015).

Rewilding, which is at the centre of current biodiversity discourse (Martin et al., 2021), aims, according to the Oxford English Dictionary, to "restore (an area of land) to its natural uncultivated state (used especially with reference to the reintroduction of species of wild animal that have been driven out or exterminated)". Another source more

broadly describes rewilding as:

"... a progressive approach to conservation. It's about letting nature take care of itself, enabling natural processes to shape land and sea, repair damaged ecosystems and restore degraded landscapes. Through rewilding, wildlife's natural rhythms create wilder, more biodiverse habitats." (Rewilding Europe, n.d.).

In many cases 'allowing nature to take care of itself' paradoxically involves wide-ranging management and governance of ecosystems, the substance and rationale of which are, more often than not, contested (Martin et al., 2021). Through environmental policy and action, the anthropomorphic configuration of nature is being extended (see also McKibben, 1990) albeit often disrupting farming related practices. Where farmers and rural communities have traditionally hunted or controlled wildlife, sometimes to the extent of entirely eradicating large predators, there are now new restrictions on their control practices. Alongside numerous examples of species reintroduction, habitat restoration, and conservation activities, there are new legal instruments, international conventions, enforcement regimes and changed societal values, all signalling a paradigm shift. We provide four detailed, illustrative case studies below.

While both sides of the FNS and biodiversity equation appeal to public goods of the highest order, on the one side, feeding the world's growing population (UN SDG2), and on the other arresting the environmental destruction that threatens mass extinctions of species (UN SDG15), there is growing recognition of a need to both theorise and develop policies to meet the combined challenge within planetary boundaries (Ericksen et al., 2009; Fouilleux et al., 2017).

2. Rewilding in the World Risk Society

In this paper, we seek to better understand a world in which many small farmers see themselves entangled in decisions around promoting wildlife at the expense of food production or vice versa. The Risk Society (Beck, 1992, 1996) comprises a sociological account of contemporary society which we use as a lens to theorise hypothetical tensions between FNS and rewilding. In our increasingly globalised world, defined by Beck as a period of second modernity (Beck, 2016), critical risks associated with technological development, alongside a whole panoply of global threats, are taking centre stage. This new World Risk Society (WRS) paradigm (Beck 2006a, 2009a, 2009b) breaks with the past in which incremental knowledge and reflection revealed evermore of a world celebrated as enjoying an epoch of enlightenment. WRS constitutes a radically different *conditio-humana* (conditions composing the essentials of human existence) in which fundamentally, ambivalent contingencies, complexities, uncertainties and risks, some yet to be conceptualised, demand new categories and perspectives to distinguish them from earlier phases of social evolution (Vertovec and Cohen, 2002). Beck proceeds to argue that the scale of these geographically and temporally unbounded risks, that variously threaten global annihilation, is undermining the ability of nation states, their institutions, and industrial society to fathom the "abyss of ontological insecurity" confronting them (Beck, 2009a, 2009b, 2009c).

Beck traces the emergence of novel societal relationships to a prevalent, 'manufactured risk'. WRS is a social order newly defined through a mode of risk distribution whereby human systems generate the risks that condition most lives. Systemic risk comprises multi-hazards with interdependencies, feedback loops and knock-on effects, happening at a global scale, and arising from the socio-technical accomplishments of modernity. Risk consequences extend into agricultural domains with WRS characterising modern practices as constitutive of a distinct new paradigm replete with complex, far reaching risks inherent in contemporary food systems, ranging from emergent prion diseases in ruminant livestock (Beck, 2006a, p. 199), to toxins threatening soils and plants (Beck, 1992), to unknown dangers posed by genetically modified production and foods (Fabiansson and Fabiansson, 2016). Globalised processes, long supply chains and technological developments engender

uncertainties and create disruptions in newly powerful ways. “Nowadays, pineapples, no less than nursing staff for the elderly, have a global background (and everyone knows this).” (Beck, 2016, p. 5).

Beck contends that contemporary World Risk Society (WRS) places the individual in a new relationship to risk. People have become increasingly individualised with social buffers connected to cooperative organisation, to community and to place (e.g., workplace-founded collective action, including community and intergenerational hunting) having significantly declined within second modernity. Detachment is far from emancipatory (Beck, 1992). De-traditioning of the individual and society brings a heightened immediacy of crises which appear to be borne individually and represent personal failure. WRS individuals become responsible for their destinies and their means of subsistence from education to the market. This de-traditioning is accompanied by deepened institutionalisation and standardisation of ways of life.

In some ways, small farmers have been atypical of the collectivised labour relations in industrial society that Beck critiques, with family farms and deep-rooted place-based communities retaining anachronistic, pre-modern patterns of practice long after urban centres modernised, however, increasingly the gravitational pull of a paradigmatic shift in reflexive modernity is being felt on the remotest of small farms. There is ever greater intersection with modernity through a myriad of socio-technological and socio-economic practices that increasingly encompass wildlife dynamics. Farms are subject to controls, incentives, or penalties around participation in agri-ecological practices including species reintroductions and conservation measures. While the farmer and the wild nature around the farm may appear to be locked in a timeless struggle, perhaps most iconically framed as shepherd versus wolf, in consequential ways this relationship has become materially entangled with modernity, with the wolf but one of many boundary objects (Trompette and Vinck, 2009) marking changed frontiers between competing interests.

Against this backdrop, small farmers face parochial and immediate challenges in the form of predatory wildlife killing livestock or wild beasts destroying crops. While the primordial struggle between farmer and nature clearly pre-dates WRS, in a very concrete sense, old dangers are newly metamorphosed by reflexive modernity (Beck, 2009b, 2016) through anthropocentric reversals of ancient battles whereby human agency, not wild nature, facilitates the rewilding of spaces and forces a redefinition of agricultural practices. Beck challenges research to explore the destruction and renaturalisation of nature through its production, suppression, normalisation, and integration within a socio-technical and institutional context shaped by cognitive actors (Beck, 1996). Developing WRS, Beck (1992) theorises four interrelating components of reflexive modernity that constitute this societal reformation. Our study considers the reported experiences of small farmers dealing with wildlife risks in the light of these reformative components, namely:

