ANIMAL SOCIETY

THE WAY OUT: A REPORT ON ENDING CHICK KILLING IN THE EUROPEAN UNION

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EXECUTIVE SUMMARY

Foto-Credit: franz12 / Shutterstock

1 Executive Summary

Every year, around **330 million just-hatched male chicks are killed** in the egg laying industry in the European Union (EU).[1]. It is also estimated that an additional 40 million day-old female ducklings are killed annually in the foie gras industry, also mainly in the EU.[2]. This practice exists because **these industries do not place economic value** on these chicks and ducklings.

Male chicks from layer hen breeds cannot lay eggs and also do not develop enough meat for them to be economically valuable for the meat industry. Similarly, female ducks do not develop livers of the same targeted quality as male ducks do through force-feeding in foie gras production. As a result, foie gras producers cannot generate a profit with female ducks, which renders them as surplus in the production process.[3]

The killing of these birds is not only an **ethical concern in itself**, but the killing methods currently in practice also raise severe **animal welfare concerns**.

Although there are **alternatives** to killing chicks and ducklings shortly after hatching, the practice of killing these young birds still takes place in most EU Member States. One alternative, called **in-ovo sexing**, involves the use of technologies that detect the sex of the unhatched chicks or ducklings in the egg to sort out the "unwanted" ones. Currently, market mature methods of in-ovo sexing work from the 9th day of incubation, at the earliest, raising concerns over the perception of pain by the chick embryos.

The **rearing of male chickens of laying hen breeds (known as "brother roosters")** for meat production is a second alternative. This alternative is currently used in Germany because in-ovo sexing methods were not operationally viable at scale by the end of 2021. This alternative raises severe animal welfare concerns, is highly cost intensive and not environmentally friendly. Additionally there is currently no market for brother rooster meat in Europe, which leads to it being exported to African markets already flooded with European poultry meat.

A third alternative is the use of **dual purpose breeds**, which develop enough meat for the male chickens to be viable for the European meat industry. While this alternative can be considered an improvement to animal welfare due to better health in these chickens, these breeds are currently not market-competitive with layer and broiler breeds.

A fourth alternative, differing from the others in moving away from animal husbandry in general, are **plant-based egg alternatives and plant-based protein** sources.

An EU-wide ban on chick killing has broad support not only among citizens, but also among Member States, the egg industry and hatcheries, who seek to establish common standards for all

1. Buhl, A. C. (January 15th 2016), Legal Aspects of the Prohibition on Chick Shredding in the German State of North Rhine-Westphalia, Global Journal of Animal Law, N. 2 , 2016.
2. Porter, M., Pouvreau, A. (October 17th 2014), Torture In A Can. French Foie Gras Farmer to Improve Appalling Conditions, Newsweek.com (last visited November 29th 2022).
3. Rochlitz, I., Broom, D.M. (2017), The welfare of ducks during foie gras production , Animal Welfare 26 (2017), pp. 135.

Member States out of competitive reasons. Germany [4], France [5], Austria [6], and Italy [7] have already prohibited the systematic killing of day-old chicks since 2022. In Germany, the ban has been in force for almost a year, providing useful reference data. The judges of the Federal Administrative Court of Germany ruled in 2019 that chick killing was not compatible with the German Animal Welfare Act, which led to the final prohibition. The court decided in a historic judgement that economic reasons alone are not a reasonable cause to kill an animal within the meaning of the law. [8]

Although the enactment of national bans is positive news, national bans have limited effects in ending the practice of systematically killing day-old chicks in Europe, given that producers are still able to import eggs and young layer hens from hatcheries in other Member States, where this practice is allowed.

With the current revision of the animal welfare legislation, the European Commission is seeking to bring animal welfare in the EU up to current scientific standards. In light of already-available alternatives to chick killing, the unnecessary practice can no longer be justified.

As the European Commission is considering the enactment of an EU-wide prohibition, this report presents relevant data in preparation of the European Commission's impact assessment.

In so doing, this report seeks to support a way out of the unethical practice : **the adoption of a ban on chick and duckling killing into EU law.**

4. German Government, Bundesregierung (December 14th 2021), Kükentöten wird verboten bundesregierung.de (last visited December 7th 2022).

5. Le Monde avec AFP (February 6th 2022), Le broyage des poussins mâles désormais interdit dans la filière des poules pondeuses , lemonde.fr (last visited November 29th 2022).

6. Bezirksblätter Tirol (July 8th 2022) Tierwohl-Paket : Kükenschreddern wird verboten, meinbezirk.at (last visited November 29th 2022).

7. Lovato, F. (July 13th 2022), Stop all'uccisione dei pulcini maschi : arrica l'approvazione da Senato kodami.it (last visited November 29th 2022).

8. BVerwG, Judgement of 13 June 2019 - 3 C 28.16 (English Version).

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THE PROBLEM

Foto-Credit: Human Cruelties

2 The Problem

Every year, the poultry industry kills **hundreds of millions of just-hatched male chicks and female ducklings** in the European Union (EU) [9]. All over the **world**, it is estimated that around **6.5 billion of these young animals are killed every year** by the industry. This practice exists because the day-old chicks and ducklings are considered to be unviable by the egg and foie gras industries.

The basis for this is **that male chicks from hybrid layer hen breeds** cannot lay eggs and also do not develop enough meat for them to be economically valuable in the meat industry. Similarly, **female ducks** do not develop a liver of the targeted size and fat content as male ducks do through force-feeding in **foie gras production**.

Therefore, these just-hatched animals are killed mere hours after they take their first breath. Chick killing is, above all, an **animal welfare concern** that also holds a mirror to the neglected moral considerations within industrial animal husbandry in general. Moreover, the practice is **uneconomical, unsustainable, and a waste of resources**.

2.1 Numbers

2.1.1 Male chicks in the egg laying industry

Worldwide, **the egg industry kills around 6.5 billion day-old male chicks** every year. [10] It is estimated that the **EU accounts for 330 million** of those newly hatched animals killed per year. [11] As there are egg-laying hen hatcheries in all 27 EU Member States [12] , it is suggested that the selective killing of male chicks is taking place in every EU member state that has not yet banned the practice.

2.1.2 Female ducklings in the foie gras industry

It is estimated that the **foie gras industry kills around 40 million female ducklings annually**. [13] There is no official data on the numbers because the European Commission only collects data on duck hatcheries in general and not specifically for mulard ducks, that are commonly used for foie gras. [14]

Female ducklings are usually not used for meat production and are not viable for foie gras production, because they are not as large and robust as the males, who are better able to withstand the gruesome process of overfeeding. Additionally, females do not develop as big of a liver as the male ducks do, and their livers tend to be veined, which is an unwanted attribute in foie gras. [15] As a result, female ducklings in France are killed once their sex has been identified following hatching [16] as their livers are unsuitable as a product with the appellation “100% foie

9. Buhl, A. C. (January 15th 2016), Legal Aspects of the Prohibition on Chick Shredding in the German State of North Rhine-Westphalia , Global Journal of Animal Law, N. 2, 2016.
10. Noble, N. (March 26th 2022), What The Poultry Sector Is Doing To Address Male Chick Culling , Farmers Weekly, fwi.co.uk (last visited November 29th 2022).
11. Buhl, A. C. (January 15th 2016), Legal Aspects of the Prohibition on Chick Shredding in the German State of North Rhine-Westphalia, Global Journal of Animal Law, N. 2 , 2016.
12. European Commission, Eurostat Data Browser “Hatcheries - Hens Annual Data” (last visited December 6th 2022).
13. Porter, M., Pouvreau, A. (2014, Oct. 17th) Torture In A Can. French Foie Gras Farmer to Improve Appalling Conditions T, Newsweek.com (last visited November 29th 2022).
14. European Commission, Eurostat Data Browser “Hatcheries - Poultry, other than hens” (last visited December 6th 2022).
15. Liu, M. H. C, Churchil, R. R. (January 20th 2022), Duck Genetics and Breeding, in : Jalaludeen, A., Richard Churchil, R., Baéza, E. (Ed.) (2022), Duck Production and Management Strategies, pp. 142.
16. Rochlitz, I., Broom, D.M. (2017), The welfare of ducks during foie gras production , Animal Welfare 26 (2017), pp. 135.

gras". [17] Ground-up ducklings are collected by processing plants, where they are used for cat food, fertilisers or the pharmaceutical industry. [18]

Foie gras-producing countries in the EU are France, Belgium, Bulgaria, Hungary and Spain. [19] These countries account for approximately 90% of the world's foie gras [20]production. France produces 75% of the foie gras produced in these Member States. [21]

Although the industry is considering raising female ducklings for meat production, [22] as the meat can be exported mainly to Egypt, killing of unwanted female ducklings is still the dominant industry practice.

2.1.3 Unwanted surplus chicks

Not only are male chicks and female ducklings killed directly after hatching, female chicks of layer hen breeds and broiler chicks are also eliminated due to calculated or miscalculated overproduction. [23] Hatcheries often produce more animals than needed in case fewer chicks hatch than were estimated. [24] Treating living, sentient beings as products results in cruel and immoral practices like these.

All poultry hatcheries kill numbers of chicks, ducklings, goslings and turkey chicks. When the chicks do not manage to hatch by themselves, are too weak or have unwanted properties, the hatchery sees no purpose to keep them alive. [25] They are thrown away like rotten vegetables, but with the significant difference that they feel pain and suffer under the circumstances they are put in.

