# Introduction

In addition to social value, animals also offer economic value. Without bats, bees and moths our crops would not be pollinated. Caterpillars produce silk, fish can be eaten and our children own rabbits as pets. To reinforce that message and to give insight into what the world's fauna offers us without us realizing it, we have tried to calculate the economic value. Although we feel that flora and fauna are valuable, practice shows that our behaviour is not always in line with our feelings.

A depiction of the financial value is interesting, but not so much because we want to see animals as economic objects, but that it illustrates that without fauna there is no healthy economy imaginable. For example, take the fox, an animal that has been denounced by farmers. But for every fox a farmer kills, the rabbit population grows, and as a result eat an extra €235 worth of crops.[1] It is precisely this type of knowledge that allows people to consider the value that flora and fauna creates. And that value is not insignificant: Nature offers us at least $33 trillion a year.[2] The U.S. economy is stuck at $23 trillion.[3] We advocate, and are committed to, including the real value of nature in economic and policy decisions. Many incredible initiatives appeal to people's emotions, but we strive to contribute by focusing on the perspective on the wallet.

But that is not an easy task. How do you express the monetary value of a coal tit eating a nest of caterpillars in front of your house? Or a bat eating an average of 300 mosquitoes a night.[4] Nevertheless, we made the attempt. Although sometimes assumptions were needed to be made, and more importantly, a lot of benefits are still to be calculated. The numbers we mention are just the tip of the iceberg.

In the end, it always comes down to the fact that every animal species plays an essential role in the ecosystem. Do you fish all the pike? Then the heron will have no food left, and there will not be much left in the pike ecosystem other than a mass of algae.[5] Only a healthy ecosystem, with room for all animals, can show the full value each animal. But what happens when you remove one link, causing the ecosystem to be out of balance? Problems arise, such as structural pests and diseases. Species such as the rat and mouse have lost their natural enemy and have changed from timid animals to aggressive pests. Just in America alone, these types of pests cause $138 billion in damage each year.[6] Every animal deserves its space: The bat, the rat, the bee and the fox. These animals will offer us so much more as long as we give them that space.

Below we offer no more than some indicative insights into the values of individual animals, the real value lies in the ecosystem as a whole.

## The bat

**Indicative value: €40 bilion**

The bat often doesn't get the appreciation it deserves. Bats are a linchpin in the ecological web. By hunting insects they prevent pests and as many as 500 species of plants and trees depend on pollination by bats. You could bring in bees to replace bats to pollinate, but the ecosystem is not that simple.[7] Many plants have evolved to rely on the pollination of bats. Some plants bloom at night and have a shape that allows bats to easily reach the nectar.[8] In addition, bats like to eat tropical fruits. During their flight they drop the undigested seeds, nestled in fertile manure. This way, bats spread around the seeds of many flora.

Simple calculations indicate an economic impact of the bat of € 40 billion worldwide. Bats pollinate specific types of plants. For example, the durian is almost entirely dependent on the bat,[9] just like agave, the main ingredient of tequila.[10] Without bats, these crops will not survive, crops that respectively have a global market of $17.6 billion and[11] $195 million per year.[12] The economic value of the pest control by bats has only been calculated in the U.S., where it's worth $22.9 billion per year.[13] Given that just China alone already has an agricultural sector that is five times larger,[14] it is not unfathomable that the real, global economic impact is a multitude of that. What we know about bat tourism is that just at the U.S. Congress Avenue Bridge alone a $3 million a year is spent.[15] Bat poop is used on a small scale for fertilization, roughly estimated to be worth $50 million worldwide per year. [16] By spreading the seeds of the Gaint Oak, the bat adds more than $1 million in value in Sweden alone.[17] Finally, as a food source in Ghana the bat is estimated at a total market value of $80,000 per year.[18] Adding it all up and converting it to euros,[19] the economic impact of the bat is not nothing.

## Moth

**Indicative value: €15 billion**

The moth is a miraculous natural phenomenon with one of the most amazing life cycles: born as an egg, grows into a caterpillar, pupates, and turns itself into a moth. But the moth does not only

symbolic value. It is an essential source of nutrition for birds and bats. Without the moth, the survival of these animals could be endangered. In addition, moths provide pollination of flowers. They distinguish themselves from bees and butterflies by being active at night and thus having their own special niche in pollination.[20] Unfortunately, it has never been established what these specific actions provide us. What we do know is that some moth caterpillars produce precious silk, which is by no means matched by synthetic equivalents, such as viscose. Caterpillar silk adds more than €15 billion in economic value worldwide every year.[21]