1. De-traditionalization: Farmers within a given locality formerly shared a common bond of solidarity forged through shared labour across the generations on similarly configured small farms (Jongman, 2002) where they grew time honoured ranges of produce in customary ways and reared long established breeds of animals. Together they faced common risks. Beck characterizes this former rootedness as in freefall.
2. De-localisation: The local sphere, within which pre-modern risks were situated, managed and consequential to the individual, has been eclipsed in reflexive modernity by wider ranging structures that have added regional, national, international and global dimensions to societal risks (Beck, 2002). Conservation politics exemplifies the emergent, internationalised, convention-shaped spaces disrupting local decision making.
3. Individualisation: The individual, the small farmer included, becomes decoupled from former aspects of community (Beck, 2016) and increasingly faces risks alone. There is greater individual responsibility for complying with rapidly expanding and standardising institutional governance. A competitive, global market individualises farms by rewarding differentiation and specialisation. An acute division of labour subjects farmers to individual contracts and personal liabilities, isolating them at their own risk. As institutionalised actors, individually accountable for professional practices, small farmers, in common with many WRS professionals, must singularly navigate the ambivalent contingencies and complexities in these profoundly uncertain times.
4. Globalisation: Institutions and governance regimes are evermore far reaching. Transgressive and transformative impacts of world markets are felt on the remotest of farms. Farmers are cast adrift from traditional social bonds, plunged into globalised markets, subject to the effects of national, international, and global treaties covering trade, environmental protection, wildlife conservation, food regulation, animal welfare, and a host of other areas. The additive effect is the emergence of WRS experienced by local actors in which incalculable, non-compensable consequences arise exogenously (Beck, 2009b).

In this paper, drawing upon Beck’s World Risk Society (Beck 2006a, 2009a, 2009b) we consider: How predators and other wildlife are a changed threat to small farms, elevated from perennial ‘old fashioned’, ‘timeless’ risks to manufactured risks within an anthropocentrically risk reshaping modernity? When risk is experienced as omnipresent there are, according to Beck (2009b, p. 291), only three possible reactions: denial, apathy, or transformation. Not satisfied with the first two options, we follow Beck in posing the additional question: How does the anticipation of manmade futures (here: rewilding) and its risky consequences (for small farmers) affect and transform small farming communities including their perceptions, living conditions, governance arrangements and institutional relationships?

3. Methods

This study applies a WRS theoretical lens to a subset of data collected for an EU project.¹ The wider project adopted a food systems approach (Ingram, 2011) to investigate the actual and potential contribution of small farms to FNS across Europe and Africa. Researchers took an exploratory approach, asking many open-ended questions, the results of which were subject to thematic analysis (for example Rust et al., 2021). A consortium exercise in the final year of the project, integral to the projects design from the outset, encouraged sub teams to form to further develop findings into outputs. Farmer concerns about wildlife constraining contribution emerged during the fieldwork and were further highlighted by the analysis. These concerns were entirely consistent with the wider project’s framework placing farms’ productive capacity at the centre of the food system and critically influencing FNS.

The sub team that formed (the current authors) represents Norway, Scotland, Spain and Italy where particular issues around species reintroduction and conservation are prominent. This sub team was able to develop four case studies in a detailed manner from professional familiarity with the issues and drawing on contextual background from secondary literature.

The definition of a small farm was initially tackled within the project’s Conceptual framework (SALSA) which identified small farms as those of less than 5 ha in size and 8 ESU (which is equivalent to €9800 of Standard Gross Margin (SGM)). However, the need for a more flexible interpretation allowing for varying regional contexts quickly became apparent. For example, in Norway and Scotland 5-hectare farms are a rarity in the two reference regions where rough grazing dominates the

¹ EU Horizon 2020 research project SALSA - ‘Small Farms, Small Food Businesses and Sustainable Food Security’, which studies the role of small farms in food and nutrition security and in regional food systems.

terrain and a higher threshold of 10 ha was permitted to allow for a more representative sample of what is locally considered very small. In contrast, in Southern and Eastern Europe 5-hectare farms are a common sight. 'Small' can be a testing concept in this context. According to [Tree \(2018\)](#), Knepp farm, home to her family rewilding project, is a small farm at 3500 acres (14,156 Ha). That Knepp Farm is bigger than all the project's sample farms across Europe and African reference regions combined illustrates the projects' need for flexible yet explicit criteria to define, what might more loosely be called, relatively small farms. The research is predicated on the assumption that a significant proportion of European farms are under 10 ha yet their combined contribution to food systems is significant and likely to remain so.

The project's researchers interviewed small farmers, small food business owners and key informants across 25 European and 5 African reference regions using a common interview guide. Interviews were conducted in person where possible. Amongst questions exploring small farm participation in the food system holistically, the guide included a subset of questions asking about potential risks to the small-scale farming sector, specifically production constraints. Of particular interest to this study, farmers were asked: 'What are the main external sources of risk for your farming activity? And 'Could you potentially produce more food in your farm? (a follow-up question enquired 'If yes, what is preventing you from doing so?'). Interviews were followed-up with focus groups and regional workshops.

While half of all reference regions reported wildlife-related production constraints, 60 farmers in total from fifteen of the 30 reference regions, we present four of the project's reference regions where a sub team, the current authors, were able to perform more in-depth analysis of governance arrangements and specificities of the issues in the form of case studies. Norway, Scotland, Spain and Italy are presented below highlighting specific tensions around named wildlife species. Undoubtedly, some small farmers who reported wildlife reintroduction and species conservation as constraints on production, would not necessarily increase food production were they to be relaxed. Further study is required to gauge how strong any effect is, perhaps looking at productivity before and after a reintroduction or through a comparative spatial analysis, taking great care to consider all relevant variables. Here we were interested in stakeholder self-reporting and contextualisation in terms of governance arrangements, however we are able to show a pattern across diverse territories. Furthermore, the interview data was augmented by desk-based research in each of these four selected reference regions, to explore the governance arrangements surrounding the reported tensions and to consider social, technological, environmental, economic and political (STEEP) ([Aguilar, 1967](#)) features relevant to each case. Beck's World Risk Society (2006a, 2009a, 2009b) was deployed as a conceptual framework to interpret the findings.

4. Findings

4.1. Identification of risks

Fifteen of the 30 reference regions, 60 farmers in total, implicated wildlife, reporting that maximising production and wildlife conservation was typically a trade-off. In Norway, Scotland, Spain and Italy approximately one third of respondents reported challenges with wild animals. Species of acute concern differ across regions, wolves being mentioned in eastern parts of Europe (Bulgaria, Poland and Italy) in addition to Norway, while the reintroduction of sea eagles in Scotland reportedly challenges many sheep farmers in remote areas. Across southern and eastern parts of Europe, increasing numbers of wild boar were of great concern to farmers, damaging crops and property, and causing road traffic accidents. Wild animals were said to reduce agricultural production directly through predation of livestock and destruction of crops and infrastructure, or indirectly through the setting aside of habitat from agricultural use. In some cases, farmers can receive financial compensation for losses and can benefit from pro-

environmental actions, for example, in the form of paid participation in conservation schemes or through eco-tourism. Benefits notwithstanding, many small farmers reported wild and rewilded nature as a constraint on production.