The difference to killing male chicks of course is that it is not that easy to estimate if a chick will be able to hatch by themself in advance. However, recent research related to in-ovo sex determination with the detection of so called "super grade" chick embryos could also contribute in minimising the killing of undesired ("low grade") chicks [26]. Nonetheless, even if the killing of unproductive animals in the animal production system is seen as an unavoidable necessity like in the case of unhatchable chicks, at least the killing methods need to be improved to reduce suffering.

17. Marie-Entancelin, C., Retailleau, B., Alinier, A., Vitezica, Z.G., Sex impact on the quality of fatty liver and its genetic determinism in mule ducks (2015), Journal of Animal Science, 93(9), pp. 4254.
18. Porter, M., Pouvreau, A. (2014, Oct. 17th) Torture In A Can. French Foie Gras Farmer to Improve Appalling Conditions , Newsweek.com (last visited November 29th 2022).
19. Litt, J., Pe, M.P. (2015), Principales évolutions du marché du foie gras et des résultats techniques à l'échelle des ateliers d'élevage et de gavage ces dix dernières années , in : Institut Technique de l'Aviculture (ed) 11èmes Journées de la Recherche sur les Palmipèdes à Foie Gras, 25 - 26 Mars, Tours, France, pp. 147.
20. Rochlitz, I., Broom, D.M. (2017), The welfare of ducks during foie gras production , Animal Welfare 26 (2017), pp. 135.
21. Houck, B. (2016, May 12), France Places Temporary Ban on Foie Gras Production , eater.com (last visited November 29th 2022).
22. Informal discussions with duck breeding companies from France and Poland at EuroTier Fair, November 15th and 16th 2022 ; e.g., Duckling Mule Stimul MV by Orvia Group.
23. Deutscher Tierschutzbund - Landestierschutzverband Niedersachsen e.V. (April 14th 2018), , Bei Überproduktion wird alles getötet, tierschutzniedersachsen.de (last visited November 29th 2022).
24. Animal Rights Watch (2022), Kein Kükentöten mehr in der Eierindustrie. Und nun ? ariwa.org/maennliche-kueken-eierindustrie.(last visited December 9th 2022).
25. EFSA (2019), Scientific Opinion : Killing for purposes other than slaughter : poultry, EFSA Journal 2019 ;17(11):5850, p. 29.
26. Khaliduzzaman, A., Kashimori, A., Suzuki, T., Ogawa, Y, Kondo, N. (2021), Research Note : Nondestructive detection of super grade chick embryos or hatchlings using near-infrared spectroscopy , Poultry Science Vol. 100 Issue 7, Article 101189.

2.2 Sexing

Sexing of chicks and ducklings has to be done manually currently. So-called “chick sexers” in hatcheries sort the newly-hatched chicks and ducklings. The female chicks are then transported to rearing facilities and later on layer hen farms, while the males are killed - or vice versa for foie gras production.

There are two ways of sexing : **vent-sexing** and **feather-sexing**. [27] In vent-sexing the chicks or ducklings are turned upside down and the sexer squeezes out the faeces to open up the cloaca of the chick. If a small bump comes out of the chick’s or duckling’s cloaca, the chick can be identified as a male. [28] Vent-sexing requires training, manual dexterity, and high concentration. In layer hen chicks, another method that is used is feather-sexing, in which the sex of the chick is determined either by the colour or the length and growth rate of the wing feathers. [29]From an **economic viewpoint**, manual sexing of animals represents production costs in the form of salaries that could be completely obsolete if alternatives were used. Regardless of method, sexing itself causes stress and sometimes injuries to the chicks and ducklings as they are handled quickly.

Figure 1. Feather Sexing, Photo-Credit : Vipavlenkoff / Shutterstock

The time at the hatchery is likely already **very stressful for chicks** in terms of changes in temperature, sound, movement, humidity, handling, nutrition, vibration and other factors. [30] Chick movement throughout the hatchery can be very quick and can involve the chicks being dropped between various conveyor belts from heights between 7cm and 55cm. [31] Furthermore, as they

27. MEK (Maatschap Europese Kuikenseksers), European Partnership for Chickensexers, mek-chicksexing.com (last visited November 29th 2022).
28. Cyriac, S., Joseph, L. (2022), Incubation and Hatching of Duck Eggs, in : Jalaludeen, A., Richard Churchil, R., Baéza, E. (Ed.), Duck Production and Management Strategies, p. 371.
29. Schrider, D. (January 10th 2022), How to tell the sex of baby chicks, backyardpoultry.iamcountryside.com (last visited November 29th 2022).
30. Schwean-Lardner, K. (2018), The effects of hatchery practices on the welfare of poultry, Advances in Poultry Welfare 2018, p. 29.
31. Ibid, p. 35

are transported on the conveyor belts, they often fall off. [32] In addition, the males and chicks that have disabilities or do not possess the desired property also experience pain and fear during the killing process.

Figure 2. Chicks on a conveyor belt, Photo-Credits : Luis Tato / HIDDEN / We Animals Media

2.3 Killing methods in the EU

Regulation 1099/2009 on the Protection of Animals at the Time of Killing allows two killing methods for day-old chicks and ducklings and other poultry hatchlings. The European Commission does not collect data differentiating between the methods, so there are no official numbers on the use of each method in EU Member State hatcheries. Though regulated, these two methods raise significant animal welfare concerns. Not only as the killing of surplus chicks and ducklings itself raises ethical issues, but also as the methods in use cause the animals pain and suffering.

2.3.1 Maceration

One method is **maceration**, commonly known as “grinding” or “shredding.” The chicks and ducklings are killed by throwing them in an apparatus that contains “rapidly rotating mechanically operated killing blades or expanded polystyrene projections”. [33] EU law requires that the equipment used for macerating chicks provide instantaneous maceration and immediate death of the animals, and that the capacity of the apparatus shall be sufficient to ensure that all animals are killed instantaneously, even if they are handled in a large number. [34]

Regarding maceration, a 2019 Scientific Opinion by the **European Food Safety Authority** (EFSA), found poor animal welfare consequences due to equipment overloading, slow blade

32. Example corporation video of hatchery : GeoTech HD, Modern Chicken Hatchery Technology, Poultry Slaughter & Processing Plant, Farming Highest Efficiency, youtube.com (last visited November 29th 2022).

33. Council Regulation (EC) Nr. 1099/2009 of 24th September 2009 on the protection of animals at the time of killing, Chapter I Tab. 1, Nr. 4 and Chapter II Nr. 2, OJ L 303 18.11.2009, 21, ELI :http://data.europa.eu/eli/reg/2009/1099/oj.

34. Ibid.

rotation, or rollers set too wide, all of which causing heavy injuries without immediate death, suffocation, rebounding from the blade, and pain, distress and fear in general. [35]

Council Regulation (EC) 1099/2009 on the protection of animals at the time of killing provides that animals may only be killed after stunning, and the "absence of perception and sensation must last until the animal's death". [36]

Maceration contradicts the general objective of Regulation (EC) 1099/2009 as hatchlings under the age of 72 hours were not included in the requirement of stunning before killing. Exceptions to stunning are only permitted in case of slaughter according to religious rites or **if prior stunning is technically not possible.** However, it is certainly the case that chicks that have already hatched could at least be stunned with CO2. At most, the shredding of non-hatchable chicks can be considered permissible due to the lack of possibility for stunning (but even this is questionable, because a head blow is available as a stunning method in this case). [37]

2.3.2 Asphyxiation

The other method permitted after EU law is **asphyxiation**, commonly by exposing the chicks and ducklings to carbon dioxide (CO2), which leads to suffocation. [38] For the killing of poultry in general the following gas methods are allowed : carbon dioxide at high concentration, carbon dioxide in two phases (first lower, then high concentration), carbon dioxide associated with inert gases, carbon dioxide (pure source) and carbon dioxide associated with other gases. [39]

Asphyxiation also causes adverse animal welfare impacts, such as pain, fear and respiratory distress. [40] CO2 causes mucous irritation, burning eyes and the feeling of suffocation in poultry exposed to it. [41]

Council Regulation (EC) 1099/2009 on the protection of animals at the time of killing obligates that animals must be "spared any avoidable pain, stress and suffering" at the time of killing. [42] Asphyxiation, in the light of alternative methods to chick killing, is meanwhile avoidable and therefore no longer in line with the regulation.

35. European Food Safety Authority (EFSA) (2019), Scientific Opinion : Killing for purposes other than slaughter : poultry EFSA Journal 2019 ;17(11):5850, pp. 59.
36. Council Regulation (EC) 1009/2009 of 24 September 2009 on the protection of animals at the time of killing, OJ L 303, 18.11.2009, ELI : http://data.europa.eu/eli/reg/2009/1099/oj
37. Hirt, A., Maisack, C., & Moritz, J. (2016). TierSchG Tierschutzgesetz-Kommentar, 3. Auflage. 2016 München : Verlag Franz Vahlen, p. 1076
38. Council Regulation (EC) Nr. 1099/2009 of 24th September 2009 on the protection of animals at the time of killing, Chapter I Tab. 3, Nr. 1, Nr. 2, OJ L 303 18.11.2009, 21, ELI : http://data.europa.eu/eli/reg/2009/1099/oj.
39. Ibid.
40. EFSA (2019), Scientific Opinion : Killing for purposes other than slaughter : poultry , EFSA Journal 2019 ;17(11):5850, p. 67 (Table 14).
41. Hänsch, F.J. (2009) Betäubungshilfe und Fleischqualität bei Schlachtputen nach Betäubung mit Kohlendioxid und mit Zusatz von Argon , Hannover University, Veterinary Faculty, p. 12.
42. Council Regulation (EC) 1009/2009 of 24 September 2009 on the protection of animals at the time of killing, OJ L 303, 18.11.2009, ELI : http://data.europa.eu/eli/reg/2009/1099/oj


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THE ALTERNATIVES
Foto-Credit: Human Cruelties

3 The Alternatives

Because of public pressure and prohibitions in some countries, many **alternatives to the killing of male chicks** have been developed in the past ten years. Some of them are not practicable and some do not add any value from an animal welfare point of view as they cause, or even increase, pain and suffering.