## Pike

**Indicative value: €4 billion**

The pike is one of the top predators of our freshwater ecosystem. He waits patiently in the reeds and shoots out as a torpedo to catch his prey. The pike keeps populations of smaller fish in check and thus ensures more diversity of fish. For example, the pike is a natural enemy of an invasive exotic fish; the American Crayfish.[22] Research shows that overfishing pike creates a significant disturbance in the ecosystem.[23] A pike on its own is a source of food for other animals. In mating season pikes produce masses of eggs that are eaten by a lot of smaller animals. Pike themselves are eaten by birds, such as the heron and cormorant, and by humans.[24]

The value of the pike as a food source for humans is clear because the world market amounts to almost € 4 billion.[25] But what if the pike disappeared? Ecosystems would collapse, fish catches would decrease, pleasure anglers would have to find another hobby and pests would gain the upper hand. The economic damage would outweigh the value that the pike itself represents.

## Heron

**Indicative value: €1 billion**

Herons are beautiful animals that come in all kinds of colours, shapes and sizes. They are an important indicator of a healthy ecosystem. Herons hunt in fresh and sweet water and are at the top of the food ladder in both systems. If the system is out of balance, there will not be enough food for the heron and it would disappear.[26] Unfortunately, the value of herons is difficult to calculate. What is known is that

herons are loved by birdwatchers, and some calculations have been made. Unfortunately, it remains mostly guesswork, but that the system becomes unbalanced without the heron is evident.

## Coal Tit

**Indicative value: €18 billion**

The small great tit can be found in large numbers in the Netherlands. They eat caterpillars, small insects, nuts and seeds. This means it's very important to maintain caterpillar populations. And that is not without significant reasons. Disturbed ecosystems have led to pests of caterpillars that eat crops. The great tit could rebalance those ecosystems and thus reduce the use of pesticides and increase agricultural yields. Research shows that placing nest boxes at an apple orchard can significantly increase yield.[27] This has the potential for an increase in economic impact of €1.4 billion worldwide. Along with its aesthetic value, the great tit has significant economic impact.

## Bee

**Indicative value: €30 billion**

When it comes to the beautiful dependence that nature has created between pollinators and plants, the bee is the icon. The bee needs the flower to harvest nectar. The flower needs the bee for pollination. What economic value does animal pollination add? On the surface, not all that much. Worldwide, 90% of our diet consists of cereals, most of which are not pollinated by animals. If you look at it this way, insect pollination only contributes to 1% of the world's food production.[28]

But fortunately, we look beyond that. Because if we take food for the animals we eat and consider the production of fats and oils, we find that insect pollination nevertheless plays an essential role in food production.[29] For example, it has been calculated that animal pollinators have an added value of between $191 and $310 billion worldwide, accounting for 9.5% of global food production.  Although bees have by far the largest share in this, it is not known exactly how big that share is. That is why we assume an indicative value based on the figures that do exist. For example, research has been carried out into the added value of pollination in the US, which amounts to $19 billion a year,[30] and the UK, with a value of £200 million per year.[31] If you add the value of the organic honey market ($605

billion)[32] and the market for beeswax ($992 million)[33] worldwide to that, you end up with an economic impact of at least €30 billion per year.

## Hare

**Indicative value: €4 billion**

Herbivores such as hares and rabbits are also important for the ecosystem. They provide food for predators, such as the fox, the stork, and in the Netherlands, recently the wolf. But the hare also contributes to the ecosystem through its own eating behaviour. Grazing allows the rabbit to maintain precious nature reserves. By keeping plants short, a lot of sunlight can continue to reach all the way to the ground. This way plants that do not get that high are able to continue to catch enough light and satisfy birds that like to live in open areas.[34] Only, none of these benefits come with a price tag. Other benefits do. For example, hares produce wool,[35] meat,[36] they are used as pets[37] or in the laboratory.[38] In total, the hare adds a roughly estimated € 4.0 billion, although in most cases the figures are purely regional revenues. Worldwide, the amount could be a lot higher.

## Fox

**Indicative value: 2 billion**

The fox is by no means a difficult eater. And that is exactly the reason why the fox so important to the ecosystem. Are there too many hares? Then the fox hunts and eats the surplus. And this is very important. If the hare populations become too big, it'll not only have a negative effect on the environment, but also on the hares themselves. A large population allows diseases to develop and spread, putting pressure on the entire population. For that, this beautiful animal deserves a little more appreciation.

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**Mark Bode**
+31 6 21 88 81 99
Mark.Bode@rebelgroup.com

**Jan Smelik**
+31 6 25 12 83 10
Jan.Smelik@rebelgroup.com


Wijnhaven 23
3011 WH Rotterdam
Nederland
+31 10 275 59 95

info@rebelgroup.com
www.rebelgroup.com