Analysis of the project questionnaire brings different facets of the 'old, new risk' phenomenon to the fore. While Beck stresses scientific innovations as new risk incubators, for example, through the introduction of gene modified organisms in nature, he also recognizes that manufactured uncertainties can be "Old dangers, new risks" ([Beck, 2009b](#)), and sometimes only indirectly socio-technical. Beck argues that both directly and indirectly socio-technical uncertainties are "dependent on human decisions, created by society itself, immanent to society, thus externalizable, collectively imposed and thus individually unavoidable..." ([Beck, 2009b](#)). We present examples of institutionalised, scientific or knowledge-based systems, governance structures and policies, and implementation arrangements that are set up to manage contingencies appearing in the wake of the reintroduction of 'old dangers'.

Our data shows other WRS effects being felt by small farmers in an increasingly individualised manner, living in shrinking, unstable, depleted rural communities within modern family units, ageing without farm successors, isolated, and marginalised in multiple ways. Furthermore, the climate emergency as an anthropocentric challenge inflicts severe weather events and climate risks to small farms, sometimes in unique forms. These broader WRS features were equally present across all reference regions and arguably increase the tension between FNS and rewilding. However, our focus here is upon the particular challenge of species reintroduction, wildlife conservation and protection, and habitat restoration, set against increasing food production demands on small farms.

4.2. Norway's wolves

Five large carnivores, king eagle (1968), bear, wolf and wolverine (1973), and lynx (1992) are protected by Norwegian law ([Richardson, 2014](#)). With its ratification of the Convention on the Conservation of European Wildlife and Natural Habitats in 1986, the EU Directive of Habitats (1992) and the Convention on Biological Diversity (1993), Norway has committed to protect its endangered species. All treaties concretize both a globalising and de-localising effect of governance in WRS. In this case study we focus on the reintroduction of the wolf (*Canis lupus Linnaeus, 1758*) and the implications for small farms in the Hedmark region. Driven to the brink of extinction to protect edible game, the wolf was practically exterminated on the Scandinavian peninsula by the nineteen sixties following years of active hunting and shooting premiums on capture.

Norway has been divided into designated zones prioritising carnivores and other zones prioritising grazing farm animals or reindeer (subject to Sami herding rights). Parts of Hedmark, Norway's selected reference region, lies within prioritised carnivore zones. Large areas border onto these zones, and wild game do not of course respect lines drawn on maps. Hedmark is one of the regions in Norway with the highest loss of farm animals to predators. The Office of the Auditor General (Riksrevisjonen) concluded in a recent report that the ambitions set for zone governance are only partially fulfilled under current management ([Riksrevisjonen, 2019](#)). Importantly, the loss of sheep or reindeer to predators trigger compensation if justified.

Today's wolf populations in Norway and Sweden are of Finnish-Russian origin and established themselves in southern Scandinavia at the beginning of the nineteen eighties ([Rovdata, 2020a](#)). The current growing wolf population was, up until 2008, descended from only three individuals. More recent migration from the Finnish-Russian population has since enabled a larger population. Today's policy ambition is 4–6 annual wolf litters in Norway and in reefs close to the border of Sweden of which at least three litters must be born within Norway. Inbreeding and illegal hunting are the main reasons for a slow growth of the population.

Science has become a major factor in governance, and in Norwegian wolf politics. Breakthroughs in the field of genetics play a key role in substantiating decisions in wolf management, enabling genetically important individuals to be distinguished and protecting them from culling should they stray outside designated areas, excluding them from quotas, and increasing the threat posed to livestock including reindeer herds (Rovdata, 2020b). Sophisticated surveillance of individual wolves and statistical mapping accompanied with an increased emphasis on national and international rules and conventions, all feed into the governance. Wolves are carefully monitored. Individuals are tracked on snow in the winter, and analysis of DNA from hair and excrement, collected year-round, are recorded. A supervision authority under the state Norwegian Environment Agency, is responsible for monitoring wolves, in collaboration with research organisations (NINA) and Rovdata who develop the Norwegian wolf 'family tree'. According to Rovdata (Rovdata, 2020b), this tree details virtually all wolves living in Norway over the past 30-years, an almost ironic familiar and tame presentation of the wild.

The case study was conducted in the Hedmark region of Norway, equivalent NUTS3 classification NO021 (Norway not being in the EU), located in the inland southern part of the country along the Swedish border. It included 40 interviews with both farmers (30) and small food businesses (10) as well as a workshop with key informants. From the farm sample, the sheep farmers (n = 16) encountered challenges regarding carnivores (other SALSA project farms were selected for producing potatoes, fruits and vegetables or milk). Sheep farming in Norway is structured around a yearly cycle of in-barn lambing in spring, early summer grazing on farm pastures, before the main grazing season on outfield pastures in forest and mountain areas. Farm grassland is used for fodder production providing for the following winter season in barn. When gathered from outfield pastures most lambs and some ewes are slaughtered, and the remaining ewes enter a new cycle of breeding. This method of production has developed over time into optimal utilisation of large grazing areas free of predators. Seven of the sample farms reported current carnivore policy as a constraint for their farming activity in terms of potentially producing more food on their farm. Two other farms explicitly reported what can be seen as opposing views, viewing carnivores as part of their proximity to nature and not a problem.

Two of the sample farms were located inside the designated wolf zone, having wolf pack territory nearby. Here the farmers had ceased the practice of outfield grazing, now only using in-bye land. Even so, both farmers reported losses of enclosed livestock to wolves close to the farm. One participant (Norwegian farmer 4) living inside the zone explains her opinion on the wolf problem, being a political not an animal issue as such:

"It is mostly politics, it is not nature itself, but politics around the governance that is challenging. To deprive people of the right of decision-making and of old traditions. (We) want to have wolves that are scared of humans but can't have wolves that aren't scared. The territorial wolves that are shy and stick here, they are not dangerous."

The latter part of this excerpt reflects part of a wider wolf debate around 'real' wolf and 'manufactured wolves', the latter not having natural instincts to avoid humans, and further evokes WRS de-traditionalisation.

While the sheep farms inside the zone resisted giving up shepherding, forthcoming farming generations might not do the same: "... as long as the carnivore policy is as it is, the son does not want to have livestock, but plans to take over the farm within few years" as Norwegian farmer 5 explained. She has herself resisted ending sheep farming even after years of 100% loss.