The focus of this chapter is to identify the best solutions by listing all the alternatives, including their respective advantages and disadvantages. For this purpose Table 2, Table 3 and Table 4 listing in-ovo sexing technologies and plant-based egg alternatives can be found in the annex of the report.

3.1 In Ovo Sexing

There already exist alternatives that prevent hatching of the chicks by detecting the sex when the embryo is still in the egg, known as **in-ovo sexing**.

3.1.1 Background information

There are various methods of in-ovo sexing. **Methods already in use in European hatcheries** at the time of this report's publication detect the sex of embryos **between the 9th and 14th day of incubation**. Raman-spectroscopy, which could work from the 5th to 6th day of incubation, is not yet available for large-scale practice ; but, trials for practical use started in September 2022. [43]

Currently, in-ovo sexing technology is used in around 20% of the eggs in Germany. [44] However, that amount is increasing as the methods become more available. Companies *Seleggt*, *PLANTegg* and In Ovo indicate that they could together sex around 40 million eggs by 2023. [45]

For **ducklings**, there are also some in-ovo sexing methods that have already been developed, although there is no prohibition of killing unwanted female ducklings yet. Breeders developed techniques mainly to detect unfertilised eggs in duckling hatcheries, which now can also be used for detecting the sex. [46].

Existing **genome-editing methods** work with transgenic animals with either fluorescent male eggs or male embryos dying early on. Though these methods are available, they would have to be observed more than other methods due to ethical concerns, GMO legislation and citizen acceptance.

3.1.2 Animal Welfare

There is scientific consensus that the embryo can feel pain after day 15 of the 21-day incubation period of chicken eggs. [47] Scientists further estimate that **chicken embryos can perceive pain as**

43. Waterloh, B. (September 29th 2022), Geschlechtsbestimmung im Ei - Brüterei startet vor Tag 7 Wochenblatt für Landwirtschaft und Landleben, wochenblatt.com (last visited November 29th 2022).
44. Bundesanstalt für Landwirtschaft und Ernährung (April 2022), Bericht zur Markt- und Versorgungslage mit Eiern 2022, p. 50.
45. Conversation with Respeggt Group at exhibitor booth at EuroTier Fair November 16th 2022.
46. See Annex:Table 3 : In-Ovo Sexing Technologies For Duck Embryos In Foie Gras Production
47. Incubation times differ in other poultry : e.g., 28 days in ducks other than Muscovy, 35 days in Muscovy ducks, 28–33 days in geese, cf. Schwean-Lardner, K. (2018), The effects of hatchery practices on the welfare of poultry, Advances in Poultry Welfare 2018, p. 30.

early as the 7th day of incubation. [48] For this reason, the German legislature will prohibit the destruction of eggs past the 7th day of incubation beginning in 2024. The German Agricultural Ministry has commissioned a research study in order to ascertain scientific proof of the beginning of pain perception in chicken embryos. Results are expected in January 2023. [49] In evaluating in-ovo sexing methods, the focus must be on which day of incubation the technology is able to detect the sex : **the earlier the better**.

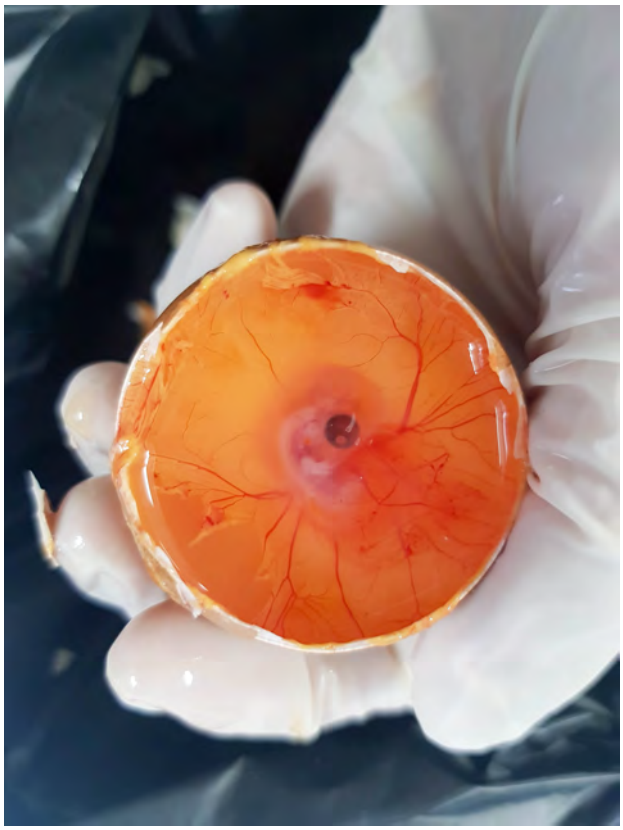

Figure 3. Chick embryo on the 6th day of incubation, Photo-Credit : Smile Ratanadet /Shutterstock

At the moment, unfortunately, there is **no method ready for large-scale practice working before day 9 of incubation**. Therefore, much research and development is currently underway.

Currently in-ovo sexing companies oppose the restriction of the German law that is intended to come into force in 2024 and would prohibit destruction of eggs after the 7th day of incubation. Those companies are stating that, though methods are available, they will not be ready for large-scale application by the end of 2023. [50] [51] In addition to *Cheggy*-technology, *AAT (Agri Advanced Technologies)* also developed a stunning method for male eggs, called *Stunny*, due to their in-ovo sexing method working only from the 13th day of incubation on. [52]

If technology is not advanced enough by 2024, a devastating outcome from an animal welfare

48. Scientific Services of the German Parliament, Wissenschaftliche Dienste des Deutschen Bundestages (2017) Sachstand zum Schmerzempfinden von Hühnerembryonen - WD 8 - 3000 - 030/17.

49. Phone correspondence with staff member of German Federal Ministry of Agriculture, September 22nd 2022.

50. DGS-Magazin, Lohmann Deutschland (November 22nd 2022), Forderung nach realistischer Debatte zum Kükentöten, dgs-magazin.de (last visited November 29th 2022).

51. DGS-Magazin (November 11th 2022), Breloh fordert Planungssicherheit für Geschlechtsbestimmung im Brutei , dgs-magazin.de (last visited November 29th 2022).

52. AAT EW Group Company, European hatcheries are introducing CHEGGY, agri-at.com/en (last visited November 29th 2022).

perspective would be that all male chicks would have to be raised, because current in-ovo sexing methods would be illegal. [53]

For the **individual chick**, it can be seen as the better alternative to be sorted out as an embryo in the egg as early as possible than to be killed right after hatching, because the selection of fertilised eggs causes less suffering than the killing methods for hatched chicks.

On the other hand, for the welfare of all animals affected by the egg and chicken meat industry, in-ovo sexing also presents **drawbacks**. In-ovo sexing only tackles the symptoms, not the cause of the problem, which is selective breeding. [54] Sex determination in the egg is not designed to target the underlying problems of selective breeding. It gives the industry the sign that the system as it is can go on, although it has been known for years that selective breeding has caused severe animal welfare problems in layer hens and broiler chickens. [55]

3.2 Rearing of 'brother roosters'

A currently common alternative to killing male chicks directly after hatching is the **rearing of the male chickens of the laying hen strains (brother roosters), to kill them for slaughter** later on. However, as explained below, the raising of brother roosters for meat production is not an alternative that makes sense in any way.

3.2.1 Background information

Brother roosters are not bred to develop much meat as breeding is selectively focused on egg laying performance of the females. For this reason, the **food conversion rate (FCR)** [56] of brother roosters is around twice as high as that of broiler hybrids. The latest studies on reducing costs find that, for conventional rearing of brother roosters up to a slaughter weight of 1.5 kg, the FCR is 1:3.0–3.5 kg. [57] [58] . This seems to be the best result possible; however, it is not approved under common husbandry circumstances, which see FCRs between 3.4 [59] and 12 kg [60] per 1 kg weight gain for brother rooster rearing. In contrast, the FCR for broiler chickens is around 1:1.7 kg. [61]

Brother roosters reach a weight of 1.2 kg after 10 weeks (70 days) and 1.5–1.6 kg after **91 days** in organic husbandry systems [62] as well as conventional rearing. [63] After the 13th week, the roosters reach puberty, which causes more cockfights, injuries and a decreasing FCR.

The raising of male layer chicks for meat production is currently practised in Germany and also in the Netherlands and Eastern Europe, particularly Poland, as German male layer chicks are

53. For issues regarding the rearing of male chicks, see below under "Rearing of brother roosters".
54. Jan Peifer, in : Schönherr, H.P. (October 7th 2022), Tod im Ei - Umgang mit männlichen Küken taz.de (last visited November 29th 2022).
55. See the "Dual Purpose Breeds" chapter below for the animal welfare problems selective breeding has caused.
56. FCR = the weight of feed intake divided by weight gained by the animal.
57. Netzwerk Fokus Tierwohl, Bruderhahnaufzucht - Echte Perspektive oder Zwischenlösung? fokus-tierwohl.de (last visited November 29th 2022).
58. Krieg, J., Niewind, P., Stegemann, J. (2022), Bruderhähne - wie werden sie richtig gefüttert?, DGS Magazin 10/2022, pp. 30.
59. Bessei, W., Plantegg, (2021), Umweltrelevante Kriterien in der Bruderhahnaufzucht - Schlechte Klimabilanz , DGS Magazin 44/2021, pp. 40.
60. Jost, L., SWR2 Podcast (July 31st 2022), Kükentöten verboten - Deutschlands Alleingang für mehr Tierschutz, , swr.de/swr2 (last visited November 29th 2022).
61. Ibid.
62. Alpers, A. (October 2022), Facetten der Öko-Bruderhahnaufzucht, Naturland Nachrichten 05/ October 2022, pp. 10.
63. Bessei, W., Plantegg, (2021), Umweltrelevante Kriterien in der Bruderhahnaufzucht - Schlechte Klimabilanz , DGS Magazin 44/2021, pp. 40.

exported to those countries. It is estimated that this method is used in 70% of all male eggs from layer hen hatcheries in Germany. [64] This high number has the effect of in-ovo sexing methods not being ready on a larger scale by the beginning of 2022. [65] While the concerns regarding this alternative in terms of animal welfare, sustainability and intransparent supply chains continue to get bigger and increasingly more common, retailers tend to prefer in-ovo sexing methods which could change the proportions in the use of available alternatives. [66]

In reaction to pressure due to supply chain laws, many retailers do not want to face the possibility of negative publicity or future legal challenges of brother rooster meat being exported to west African countries and destroying the livelihoods of local farmers. [67]

This seems to cause retailers to prefer in-ovo sexing methods as they get more and more available. For example, as German retailers like *REWE*, *ALDI* and *Kaufland* concluded their yearly contracts in August 2022, they demanded eggs with in-ovo sexing methods. [68] As a result, it is estimated that the number of reared brother roosters will decrease drastically. [69]

Even if in-ovo sexing was in place nationwide in Germany, because none of the in-ovo sexing methods is currently 100% accurate, there will always be some male chicks that hatch and, under German law, will need to be raised. Under French law it is still allowed to kill male chicks on which the in-ovo sexing failed ; however, these chicks are not protected from suffering caused by the killing methods in use despite the severe animal welfare concerns they raise.

3.2.2 Animal Welfare

For the **individual chick**, it could be considered as the better outcome not to have hatched at all rather than hatching into a world where it is seen merely as a product and raised for killing and exploitation for its meat. Killing the chicks directly after hatching because there is no economic reason to keep them alive is an ethical turmoil. However, it could actually be considered as worse not to kill them immediately and, instead, raise them in the circumstances of industrial animal farming only to kill them later for their meat despite there currently not even being a demand for it in Europe.

That said, it is also the case that, in raising brother roosters, **total animal suffering** could be minimised. Broiler chickens suffer tremendously under the effects of selective breeding. [70] Therefore, if brother rooster meat replaced broiler chicken meat on the market, animal suffering would decrease overall, as brother roosters in general seem to be healthier than broiler chickens. [71]

However, the following has to be taken into account when evaluating these theoretical effects on general animal suffering : even if brother rooster meat replaced broiler chicken meat, this would not decrease numbers of individuals put in the animal industry since, for 1 kg of meat 2.5–3.6 brother roosters are needed (in organic farming). [72] In contrast, for 1 kg of meat from

64. Bundesanstalt für Landwirtschaft und Ernährung (April 2022), Bericht zur Markt- und Versorgungslage mit Eiern 2022, p. 50.
65. Ibid., p. 51.
66. Informal discussions with German egg producers and technology companies at EuroTier Fair, November 16th 2022.
67. Ibid.
68. Ibid.
69. Ibid.
70. For further information on the animal welfare concerns caused by selective breeding, see below under section “Dual Purpose Breeds - Animal Welfare”
71. Expert Report on Husbandry of Brother Males : Krautwald-Junghans, M. (June 20th 2021), Sachverständigengutachten zur Haltung sog. Bruderhähne, Leipzig University, Faculty of Veterinary Medicine, on Behalf of the Hessian Ministry for the Environment, Energy, Agriculture and Consumer Protection (HMUELV), pp. 9.
72. Presentation by Alpers, A., Bioland, Bio-Bruderhähne, Aufzucht und Verwertung, at EuroTier Fair, November 16th

broiler chickens (with a slaughter weight of around 1.7 kg [73]), 0.8 broiler chickens are needed, given a carcass utilisation rate of 70%. [74]Therefore, more individual brother roosters would need to be raised and killed to cover current meat demand.

The rearing of brother roosters for meat production already raises additional **concrete animal welfare concerns**. In Germany, it was observed that, due to a lack of capacity to rear all the hatched male chicks, many of them are being exported to other countries, mainly the Netherlands and Poland. [75] [76] This requires **longer transports**. Transport in general causes significant stress in these young animals as chicks within the first 3 days (72 hours) of their lives can be transported for up to 24 hours without any feed or fresh water. [77]

In addition, there are not enough slaughter capacities for these animals either. [78] This again leads to longer transport periods. Because of their lower body weight, brother roosters cannot be slaughtered in usual broiler slaughter facilities as the slaughter line there is not suitable for them. [79] For example, in waterbath stunning, they would be too small to reach the water and the bodies are too small for the eviscerators used in broiler slaughter houses. [80]

Therefore, they need to be slaughtered in slaughterhouses that kill “old” layer hens as they are around the same size. For the cockerels to get there requires longer transportation, which causes additional stress [81] as poultry can be transported for up to 12 hours in plastic boxes without any feed or fresh water. [82]

Currently, only **Commission Implementing Regulation (EU) 2020/464** of 26 March 2020 [83] mentions **brother roosters**. The regulation describes stocking densities and flock sizes, but only applies to **organic farming**.

In conventional farming, there are no regulations for brother roosters that go beyond the general requirements for chickens kept for meat production in **Council Directive 98/58/EC** of

2022, Hannover, Source : Annika Bruhn (Bioland NRW) taking a basis of 40% usable carcass which could be increased to up to 60% with enough experience.

73. Ahrens, S. (June 8th 2022), Average Slaughter Weight of Broilers in Germany in the Years 2010 to 2021 in Kilogram, Statista, de.statista.com (last visited November 29th 2022).

74. Haus Düsse of Chamber of Agriculture of North Rhine-Westphalia, Simon, I. Stegemann, J. (2007), Neue Hähnchenlinien im Fokus - Hähnchenherkünfte im Vergleich

75. Jost, L., SWR2 Podcast (July 31st 2022), Kükentöten verboten - Deutschlands Alleingang für mehr Tierschutz , swr.de/swr2 (last visited November 29th 2022).

76. Theile, M. (July 22nd 2022), Kükentöten : Piep ?, Die ZEIT, zeit.de.

77. Council Regulation (EC) No. 1/2005 of 22nd December 2004 on the protection of animals during transport and related operations, Annex I Chapter 5 Nr. 2.1 b), OJ L 3 5.1.2005, p. 1 ELI : http://data.europa.eu/eli/reg/2005/1/oj

78. Waterloh, B. (2021), Zwischen Leben und Tod , Wochenblatt für Landwirtschaft und Landleben 12/2021, pp. 18.

79. Netzwerk Fokus Tierwohl, Bruderhahnaufzucht - Echte Perspektive oder Zwischenlösung ? fokus-tierwohl.de (last visited November 29th 2022).

80. Expert Report on Husbandry of Brother Males : Krautwald-Junghans, M. (June 20th 2021), Sachverständigengutachten zur Haltung sog. Bruderhähne, Leipzig University, Faculty of Veterinary Medicine, on Behalf of the Hessian Ministry for the Environment, Energy, Agriculture and Consumer Protection (HMUELV), pp. 9.

81. European Food Safety Authority (EFSA) (2011), Scientific Opinion Concerning the Welfare of Animals During Transport, EFSA Journal 2011;9(1):1966, pp. 46.