Even though compensation is given to farmers that can document loss of stock to carnivores, other expenses are incurred by some farmers stemming from The Norwegian Food Safety Authority who monitor losses in carnivore areas in consideration of animal welfare regulations. Non-compensable expenses, a characteristic WRS feature (Beck, 2009b) include adaptive practices such as not letting small lambs graze in

outfields, delaying the lambing season and providing supplementary fodder to reduce extensive grazing.

Problems are by no means restricted to the sample small farms. A Norwegian research project ("Local Carnivore") addressed challenges with carnivores for sheep farmers of larger sizes. Farmers reported psychological strain connected to high losses and finding dead and injured animals in the field (Zahl-Thanem et al., 2020). In common with the farmers located inside the zones within the Hedmark sample, outfield grazing was declining. Experiences from grazing on inbye land were reported as negative overall, with disincentives such as an increased need for medication and vaccines against parasites, reduced growth rate, reduced produce quality, a higher workload, and the need to purchase more feed since fields formerly cultivating winter fodder are needed as summer pastures. Farms still able to use outfield pastures experiment with new technologies such as GPS tracking, however this is currently an expensive solution, and it is not carnivore proof. Another loss affects children for whom gathering livestock in the autumn used to be an enjoyable introduction to farm activity and a rite of passage toward future succession. Due to the incidence of injured and killed animals, many parents now keep the children at home. Conflict with and sabotage from carnivore activists were also reported in this project.

To mitigate risks, many of the reference region's small farmers use other sheep breeds compared to "conventional" farming. Typically, they hold old heritage sheep breeds (e.g., Gammelnorsk spælsau). These are lighter in weight and, according to the farmers interviewed, behave differently when threatened, leading to lower losses to carnivores on small farms. Some also let horses graze with sheep. Multispecies grazing, with 'guardian animals' is thought to deter predators; others use higher or electric fences. The fact that herds are smaller also means a better potential for monitoring grazing sheep in their pastures and if needed, bringing herds to barns at night (relates to very small herds). These various measures represent farmers changing long established routines or developing new infrastructure as lines of defence against protected, destructive fauna.

Despite undisputed risks to production, farmers were not anti-wolf per se. De-traditionalization of common farming goals dilute community unity. Some of our sampled farmers even see carnivores as an added value to their lifestyle. Those most strongly expressing these values are young farmers living the "dream of a smallholder", people who have moved from an urban area, bought a small farm and lack the rootedness and common conception of risks (Beck, 2006a, 2006b) in agriculture shared by "old farmers". This does not necessarily lead to conflict but can make it more difficult to build common resilience towards new risks.

4.3. Scotland's sea eagles

Sea eagles, also known as white-tailed eagles (*Haliaeetus albicilla*), are a globally endangered species. Driven to extinction in the UK, where the last eagle was shot in 1918, this recent history, as Beck observes, is not so much an error of modernisation but a result of its success (Beck, 2009c). As a developed, industrial society, the UK systematically eradicated this predator within a socio-technical environment conducive to this end. Latterly, the species has been successfully reintroduced into Scotland from Norway, home to the largest breeding population, and is once again the UK's largest bird of prey. Birds were brought to the Isle of Rum in 1975 and then Wester Ross between 1993 and 1998; both locations are within one of the project's reference regions, designated UKM63 in the NUTS3 classification. More reintroductions have followed and in 2013 white-tailed eagles bred successfully in East Scotland for the first time in 200 years with regular sightings in the project's second Scottish reference region, UKM27 (Royal Society for the Protection of Birds, 2019). The broad objective of sea eagle reintroduction has been to extend the species' range to ensure its survival. Reintroductions often encompass such transnational objectives enjoying widespread international, broad-based support, which is the case for both Norway's wolves and Scotland's Sea Eagles. Raptor persecution throughout the whole of

the UK is prohibited by the Wildlife and Countryside Act (1981), as amended by the Nature Conservation (Scotland) Act 2004. UK and Scottish law has been influenced by a host of international agreements around protecting wild birds including the Ramsar Convention (1975), the Bern Convention (1982), the Bonn Convention (1985), the Birds Directive (2009/147/EC).

Alongside species reintroduction there is often a parallel reintroduction of tensions with farmers (see also O'Rourke, 2014) openly expressed as visceral concerns. Scottish farmers complained about a whole host of wildlife challenges including foxes, wild geese, and badgers, but the most cited wildlife culprit was the sea eagle.

"... we have two breeding pairs in Sleat [a peninsula on the island of Skye], two breeding pairs south of Broadford [a main town on Skye] and another two breeding pairs on the other side of Kylerhea [a settlement on the East coast of Skye], plus, we have two golden eagle pairs breeding in Sleat. So, we have a very high incidence and then we have the Cuillin eagle reserve next to us. And we have Rum where they released the bloody things just over there." [gesticulates] (Scottish farmer 1).

This farmer, based on the Isle of Skye represented a common farmer's claim that eagles predate new born lambs, materially affecting farming livelihoods. These claims have been tacitly recognised at national level (Scottish National Heritage 2014), and the current Sea Eagle Management Scheme 2015–2018 (Scottish Natural Heritage, 2015), extended and still in force, offers financial support for livestock farmers and crofters who suffer impacts across the sea eagle breeding range. This scheme provides funding for farmers to carry out risk controls where sheep flocks are managed in the presence of breeding sea eagles. Measures, supported under the scheme, are framed as being of positive benefit to sea eagles and are managed by Scottish Natural Heritage (SNH) who consider eagle-friendly applications for support from livestock keepers on a case-by-case basis. Exemplars are provided (Scottish National Heritage) and include 'special measures' to improve the availability of the sea eagles' preferred natural prey, by creating fish ponds or habitat for wildfowl. Farmers may also provide supplementary feed in the form of approved carcass material in order to 'heft' birds away from grazing sheep. 'Hefting' in this context means to encourage the natural instinct of certain animals to keep within a discreet range. Nesting and roosting sites in more suitable locations, away from pastures, can be improved with selective tree felling and other woodland management. Nest site management plans, following guidelines (Forestry Commission Scotland, 2006; Kortland et al., 2011) can be agreed with Forestry and Land Scotland² and SNH.

Other less directly eagle-friendly interventions to reduce predator interaction with livestock promoted under the scheme include either *defensive* approaches, for example, fencing, netting, housing and sheltering stock, or *deterrent* measures, such as scaring devices and support for extra shepherding at lambing time. There is also financial support for sheep health measures including supplementary feeding and veterinary treatments. The logic here is that healthier lambs are less vulnerable to eagle predation. Collectively these provisions aim to reduce predation on livestock and are therefore supportive of production however, remedial measures also comprise a tacit recognition that the reintroduction of predators brings with it a loss of livestock warranting a publicly funded range of mitigations, although attributing losses to sea eagles is contested. From a project perspective, it is also interesting that payments appear geared to small farms with stepped payments higher for the first 5 ha and with a low ceiling of £ 1500 (GBP).