82. Council Regulation (EC) No. 1/2005 of 22nd December 2004 on the protection of animals during transport and related operations, Annex I Chapter 5 Nr. 2.1 a), OJ L 3 5.1.2005, p. 1 ELI : http://data.europa.eu/eli/reg/2005/1/oj

83. ommission Implementing Regulation (EU) 2020/464 of 26 March 2020 laying down certain rules for the application of Regulation (EU) 2018/848 of the European Parliament and of the Council as regards the documents needed for the retroactive recognition of periods for the purpose of conversion, the production of organic products and information to be provided by Member States, Article 13 a) and c), Article 15 (3)b) iii), Annex I Part IV No. 2, OJ L 98, 31.03.2020, p. 2, ELI : http://data.europa.eu/eli/reg_impl/2020/464/oj

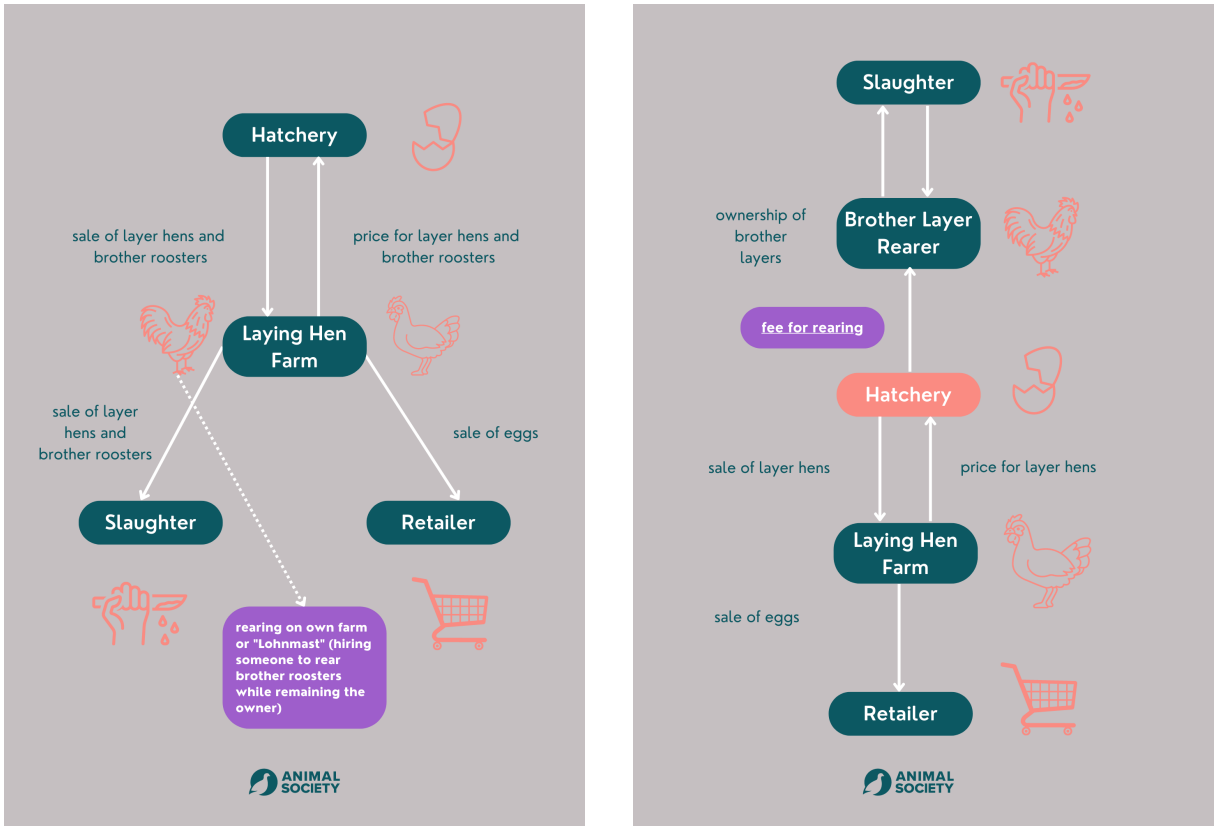

FIGURE 4. Supply Chains - Source : Reiter, J. (2022), Der richtige Satz für Bruderhähne - welche Steuer gilt wann ?, DGS Magazin 10/2022, pp. 34, 37

July 20th 1998, concerning the protection of animals kept for farming purposes [84] [85] In countries with generally weak animal welfare legislations, this likely leads to brother roosters being raised under intransparent conditions that are not adapted to the specific needs of the more active brother roosters.

Industry insiders report **disturbing tendencies** in this alternative scenario. Presumably, it could be more profitable for producers if these roosters die in the early stages of the rearing period than if they are kept alive until slaughter. Therefore, producers of brother rooster meat could likely be incentivized to keep the roosters under conditions that make it more likely for them to die at an early age. [86] This means high mortality rates in these cockerels could be something producers are not trying to avoid because they are receiving a fee from the hatcheries for raising these animals, regardless of how long they live.

The following graphics show the ways in which the current trading systems between hatcheries, layer hen facilities, brother rooster rearers and slaughterhouses work and why, as a result, it is likely that these accusations could be in fact true.

In Germany, as a result of public awareness on the neglect of animal welfare in brother

84. Council Directive 98/58/EC of 20 July 1998 concerning the protection of animals kept for farming purposes, OJ L 221, 08.08.1998, p. 23, ELI : http://data.europa.eu/eli/dir/1998/58/oj

85. Council Directive 2007/43/EC of June 28th 2007 laying down minimum rules for the protection of chickens kept for meat production, OJ L 182, 12.7.2007, p. 19–28, ELI : http://data.europa.eu/eli/dir/2007/43/oj

86. Informal discussions with German egg producers and technology companies at EuroTier Fair, November 16th 2022.

rooster husbandry, the *KAT*-association [87] tried to address this problem. They, as well as some organic producer associations [88], have developed guidelines with requirements pertaining to, e.g., stocking densities, slaughter age and manipulable materials. [89] Around 90% of eggs in Germany have the *KAT*-label. [90]

Another problem regarding brother roosters raised on small farms (less than 250 animals) is that they are often kept with the layer hen flocks and fed with the same feed with high lime concentrations for egg production. However, as the males do not lay eggs, the high percentage of lime stresses their metabolism causing diarrhoea and other sickness. [91]

Like in-ovo sexing, the rearing of brother roosters also does not question the current system of selective breeding that causes layer hens to suffer tremendously under their own bodies.

3.2.3 Environmental issues

The rearing of brother roosters is also **harming the environment even more than broiler meat production**. Not only do brother roosters consume much more food than broiler chickens, they also have to be raised for a longer period of time, causing them to produce more faeces and particulate matter, as well as requiring increased energy and water use. [92] [93] While this is not meant to promote broiler chicken husbandry, it clearly shows that the raising of brother roosters is not a desirable solution from the perspective of climate change and emission reductions. Moreover, the already environmentally damaging practices of the animal industry should not be increased with the additional rearing of brother roosters.

Furthermore, as there are not enough rearing facilities, currently many of these cockerels are being transported to other countries for rearing or slaughter. Emissions from long transport routes worsen the environmental impact of brother rooster meat production. On the other hand, building more facilities for rearing these chicks is also not sustainable under resource and energy considerations. Furthermore, in most regions in Germany, for example, it is not possible to build many additional barns, as there are strict regulations in construction law regarding agricultural animal husbandry facilities. Yet, it was estimated that an additional 56 hectares in stable spaces would be needed to raise all 40 million male chicks in Germany. [94]

Altogether, raising male chicks uses up many more resources than it provides, which is actually true of all animal husbandry but is particularly apparent in this case.

3.3 Dual Purpose Breeds

Another alternative that is more of a long term solution is the use of **dual purpose breeds**. This entails layer chickens being bred back to less specialised breeds. The female layer hens lay

87. KAT (Verein für kontrollierte alternative Haltungsformen) = Association for Controlled Alternative Animal Husbandry.
88. Hörning, B. (2021), Bruderhähne, KTBL, ktbl.de.
89. KAT Association, Opting Out Of Chick Killing, was-steht-auf-dem-ei.de/en (last visited November 29th 2022).
90. Diekmann-Lenartz, C. (January 12th 2022), Kükentöten - wie geht die Branche mit dem Verbot um?, Land&Forst, landundforst.de (last visited November 29th 2022).
91. Foodwatch (March 30th 2021), Ist die Aufzucht von „Bruderhähnen“ die Lösung für das Kükentöten?, foodwatch.org (last visited November 29th 2022).
92. Bessei, W., Plantegg, (2021), Umweltrelevante Kriterien in der Bruderhahnaufzucht - Schlechte Klimabilanz, DGS Magazin 44/2021, pp. 40
93. Hiller, P., Meyer, A., Schemmann, K. (LWK Niedersachsen), Kölln, M., Klüß, J. (FLI Braunschweig) (2022), Teil 2 : Ganzkörperanalysen für die Bilanzierung der Nährstoffausscheidungen von langsam wachsenden Mastherkünften und Bruderhähnen, lwk-niedersachsen.de (last visited November 29th 2022).
94. Waterloh, B. (2021), Zwischen Leben und Tod, Wochenblatt für Landwirtschaft und Landleben 12/2021, pp. 18.

eggs while the male cockerels can be raised for meat production because they develop more meat than the males of pure layer hybrids.