Penalties and support mechanisms signal risks with clear socio-technical dimensions. Successful species reintroductions are generally supported by scientific research, experimental data and premeditated reformation of systems including legal systems, agricultural systems, and public educational programmes, all of which have underpinned both the Norwegian and Scottish examples. Previous attempts at

reintroduction, before a sea eagle chick successfully fledged on Mull in 1985, foundered, arguably because all these elements were not in place. Political dimensions are also evident as diverging interests battle for and against reintroductions through lobbying and campaigns designed to galvanise support. As Beck emphasises "everyone poses more or less of a risk for everyone else" (Beck, 2009a, 2009b, 2009c).

A recent book launch in Aberdeen, Scotland presented material to a public forum arguing for the reintroduction of the European Lynx in the Highlands (Hetherington and Geslin, 2018). While Lynx reintroduction remains a distant prospect in the UK, a similar *modus operandi* has underpinned the successful sea eagle reintroduction with pioneers such as George Waterston (1911–1980) writing and promoting the cause from the nineteen fifties onwards. Public support for such programmes is seen, by rewilding advocates, as an important prerequisite. Food and nutrition security of course is also something that advocates seek to galvanise public opinion around and the trade-offs we highlight do little to advance either agenda.

4.4. Spain's wild boar

Agricultural land in the Valencian Community, in southeast Spain, is characterised by the prevalence of small farms. In recent decades, the area has been experiencing an increase in the presence of certain wildlife species including rabbit, mountain goat, deer, and wild boar. Higher populations of these species, particularly rabbits and wild boar, are prompting conflicts between farmers, hunters, conservationists, and the public administration. Stakeholders in the project's reference region of Castellón, Valencia (NUTS3 designation ES522), both small farmers and key informants, identified this issue as a barrier to increasing agriculture production.

"There is high sensitivity in the province about the wildlife proliferation and its damages to crops and infrastructure. There are a lot of complaints, but it is difficult to quantify." (Spanish expert 1).

Complaints specifically target the wild boar (*Sus scrofa* Linnaeus, 1758) which is a native species in the Iberian Peninsula. According to the Biodiversity database (GV, 2019a), Valencian wild boars became extinct in the 19th century. Their re-appearance in the region began around the nineteen forties and boar have now become re-established across the whole region. Unlike the other case studies in this paper, this is not a case of manufactured re-introduction or re-stocking of a species, but a case of rewilding due to the return of the species from neighbouring regions combined with an acute population increase. These animals are highly adaptable at finding resources in varied habitats, from forest to agricultural land or wetlands, and population densities respond to food availability (Rosell, 2001), amongst other factors. The highest wild boar concentrations occur in highly diverse landscapes. In Mediterranean environments wild boar populate areas based on availability of water, pine woodlands, and dense vegetation that provides cover (Acevedo et al., 2006).

Wild boar is the most damaging European wild species for crops, according to Arques et al. (2009), affecting, in descending order of magnitude, irrigated horticulture, rainfed crops, irrigated fruit trees, vineyards and cereals. The species is also considered a high-risk disease pathway for livestock, particularly as a reservoir for bovine tuberculosis (TB) and African Swine Fever Virus (ASFV). The latter is a severe viral disease that is currently spreading among domestic pigs and wild boar in large areas of Eurasia (O'Neill et al., 2020). The detection of the first ASFV cases in wild boars in Germany in 2020 raised the alarm amongst the Valencian pig-farming sector (Agronews Comunitat Valenciana, 2020). Boars are also a growing cause of traffic accidents, a risk which is also reported in the Italian case to follow. Furthermore, wild boar abundance can affect the functioning of the whole ecosystem, disrupting the equilibrium and posing a threat for some endangered wildlife species (Barasona et al., 2021).

The population increase of wild boar in the Valencia region is attributed to a combination of interconnected factors, mainly human but

² This new agency superseded The Forestry Commission Scotland in 2019.

also ecology related. Broad based socio-economic changes have led to a depopulation of rural areas with a parallel decline in traditional wildlife control activities such as culling, fencing and habitat management, a pattern found across Europe (ESPON, 2017). Wild boars have no natural predators to check their population growth in Spain. Furthermore, agricultural land abandonment has provided additional resources to wildlife. These combined factors support the territorial expansion of the species, with higher reproduction rates. Moreover, environmental shocks such as droughts and forest fires, extreme events exacerbated by anthropocentric factors (Otto, 2018), put pressure on remote habitats. This, in conjunction with the intensification of agriculture, which competes for scarce water resources, and the shelter provided by abandoned cropland, pushes displaced wildlife species towards agricultural holdings and increasingly bring farmers and wild boar into conflict.

Hunting is inextricably linked to boar in this region, being an entrenched tradition in rural areas with wild boar the most affordable (in terms of license fees) and highly prized prey amongst the large game mammals (GV, 2012). Despite, and in many ways because of the high hunting pressure on this species, its population has been increasing, from around 1000 individuals in the 1970's (GV, 2019a) to around 26,000 individuals in the 2016/17 season, according to data from MAPA (2019) for the Valencian region. In parallel, the decline of hunters totals around 59% over the past 20 years, according to data on hunting licenses (Generalitat Valenciana (GV), 2019b), and is attributed to a series of factors, including rural depopulation, ageing of rural populations and the lack of participation in the activity for younger generations (Laborde, 2016). This gradual decrease in the number of hunters (Belda et al., 2012), combined with hunting interests aligned with investing in improving stocking densities in hunting grounds through forest maintenance and installation of feeding and watering points, contribute to a perfect storm of increasing wild boar populations (García-Morell, 2013).

The multi-faceted nature of the factors around the 'wild boar issue' stemming from a wide range of actors, including conservationists, hunters, farmers, land managers and legislators, can partly explain why these creatures arouse polarised interests. Farmers, and particularly small farmers, in the region have been complaining over recent years about the spiralling population of wildlife especially wild boars in upland areas, which they see directly linked to land abandonment. Farmers' representatives, including the federation of cooperatives (Federació de Cooperatives de la Comunitat Valenciana) and the two main farmers' organisations in Valencia region (La Unió de Llauradors i Ramaders and Asociación Valenciana de Agricultores (AVA)), have been coordinating efforts in recent years to lobby the regional government in order to introduce more effective regulations that facilitate population control through hunting, and for support measures to ameliorate the wildlife damage to crops and livestock, such as compensation payments or subsidising fencing (Agronews Comunitat Valenciana, 2018; Cooperatives Agroalimentaries, 2017; Cuquerella, 2017; Ros, 2018).