3.3.1 Background information

At the moment, **neither hens nor roosters of dual purpose breeds can provide as many eggs or as much meat as specialised breeds**. Dual purpose breed hens lay around 30 eggs less than layer hybrid hens. [95] They lay around 270 eggs per year with a FCR of 2.5–2.8 kg feed for 1 kg egg mass, compared to around 300 [96]– 320 [97] eggs per year with a FCR of 2.2 kg feed for 1 kg egg mass in layer hybrids. [98] Dual purpose breed roosters are raised for 60 to 80 days, compared to 32 days in broilers, with a FCR of 1:2.4 kg. [99]

What needs to be considered though, is that dual purpose breeds do not need "high quality" (imported) protein feed, but **can be fed with almost any leftovers** because they are much more robust. This could go some way to equaling out the lower good FCR from an economic standpoint and be more sustainable and environmentally friendly as well. [100] Importantly, this could contribute to more closed circle economy standards. [101]

3.3.2 Animal Welfare

For animal welfare reasons, the use of dual purpose breeds is an approach that **could reduce the suffering of chickens.**

The unnatural, high egg-laying-performance of **common layer breeds** causes **severe health problems** such as inflammation of fallopian tubes and osteoporosis. A recent study of Bern University concluded that 97% of layer hens suffer from broken keel bone due to the unnatural high amounts of eggs they lay, causing a lack of calcium. [102] Selective breeding for productivity traits leads to layer hens requiring calcium for eggshell production at an amount greater than the medullary bone can supply. Subsequently, this causes bones to become osteoporotic and fragile. [103]

Also, **selective breeding of broilers** for meat production over the last decades caused drastic changes in the anatomy of these animals. Breast and thigh muscles add up to 66% of the carcass weight. [104] The high weight leads to painful leg damage due to the juvenile skeleton not being able to handle the fast muscle growth. At the end of the fattening period, this causes the chickens to stand up and walk only 4% of the day. Additionally the heart and lungs

95. Bundesanstalt für Landwirtschaft und Ernährung (April 2022), Bericht zur Markt- und Versorgungslage mit Eiern 2022, p. 51.
96. Statistisches Bundesamt (March 30th 2021), Jede Legehenne in Deutschland legte im Jahr 2020 im Schnitt 301 Eier , Zahl der Woche Nr. 13, destatis.de.
97. Waterloh, B. (2021), Zwischen Leben und Tod, Wochenblatt für Landwirtschaft und Landleben 12/2021, pp. 18.
98. Waterloh, B. (2021), Zwischen Leben und Tod, Wochenblatt für Landwirtschaft und Landleben 12/2021, pp. 18, 23.
99. Ibid.
100. Jost, L., SWR2 Podcast (July 31st 2022), Kükentöten verboten - Deutschlands Alleingang für mehr Tierschutz , swr.de/swr2 (last visited November 29th 2022).
101. Ibid.
102. Baur, S., Rufener, C., Toscano, M.J., Geissbühler, U. (2020), Radiographic Evaluation of Keel Bone Damage in Laying Hens - Morphologic and Temporal Observations in a Longitudinal Study, Frontiers in Veterinary Science Vol. 7, Art. 129.
103. Fernyhough, M., Nicol, C.J., van de Braak, T., Toscano, M.J., Tønnessen (2019), M., The Ethics of Laying Hen Genetics, Journal of Agricultural and Environmental Ethics (2020):33, pp. 15, 22.
104. Blocksiepen, D. (2016), Schlachtkörperanalyse beim Masthähnchen mittels Dualenergie-Röntgenabsorptiometrie und Magnetresonanztomographie, Dissertation, Munich, p. 10.

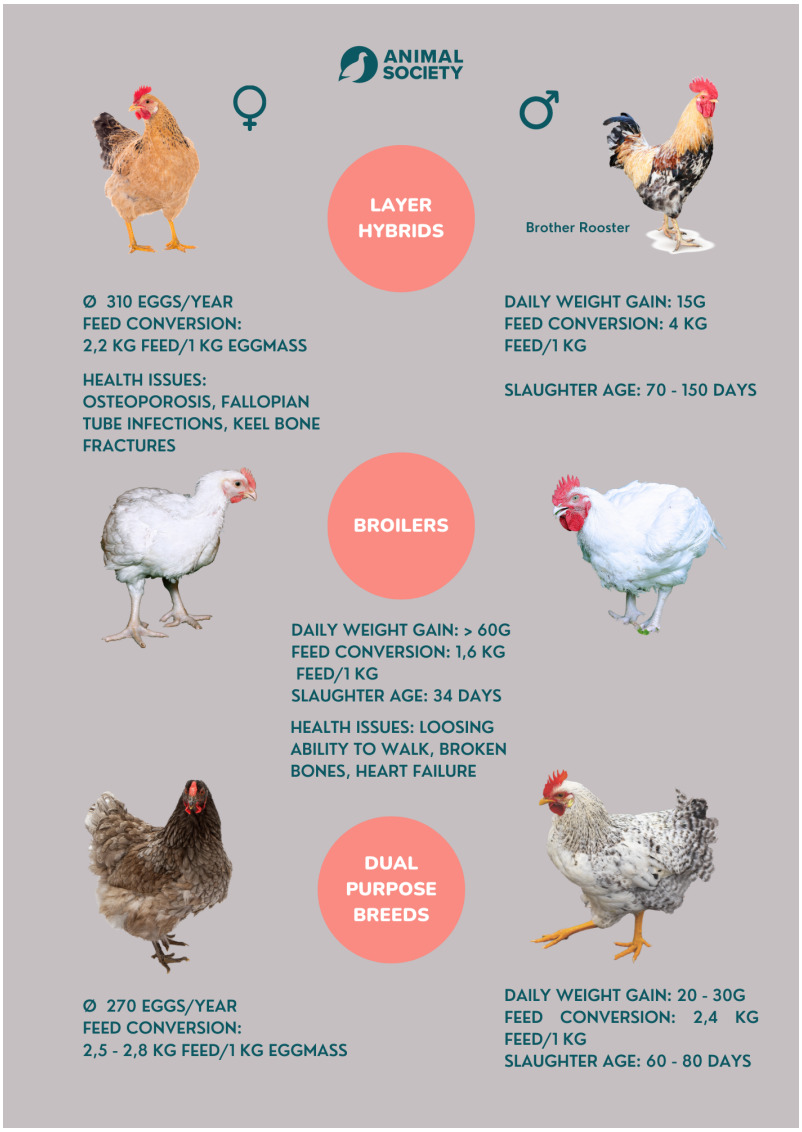

FIGURE 5. Juxtaposition of dual purpose breeds, layer hybrids and broiler chickens. Source : Waterloh, B. (2021), Zwischen Leben und Tod, Wochenblatt für Landwirtschaft und Landleben 12/2021, pp. 18.

are too small to support the fast-growing animal properly, which can lead to deadly heart failure. [105]

While market-leading breeding companies, such as *EW Group* and *Hendrix Genetics*, are trying to breed hens that are less prone to bone fragility, some animal welfare organisations see dual purpose breeds not only as an alternative to chick killing, but also as a way to minimise suffering in egg laying hens and broiler chickens due to reduced egg laying performances and body growth. [106]

However, even the dual purpose breed hens still lay an unnaturally high number of eggs, at around 270 eggs per year. For example, that amount of egg laying is nearly seven times higher than that of their ancestral Bankiva chicken in South East Asia, which lays clutches of 5–10 eggs

105. Albert Schweitzer Stiftung für unsere Mitwelt, Masthühner, albert-schweitzer-stiftung.de (last visited November 29th 2022).
106. Weinmann, B. (February 23rd 2022), Röntgenbilder mit Schock-Resultat : 97 Prozent aller Legehennen haben ein gebrochenes Brustbein, Luzerner Zeitung (last visited November 29th 2022).

only up to 4 times per year (the equivalent of a maximum of 40 eggs per year). [107]

The judges of the Federal Administrative Court of Germany ruled in 2019 that chick killing was not compatible with the German Animal Welfare Act, which led to the final prohibition that came into force January 1st 2022. As part of the grounds of its judgement, the court also declared that the practice of chick killing is a result of excessive breeding resulting purely from an effort by companies to generate larger profits and in full neglect of animal welfare. [108]

Currently in Germany, 72% of the eggs are produced domestically. To provide this amount of eggs domestically with dual purpose breeds, the numbers of layer hens in egg production would need to increase. [109] For this, parent stocks of layer hens would also need to increase. Therefore, in the interest of decreasing suffering in animals, decreasing the number of individual animals in the food industry and from the perspective of resource sufficiency, the demand for eggs would need to decrease, for this alternative to provide improvements in total animal welfare. Individually though, dual purpose breed chickens endorse more animal welfare as they are healthier.

Therefore, in the interest of decreasing suffering in animals, decreasing the number of individual animals in the food industry and from the perspective of resource sufficiency, the demand for eggs would need to decrease, for this alternative to provide improvements in total animal welfare. Individually though, dual purpose breed chickens endorse more animal welfare as they are healthier.

3.4 Plant-based protein and plant based egg alternatives

None of the previously described alternatives is perfect. The negative effects of those alternatives show clearly how deeply connected the animal industry is to a lack of sustainability and animal welfare concerns.

It must, at all times, be clear that the problem of chick killing is just a symptom of a much bigger problem. It reflects that the production of animal-based products is solely aiming at the short term optimization of economic profit, while causing the waste of resources, destruction of the environment and severe suffering of animals and humans.

However, **plant-based protein sources and plant-based egg alternatives** could provide sustainable and nutritious alternatives. [110] This includes alternatives that copy the binding properties or taste of chicken eggs that are either currently available or in development. [111] But, it also includes alternatives that look like a whole egg with shell, eggwhite and egg-yolk, combining nutritious advantages while dismissing unwanted properties like cholesterol. [112] In light of the **European Green Deal** and the **Farm-To-Fork Strategy**, plant-based alternatives should be further promoted, researched and funded by the EU.