Although ostensibly the interests of hunters and farmers often diverge (Barrio et al., 2013), hunting organisations have joined the farming lobby in seeking more permissive hunting regulation (Rejón, 2018). Apart from communications, press releases and interactions with the regional government, in 2018 and 2019 they organised joint demonstrations, together with other rural representatives and supported by conservative political factions, clamouring for the recognition and protection of "traditional rural activities" related to the rural economy, but also to the governance of the territory. One populist argument is that the present regional government is biased towards environmentalists' positions which are distant from the rural reality (Tena, 2018) and very restrictive towards hunting despite the "emergency" situation due to the damage caused by wildlife species that traditionalists consider pests. Hunters demand more permissive regulations for their activities, as well as economic support, as they consider keeping wild boar populations under control a public service (Sanchis, 2021). The last demonstration

was in May 2019 (Agronews Comunitat Valenciana, 2019) evoking parallels with the UK where the Countryside Alliance movement, is aiming to 'give rural Britain a pro-hunting voice' (see also Woods, 2003). For Beck, such developments represent an 'opening up [of] the political' whereby a sub politics that is heterogenous and decentred from conventional state politics operates through activism and evolves into "new social movements" (Beck, 1992, p. 195).

Opposing the hunters, the conservationists, including wildlife researchers, warn against the progressive decline in biodiversity and the risks involved in treating native species as pests ignoring their vital roles in ecosystems (Delibes-Mateos et al., 2011). Although, in the case of wild boar, the lack of natural predators leading to their presence in high densities may counteract some of these benefits, conservation researchers recommend less aggressive control measures than hunting, which should be used only *in extremis*. Another contested element in the discussion is the perception of damage. Delibes-Mateos et al. (2008) state that "it is very important to stress that damage attributed to small mammals is usually a social perception and therefore should be scientifically documented prior to initiating any population control". However, conflicts of interest are also embedded in the data used to inform policy. The public Administration in charge of regulating hunting in the Valencia region draws on information used for decision-making that includes figures on game captures provided by the hunting grounds, and further information regarding the damage caused from what farmers report to their insurance providers (GV, 2018).

Given the diversity of demands and tensions around this issue, the regional Administration has recently (2021) issued new guidelines for wild boar hunting specifically, with the aim to clarify the particularities of the species and to unify criteria to apply regulations related to population control through hunting. The development of this framework is itself a further source of controversy.

4.5. Wild boar Italy

Valencia's concerns were echoed by farmers in Garfagnana, a mountainous area of Lucca (NUTS3 designation ITE12), where the growing presence of destructive wildlife (primarily wild boar, wolves, and deer) increasingly shapes local agricultural management measures. They cited the closure of farm businesses and land abandonment as both resulting from and reflexively contributing to unplanned rewilding.

"Until 1997 roe deer were not such a relevant problem; they became an issue when environmentalists decided to repopulate the area. More than roe deer, I have the problem of wolves and wild boars." (Italian Farmer 1).

Small farms are disappearing (Eurostat, 2018) for complex reasons, but stakeholders (for example, Italian Farmer 1 above) drew attention to wild boar as a particular challenge echoing concerns raised in Castellón (Spain) in blaming environmentalists for problematic rewilding effects. During project interviews, wildlife was said to cause significant damage to crops, livestock, pasture, and farm infrastructure. The most pressing wildlife issue for respondents in Garfagnana was what they perceived as a large increase in wild boar throughout Italy, within living memory. In both rural and urban areas boar damage property, cause road accidents and occasionally threaten humans. A recent incident, when a herd of boar crossed a busy motorway in Lombardy, caused one fatality and 10 injuries (Squires, 2019). Similar incidents are reported throughout Spain.

Lucca's small farmers recognised deliberate re-introduction as central to the problems now faced. At the beginning of the last century wild boar had been reduced to a few areas of Italy due to the destruction of natural habitat and systematic control both for agriculture and urbanisation. This pattern has reversed. "The number of wild boar in Italy has almost doubled over the past decade with an estimated 1 million animals roaming the country, killing livestock and destroying crops" (Binnie, 2015). In large part the risk has been manufactured, in parallel to the situation in Castellón, by commercial hunting whereby demand for

game has triggered large scale restocking. In Italy this has included the introduction of wild boars from Eastern Europe (Apollonio et al., 1988). Bigger than the indigenous sub species (*meridionalis*), the introduced breed has thrived (Massei et al., 2015).

“Wild boars have been a huge concern for about 10 years: when my grandfather and my father worked on the farm, they did not have problems with wild boars, and they had to go and look in the woods if they wanted to meet them; now they are coming to you. According to my parents’ experience and to my knowledge, I would say that the ones we have today are imported boars, inasmuch as the Tuscan breed never gave such problems. And generally, the other wild animals do not cause so much damage... wild boars destroy the field.” (Italian Farmer 4).

As with Norway’s wolves, non-native origin is often connected with farmer resentment towards rewilded species as the above excerpt shows.

Small farmers also laid claim to a unique role in landscape management, something highlighted at a project focus group with farmers in Garfagnana. They described cascading risks where poor forest management of areas set aside for re-naturalisation, in their view virtually abandoned, creates an environment vulnerable to hydro-geological risks with unsustainable wildlife making adjacent areas less attractive for cultivation.

As in Castellón, the relationship between farming and hunting is ambivalent. Some farmers report interference with agri-tourism in terms of noise and danger. Against this hunting is often seen as a form of population control despite a strong causal relationship between hunting driven restocking and rising numbers (Saberwal, 2000). One unintended consequence is that hunting is socially disruptive within groups of wild boar causing the dispersal of individuals and favouring both the reproduction of younger females and an increase in range. This man-made dynamic is not lost on commentators: “Wild boars have been introduced for recreational hunting at the expense of farmers, albeit they are not an endangered species. We are not talking about wildlife protection and ecological corridors, but about lobbying, economic interests.” (Linea Verde, 2017).

The extent of the problem was said to be significant. Wildlife was frequently represented by farmers as the main source of risks for their activities, manufactured for social ends, and an obstacle to potential growth of the farm. One farmer estimated:

“My last harvest of spelt yielded only 1/3 of what was expected, because of damage caused by wild boars. I have to take into account these numbers when I plan my farm activities.” (Italian Farmer 2).

Another alluded to non compensable effects:

“My biggest problem is presented by animals, wild boars mostly, in the last 10/15 years. They are able to completely destroy a potato field. There is the possibility to claim compensations, but they arrive after a long time and never refund real damages in my experience.” (Italian Farmer 3).