Promoting and embracing these alternatives could help move away from an industry that causes suffering in farmed animals and also strengthen the fight to restrain global warming,

107. Albert Schweitzer Stiftung für unsere Mitwelt, Legehennen, albert-schweitzer-stiftung.de (last visited November 29th 2022).
108. BVerwG, Judgement of 13 June 2019 - 3 C 28.16 (English Version).
109. Office for Consumer Protection and Food Safety of Lower Saxony (LAVES), Das Prinzip Bruderhahn - Alternative zum Töten der männlichen Küken , laves.niedersachsen.de (last visited November 29th 2022).
110. Grizio, M., Specht, L., The Good Food Institute (2018), Plant-based egg alternatives : Optimizing for functional properties and applications.
111. Formanski, K. The Good Food Institute (2021), 2021 State Of The Industry Report. Plant-based meat, seafood, eggs, and dairy
112. e.g. : Neggst, https://www.neggst.co/pages/our-plant-based-egg(last visited December 9th 2022).

improve public health and protect wildlife. Additionally, in days of increasingly uncertain food-security, it should be clear that energy-intensive food systems like the animal industry that also require high imports of soy and fertiliser for domestic cereal production, will not be a promising solution for future generations or even our own.

Many egg alternatives have been developed already. [113] In reducing egg production in general and funding research into healthy plant-based egg alternatives, the EU can make a huge change and be a positive global example for a sustainable future.

113. See Annex : Table 4 : Plant-Based Egg Alternatives

ANIMAL SOCIETY

THE PIONEERS

Foto-Credit: Human Cruelties

4 The Pioneers

4.1 Germany : What we have learned so far

Germany was one of the first countries in the world to prohibit the cruel practice of chick killing. This happened after the **German Federal Administrative Court** (*Bundesverwaltungsgericht*) ruled in 2019 that **chick killing contravenes the German Animal Welfare Act**. [114] As the German Animal Welfare Act (Tierschutzgesetz - TierSchG) demands a **reasonable cause** for the killing of an animal, the court decided in a historical judgement, that **economic reasons alone are not a reasonable cause** within the meaning of Sect. 1, 2nd Cl. TierSchG. [115] Because male chicks were being killed only for economic reasons, it was ruled to be illegal under the German Animal Welfare Act, with this judgement taking effect as soon as other alternatives were available that would burden the hatchery to a significantly smaller degree than rearing the animals would. In the meantime, the continuation of the previous practice for a transitional period was understood to still be based on a reasonable cause within the meaning of the provision. [116] However, **since January 2022, it is illegal under the new section 4c TierSchG** to kill the chicks of the domestic chicken breed *Gallus gallus (domesticus)* in Germany. [117]

Current scientific evidence suggests that perception of pain (nociception) of chick embryos begins from the 7th day of incubation. Therefore, **beginning January 1st 2024**, the prohibition of male chick killing will be **further restricted in Germany**.

It will then also be prohibited to : (1) perform an operation on a hen's egg that causes the death of the hen's embryo, (2) abort the incubation process in such a way that causes the death of the embryo, during or after the application of a method for determining the sex of the hen's egg after the 7th day of incubation. [118] Therefore, many hatcheries are reluctant to invest in the currently available machinery to determine the embryo's sex, anticipating a future ban of these technologies.

The prohibition in Germany since January 2022 has had **positive and negative outcomes** so far.

One strong **positive outcome** is that male chicks are **no longer being systematically killed** and discarded. Also, the prohibition is now well accepted and not questioned anymore by citizens or the industry. Concerns mainly regard problems with brother rooster rearing and unfair market conditions for German producers related to competition with producers in Member States that do not have such a prohibition.

Furthermore, with the prohibition, **in-ovo sexing methods** were pushed to be ready for commercialisation, with companies and start-ups quickly seeking techniques to detect the sex in an even earlier stage of incubation. Additionally, **research and breeding of dual purpose chickens** was established further on, which is already bringing better results compared with years past.

However, the **negative effects** cannot be dismissed. Since the ban applies only to Germany, after it went into effect and even beforehand in anticipation of it, about 40% of the domestic **hatcheries in Germany specialised in laying hens closed** since 2019. Moreover, of the 18 operating laying hen hatcheries in Germany in February 2021, only 12 were still in operation

114. BVerwG, Judgement of 13 June 2019 - 3 C 28.16 (English Version).
115. Sect. 1 TierSchG .
116. BVerwG, Judgement of 13 June 2019 - 3 C 28.16 (English Version).
117. Sect. 4c TierSchG.
118. Sect. 4c Para. 3 TierSchG, coming into force January 1st 2022, buzer.de (last visited on December 8th 2022).

in February 2022.[119] This is because it is cheaper to import layer hen chicks from other EU countries that still allow chick killing.[120] As a result, the **number of laying hen imports increased drastically**.[121]

	Hatcheries with incubated eggs	Incubated eggs	Hatcheries with hatched chicks	Hatched female chicks	Hatched selected male chicks	Theoretical percentage of brother roosters for fattening
2019*	19	19.7 million	19	10.1 million		
2020*	18.5	18 million	18.5	7.7 million		
2021*	17.5	11.6 million	17	4.5 million		
2022*	12	7.5 million	12	2.9 million	2.1 million	71%

TABLE 1. Incubated hatching eggs and hatched chick of layer strain for use in Germany
Source : Destatis April 2022 ; Bundesanstalt für Landwirtschaft und Ernährung (April 2022), Bericht zur Markt- und Versorgungslage mit Eiern 2022, p. 51
*added and rounded up numbers from the first two months January/February 2019/2020/2021/2022

Since the prohibition came into force, chicks predominantly are not incubated in Germany anymore. In 2021, for the first time, more young layer hens for breeding were imported to Germany than exported. In effect, the incubation process was relocated to other countries.[122] The problems were detected and targeted by initiatives like the *KAT*-association, and include regulations that make sure that the supply chains providing imported young layer hens stocked after January 1st 2022 do not involve chick killing, even if chick killing is still allowed in the exporting country.[123]

Another negative effect was the amount of **brother roosters** that were then raised for meat when there is little to **no European market demand** for it. This leads to avoidable overproduction, likely causing importers in African countries to buy the dramatically cheaper meat of these brother roosters and **destroying their local African meat market**. Thus, the unfortunate and decidedly unfavourable outcomes of the prohibition include companies being paid a fee for raising brother roosters under intransparent and **seemingly bad animal welfare standards**.

A recurring critique from producers[124] and consumer protection groups[125] [126], is that consumers in Germany cannot tell which alternative was used in the process, as labels mostly just state “without chick killing”. A December 2020 representative survey came to the conclusion that around 73% of the questioned consumers wanted to know which alternative was used in the process.[127]

119. Bundesanstalt für Landwirtschaft und Ernährung (April 2022), Bericht zur Markt- und Versorgungslage mit Eiern 2022, p. 51.
120. Ibid
121. Ibid.
122. Ibid.
123. KAT Association, Opting Out Of Chick Killing, was-steht-auf-dem-ei.de/en (last visited December 2nd 2022).
124. Agrar Presseportal, Press Release by Zentralverband Deutscher Geflügelwirtschaft e.V. (June 26th 2022), Exportschlager Kükentöten / Heimische Brüterein sterben , agrar-presseportal.de (last visited November 29th 2022).
125. Verbraucherzentrale (March 17th 2022), Verbraucher lehnen Kükentöten ab und wünschen sich klare Informationen, Citizens Survey on the topic of chick killing - GfK eBUS® on behalf of Verbraucherzentrale (December 2020).
126. Interview with Bodski, A. (Foodwatch), in : RBB, Eier ohne Kükentöten - Wird die Verordnung eingehalten ? | SUPER.MARKT, available on youtube.com (last visited December 9th 2022).
127. Verbraucherzentrale (March 17th 2022), Verbraucher lehnen Kükentöten ab und wünschen sich klare Informationen, Citizens Survey on the topic of chick killing - GfK eBUS® on behalf of Verbraucherzentrale (December

It was also criticised that eggs produced with the rearing of brother roosters in the process being labelled “without chick killing” can be **deceiving to consumers**. This consumer confusion results from the fact that the chicks are actually killed later in the process, and consumers think they are buying eggs that are better for animal welfare, whereas the husbandry of brother roosters seems, in fact, to not be animal welfare friendly. [128]

Additionally, the prohibition **only regards shell eggs**. For processed food that contains eggs, imported eggs with chick killing in the process can still be used and no labelling is required to identify where these eggs come from and if chicks are killed. This is not transparent for consumers who think the killing of male chicks is prohibited in their country. Particularly for vegetarian consumers, for example, it is highly misleading that for meat substitutes like vegetarian sausages, eggs with chick killing can be used. [129]

In 2020, in addition to the 12.9 billion layed eggs, around 6 billion eggs were imported into Germany. [130] [131] Of those imported eggs, 75% of them came from the Netherlands where chick killing is still allowed. [132]

As mentioned above, many of the male chicks currently raised, are either exported to be fattened and slaughtered in other countries (mostly Poland, Hungary and the Netherlands) or being raised in Germany and exported for slaughter afterwards.

The **German poultry industry** continues to criticise the law, not so much for its content anymore, but because a ban that is only national in scope has exposed them to unequal competitive standards. For this reason, the German poultry industry **calls for an EU-wide ban as well**. [133] [134]

Moreover, after the prohibition of chick killing, egg prices reportedly increased by 2 cents per egg. Although it is not clear if this was merely an effect of the prohibition of chick killing. It is estimated that egg prices will increase by further 2 cents per egg in the upcoming year due to avian flu and increased costs of energy and feed. [135]

All these effects clearly show that a national ban is not a meaningful solution, as the problem is merely being shifted elsewhere.

2020).