Land fragmentation is a common feature of agriculture in Lucca, particularly in Garfagnana. It represents a specific obstacle to the management of the parcels of land. Wire mesh enclosures can be an efficient damage prevention system. However, they are not only often prohibitively expensive but disruptive to agricultural practices and create a negative landscape impact. For these reasons, their use tends to be reserved for acute issues such as in areas with relatively large populations of ungulates or for the protection of high value assets, for example ortho-floriculture (Cavallini and Banti, 1999).

Despite frequent ‘calls for cooperation’ in the face of shared challenges, there is a general and increasing shift toward an individual orientation to risk (Wimmer and Quandt, 2006), a WRS pattern that Beck (2016) emphasises. In Lucca, we found farmers expressing frustration, after exhausting or failing to secure top-down interventions.

“I have been lucky actually because I got an electric wire from the local Committee for the management of territorial hunting areas and it is not so easy to get fences from them. However, it works badly and occasionally, it is not enough to keep animals away.” (Italian Farmer 2).

At times, disappointment with preventative measures (like electric

wires exhibited above), provoked more drastic responses.

“I asked for monetary contributions in order to install fences against deer and wolves, but I suppose I have to do that by myself, as I’ve already done for wild boars; I would be given an amount of money unable to cover the necessary costs for job, moreover they want you to respect restricted measures (in height and width) that make fences useless for protecting crops from wolves or deer. And monetary compensations for damages are ridiculous. I lost more or less one hundred olive trees because of roe deer: I pay almost €6 each tree and I would be paid [compensated] €0.80 cents each one. Now. I just open fire and shoot them”. (Italian Farmer 1).

Noteworthy exceptions, where cooperative actions are evident, are farmer networks involving public protest.

“Take back the territory is the last event that I took part in, it was organised by Coldiretti. It was a protest demonstration against our State and the hunters’ lobby, to call for an end to the wild boar invasion that has been registered in the last 7/8 years”. (Italian Farmer 2).

There is some evidence that this sort of action, mirrored in the UK Countryside alliance and also reported in the Castellón case study, is proving effective. Recently, two Italian regions have approved a regional code that recognizes the legitimate defence of farmers: farmers have gained the right to shoot wild boars, a privilege previously reserved for police and hunters (Varese News, 2018).

5. Discussion

The small farmers we encountered in this EU project highlighted promotion of wildlife as a risk to FNS in both Europe and Africa. Rewilding engenders and entrenches new forms of governance in rural spaces. From the preservation, conservation, or reintroduction of species to generalised policies surrounding biodiversity, farms are increasingly required to adopt practices that increase rather than maintain or decrease the presence of wildlife. The related governance arrangements are being influenced by remote, urban, or international citizens and organisations, causing tensions with farmers whose livelihoods are most affected. The rewilding described to us was typically not increasing food production in situ nor was it even considered to be compatible with productivist logics (see also Merckx and Pereira, 2015).

Across Europe, on small farms, new frontiers of risk to Food and Nutrition Security are drawn as a direct result of rewilding programmes established to increase biodiversity. Food production is effectively, if not intentionally, being traded-off against conservation. That these risks resemble traditional risks, with farmers (re)contending with eagles, wolves, wild boar, and a host of predatory or destructive wild animals in ways that their ancestors would have recognised, partially obscures the fact that many of these threats to food production have been deliberately engineered in the recent Holocene. They are caused by intentional reintroductions and restocking or protection of species and habitats that are only configured as they are because of human action. A World Risk Society lens allows us to theorise the implications of this new landscape.

In World Risk Society terms, the wildlife risks faced by farmers, recognised at governmental level, mitigated by state or supra-state funded measures, and purposefully enacted by human actors, are manifestations of manufactured uncertainty (Beck, 2009a, 2009b, 2009c). Risks affect and transform farming communities. They are confronted (self-confronted) by small farmers through institutional arrangements out of which these new threats are reproduced and managed. While a predatory wolf killing a sheep is a perennially symbolic motif, the small farmer’s struggle is no longer to tame nature but to navigate the human systems that allow the wolf back into the landscape and are regulating its continuing presence there. It is only within a legal, cultural, and techno-scientific framework that mitigation of production losses can be legitimately tackled. Compliance with governance structures and adherence to new norms is required of farmers. Certain species, such as sea eagles, are to be protected regardless of their raptorial nature. A prescribed number of wolves are to be allowed irrespective of their

predatory behaviour. Numbers of wild boar are to be determined within a nexus of political agendas maintaining and protecting populations alongside farmland and highways, even at the gates of Rome (Davies, 2017).

This turnaround, from when farmers put food production above biodiversity, has emerged because of a radical reconfiguration of society. There has been a detraditionalization in which a loss of time-honoured certainties and the weakening of long-standing support mechanisms have unfolded as dark parallels to technological progress (Beck, 1992). The hunting and wildlife control practices of previous generations have disintegrated with depopulated landscapes and disinterested, younger generations neither willing nor legally empowered to keep the wolf from the door. Delocalisation (Beck, 1992) has stripped local, rural populations of their former jurisdiction and ushered in global actors and international treaties, establishing new provisions for red listed, threatened species. National, multi-national and globalised arrangements establish boundaries that small farmers have little power over, and which redefine the rules of the game for agriculture at all scales. Techno-scientific developments have made systematic reintroductions possible with genetic management of breeding stocks, electronic identification (EID) often incorporating remote sensing monitoring programmes, and advanced zoological and ecological expertise coordinating complex, multi-national collaborations (for example, to reintroduce sea eagles from Norway to Scotland).

For those affected there has been an increase in forms and numbers of wildlife, particularly large mammals and raptors that farmers have traditionally controlled. The fact that the new risk resembles an old risk, in tooth and claw, is clear, but the anthropocentric provenance and institutional and techno-scientific dimensions are incontrovertible. Without the reintroduction the threat would not (re)exist and the transformative enactments are complex socio-technical achievements of the highest order.

Using WRS as a lens to explore the tensions between FNS and conservation, including rewilding initiatives, naturally leads to the consideration of risk. The risks that are entangled within the space we have mapped out are reasonably straightforward to determine. On the one hand, traditional approaches to agriculture, including controlling wildlife and extending farmland, that prioritise increasing food production over conserving and promoting biodiversity, existentially endanger wildlife by providing a socio-economic rationale for its reduction either through killing the wildlife directly or through the destruction of habitat. The risks to wildlife appear metamorphosed in second modernity as global pressures the like of which create unprecedented demands for all resources including food and territory in what Beck terms “a bottomless barrel of demands” (1992: 23). These demands in places juxtapose hunger with obesity but are nevertheless inextricably linked to population growth. Conversely, conservation and rewilding, as currently practiced, exacerbate food insecurity by reducing available farmland and by allowing wildlife to consume or destroy a proportion of agricultural produce. Trade-offs between conservation values, practices, regulations, production, and living conditions on small farms are seemingly inevitable: the more human influence there is over nature, the more there will be trade-offs between competing values. A recent analysis published in the journal *Nature* shows that “agriculture and the overexploitation of plants and animal species are significantly greater threats to biodiversity than climate change” (Maxwell et al., 2016).

6. Next steps: two hypotheses to square the circle of rewilding and FNS

Despite the enormity of the challenge, the equation of FNS on the one side and rewilding on the other can be balanced, at least according to some advocates of rewilding, by increasing the amount of food production on a smaller area of land than is currently utilised for agriculture (UAA). Two approaches are prominent: Firstly, rebalancing land use could intensify agricultural activity on the most productive land

allowing some repurposing of less favoured areas (LFA) for rewilding (Merckx and Pereira, 2015). This so-called ‘land sparing’, also described as the ‘Borlaug hypothesis’ (Oliveira and Hecht, 2016) is a technophile assumption that productivity can satisfy crop demand within existing production areas. Proponents cite examples where this has been achieved and it is certainly true that agronomy (particularly from a techno-scientific view) has had considerable success in increasing yields. Critics counter that a more general rule is in operation demonstrating that intensification of profitable land results in unsustainable territorial expansion following the Jevons paradox (Oliveira and Hecht, 2016). Furthermore, and reinforcing the evidence for a trade-off, more productive arable land often presents better opportunities for carbon sequestration through afforestation than areas with already carbon rich soil such as the peatlands that comprise many less favoured areas (LFA) for agriculture (Matthews et al., 2020).

Wary of purely technophile approaches that tend to favour large enterprises with greater access to investment, the FAO, among others look forward to efficiency gains through a multi-layered policy approach including initiatives developing smart resource linkages and enhanced nutrient flows in integrated farming systems such as rice-fish. Resource-use efficiency policies are particularly important for the world’s 500 million family farmers in developing countries because they promote more remunerative farming systems, but they are also of global importance where the challenge is to cope with resource scarcity and environmental impact. Other solutions may lie in higher quality feeds and balanced animal diets; energy optimisation throughout the value chain; better deployment of information and communication technologies for innovation diffusion (FAO, 2019). Inter-cropping (Maximum Yield, 2017), vertical farming and GM technologies also hold the promise of higher yields from reduced agricultural areas as does biointensive farming (Reganold, 2016).

Although doubtless, some of these improvements will offset rewilding losses, the focus of this paper has not been speculative envisioning of the future but has been to consider existing approaches from the point of view of the small farmer living in WRS, and our study found small farmers reporting trade-offs rather than efficiency gains or complementarities. Furthermore, although WRS is not inherently technophile and Beck does not directly engage with this debate other than to stress the inherent uncertainty behind all future orientated theorising, he does caution that new and unknowable risks lurk around every corner in regard to socio-technical development. Risk is inherent in the fabric of techno-scientific innovation and the defining principle of late modernity. WRS presents new developments with precautionary scepticism founded in the lived experience of industrial modernity that repeatedly demonstrates how new manufactured uncertainty or currently unknown risks accompany technological fixes concurrently enabling and demanding new governance regimes as in the case of the genetic conservation entangled in Norwegian wolf management.

The second, related proposal to correct any imbalance between increased demand for food and decreasing agricultural land-use as a result of rewilding is to shift diets away from meat to crops. There is arguably 100-fold difference in the amount of land required to produce each gram of protein between the optimal crop (pulses) and conventional sheep or beef production (Poore and Nemecek, 2018). This dietary switch idea – eat less meat to grow more crops – again favours a rewilding of LFA. The proposal similarly allows for the improved efficiency to free-up less productive agricultural land for rewilding. The ramifications of such transformational realignments for the world’s 500 million small farmers are difficult to predict. For Norway and Scotland there may well be a reduction in traditional small farming as we currently know it including throughout the project reference regions which are predominantly comprised of LFA classified land, therefore suboptimal for crop production. Continued delocalisation seems likely with food supplies for those living in areas unsuited to crop production becoming even more reliant on long supply chains, a development exposing a vulnerability during the current Covid pandemic as cross

border trade has become subject to greater friction. The effects on biodiversity are similarly difficult to imagine let alone quantify. In addition, from our research, rewilding as it is currently emerging does not necessarily discriminate on the basis of land quality. Spain and Italy typify a contrasting rewilding of good agricultural land negatively impacting crop production. Here the encroaching wilderness has followed a different logic in disregard of land classification.

7. Conclusion

We began our investigation in the shadow of two major Sustainable Development Goals (SDG) challenges: SDG2 highlights that 2.37 billion people are already without food or unable to eat a healthy, balanced diet. The situation is being exacerbated by Covid and by a rising global population with forecasts at the optimistic end of the spectrum of 10.9 billion mouths to feed by 2070, (Adam, 2021); SDG15 warns of equally daunting challenges to halt biodiversity loss with more than a quarter of species faced with extinction unless radical change is implemented urgently. Yet when we questioned Europe's small farmers about barriers to increasing food production on their land, they often identified wild nature in various forms as a significant obstacle and saw trade-offs rather than complementarities in their experiences of current approaches to this twin challenge. It was not necessarily that they opposed environmental measures. Indeed, many explicitly supported all kinds of measures, sometimes enthusiastically valuing wildlife, and participating and drawing financial support from environmental schemes. Their contention is that they experience both wildlife reintroduction and specific species protection as a *de facto* constraint on production. For some, this is a price worth paying but our project was explicitly interested in exploring small farm contribution to the growing demands of FNS therefore the reported trade-off indicates a gap between on-the-ground actual rewilding and largely theoretical, aspirational win-win arguments. In short, many existing rewilding projects, from the perspective of the small farmer, compromise FNS. We think that it is important to understand this perspective if this tension is to be eased and we have used the lens of Beck's WRS to try to unpack some of the issues raised by our data.

Therefore, while acknowledging various hypothetical alternative food systems proposed by critics, we are mindful of the daunting socio-technical challenges of producing more from less, and regard the possibility that any radical, alternatives can actually deliver FNS on a global scale, without the contribution of a vibrant small farming sector, as highly uncertain. In the meantime, and without a complete overhaul of current agricultural systems, small farmers, will continue to play a vital role in FNS and to face the conundrum of rewilding. We have sought here to understand and theorise the tensions that are already confronting them, in the form of new 'old' risks, that we might better co-manage rewilding alongside food and nutrition security.

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