128. Interview with Bodski, A. (Foodwatch), in : RBB, Eier ohne Kükentöten - Wird die Verordnung eingehalten? | SUPER.MARKT, available on youtube.com. (last visited December 9th 2022).

129. Ibid.

130. Statistisches Bundesamt (March 15th 2021), Eierproduktion 2020 : 8 % mehr Eier aus ökologischer Erzeugung. Pressemitteilung Nr. 125 vom 15. März 2021, destatis.de.

131. Statistisches Bundesamt/Genesis (o. D.). 51000-0013 : Aus- und Einfuhr (Außenhandel) : Deutschland, Jahre, Warenverzeichnis (8-Steller).

132. Bundesanstalt für Landwirtschaft und Ernährung (April 2022), Bericht zur Markt- und Versorgungslage mit Eiern 2022, p. 51.

133. Dahm, J., Pistorius, M. (July 21st 2021), Germany, France call on EU countries to also ban culling of male chicks, euractiv.com (last visited November 29th 2022).

134. Waterloh, B. (June 27th 2022),“Exportschlager” Kükentöten. In Deutschland werden immer weniger Legehennenküken ausgebrütet, Wochenblatt für Landwirtschaft und Landleben, wochenblatt.com (last visited November 29th 2022).

135. Merkur (November 29th 2022), Preise für Eier könnten weiter steigen - Knappheit nicht ausgeschlossen, merkur.de (last visited November 29th 2022).

4.2 France

France prohibited the systematic killing of day-old chicks in 2022, through a regulation slated to **enter into force on January 1st 2023**. The one-year transition period allowed the hatcheries to acquire the necessary equipment while being financially supported. Notably, the law does not include the killing of female ducklings in the foie gras industry. The French law also provides an exemption for the killing of chicks, that were sexed wrong by the in-ovo sexing methods and hatched.

The French government guarantees the legality of the in-ovo sexing technologies implemented in hatcheries for a five year period. [136]

4.3 Further Countries

Austria decided to partially ban the practice of male chick killing as well. The Austrian Animal Welfare Act will have a related amendment prohibiting maceration of living chicks and restricting the killing of male chicks. [137] Killing of male chicks without a specific reason will be banned. An accepted specific reason will be the killing to use chicks for feed of captive animals.

In August 2022, the Italian Legislature adopted a ban on the systematic killing of chicks as well, coming into force by the end of 2026. [138]

Luxembourg banned the practice in 2018, presumably without having large numbers of domestic layer hen hatcheries though. [139] [140]In the **Netherlands**, on June 15th 2021, a majority of the Dutch House of Representatives supported a motion to ban the killing of day-old chicks as well. [141]

4.4 Producers and Retailers

Many German retailers offered eggs without chick killing even before it was prohibited in Germany and were increasing the consumers' willingness to pay through voluntary labelling of egg cartons. Public demand and discussion about chick killing, even years before the end of the practice was targeted legally, led to some producers and retailers voluntarily committing to phase out chick killing.

United Egg Producers (USA) announced a decision to end chick killing by 2020. In 2021, however, they were rescheduling, stating that technologies were not yet developed enough for implementation. [142]

Unilever also announced that it is "following the development of alternatives and [is] committed to supporting the market introduction of effective technologies once they are available

136. DGS Magazin (November 11th 2022), In Frankreich endet das Kükentöten, dgs-magazin.de (last visited November 29th 2022).

137. Austrian Animal Welfare Act, Amendment, Ministerialentwurf betreffend Bundesgesetz, mit dem das Bundesgesetz über den Schutz der Tiere(Tierschutzgesetz-TSchG) BGBl. I Nr. 118/2004, zuletzt geändert durch das Bundesgesetz BGBl. I Nr. 86/2018, parlament.gv.at (last visited November 29th 2022).

138. Gai, M. (July 1st 2022), Il Senato approva lo stop all'uccisione dei pulcini maschi, vegoloso.it (last visited November 29th 2022).

139. Chronicle (October 18th 2022), Luxembourg Supports EU-Wide Ban on Male Chick Cullingchronicle.lu (last visited December 8th 2022).

140. European Commission, Eurostat Data Browser " "Hatcheries - Hens Annual Data"(last visited December 6th 2022).

141. Symrise (June 15th 2021), The Dutch House of Representatives Wants To Ban The Killing Of Day-Old Chicks, schaffelaarbos.nl (last visited November 29th 2022).

142. United Egg Producers d/b/a Egg Farmers of America (March 25th 2021), United Egg Producers Updated Statement on Male Chicks, unitedegg.com (last visited November 29th 2022).

to suppliers". [143]

German retailer *ALDI*, in 2020, announced its decision to end buying eggs that involve chick killing by the end of 2021, [144] while French *Poulehouse* is already selling organic eggs using in-ovo sexing. [145]

Respeggt, a subsidiary marketing company of in-ovo sexing tech-company *Seleggt*, which is working with in-ovo sexing companies, hatcheries and retailers, offers a label that guarantees the use of in-ovo sexing methods of *Seleggt*, *PLANTegg* or *In Ovo* and controls the supply chains. Eggs with the *Respeggt* label are sold in supermarkets in Germany (*Rewe, Penny, Kaufland, EDEKA*) [146], the Netherlands since March 2020 (*JUMBO*, [147] [148] *Hoogvliet*) and Switzerland (*Coop, Migros*). [149]

143. Unilever, Farm Animal Welfare, unilever.com (last visited November 29th 2022).
144. Aldi, Wir schaffen das Kükentöten ab, aldi-sued.de (last visited November 29th 2022).
145. Eurogroup for Animals (April 17th 2019), "Poulehouse" first no-kill eggs go on sale in Franceeurogroupforanimals.org (last visited November 29th 2022).
146. Respeggt, Products, respeggt.com/en/products/ (last visited November 29th 2022).
147. Press Release Jumbo (January 16th 2020), Als eerste supermarktketen in Nederland introduceert Jumbo eieren zonder eendagshaantjes, nieuws.jumbo.com (last visited November 29th 2022).
148. HatchTech, Respeggt Eggs Introduced in Dutch Supermarket, hatchtech.com (last visited November 29th 2022).
149. Respeggt, Products, respeggt.com/en/products/ (last visited November 29th 2022).

ANIMAL SOCIETY

THE OBJECTIONS

Foto-Credit: Jo-Anne McArthur / Animal Equality / We Animals Media

5 The Objections

5.1 Economic impact

As the killing of chicks is industry practice for profitability and economic reasons, there needs to be an evaluation of what the **costs of a ban would be for the producers and ultimately for the consumers**, including how willing they are to pay more for the animal welfare they obviously demand.

5.1.1 Costs

In general, egg prices for consumers in Germany reportedly increased by 2 cents per egg after the prohibition of chick killing, without knowing the exact influence of other causes. It is estimated that egg prices will increase by further 2 cents per egg this year due to avian flu and increased costs of energy and feed. [150]

In-Ovo Sexing

With in-ovo sexing, production costs of eggs increase due to the purchase, training and maintenance of the associated technology. Production costs also increase due to inaccuracy rates, which vary from 1%–7%. [151]

Some of the companies that established in-ovo sexing methods do not sell the machines to the hatcheries but, instead, provide the sexing as a service in the hatcheries. [152] This means that the companies provide a service to set up and operate the machines with their own staff while charging a licence fee per sexed egg. This reduces investment risk for the hatcheries drastically.

The higher production costs can partly be compensated by the sale of the sorted out surplus eggs to other sectors like the animal food, research and cosmetics industries. [153] At the moment, incubated male eggs are mostly being spray-dried and used for other farmed animals as high-protein feed [154] or in the cosmetic industry as egg-oil powder. Vaccine manufacturers may also use these surplus eggs under hygienically regulated circumstances. [155]

Incubated eggs are classified as **“category 3 material”** under **Regulation (EC) No 1069/2009** of the European Parliament and of the Council of October 21st 2009 laying down health health rules as regards animal by-products and derived products not intended for human consumption and repealing Regulation (EC) No 1774/2002 **(Animal by-products Regulation)**. [156]

In the future, if in-ovo sexing methods would work even before incubation, the eggs could still find use for human consumption purposes. Currently, however, this is not practicable.

150. Merkur (November 29th 2022), Preise für Eier könnten weiter steigen - Knappheit nicht ausgeschlossen, merkur.de (last visited November 29th 2022).
151. See Annex : Table 2 : In-Ovo Sexing Technologies For Chicken Embryos In Egg Production
152. Presentation by Breloh, L., Respeggt, Status Quo der Geschlechtsbestimmung im Brutei mit dem SELEGGT-Verfahren, at EuroTier Fair in Hannover, November 17th 2022.
153. Giersberg, M.F., Kemper, N. (2018), Rearing Male Layer Chickens : A German Perspective , MDPI Agriculture.
154. Presentation by Breloh, L., Respeggt, Status Quo der Geschlechtsbestimmung im Brutei mit dem SELEGGT-Verfahren, at EuroTier Fair in Hannover, November 17th 2022.
155. Mentioned in a presentation by Volz, J., Orbem Genus, MRT Technologie zur Analyse von Hühnereiern, at EuroTier Fair in Hannover, November 15th 2022 in cooperation with Vencomatic.
156. Regulation (EC) No 1069/2009 of the European Parliament and of the Council of 21 October 2009 laying down health rules as regards animal by-products and derived products not intended for human consumption and repealing Regulation (EC) No 1774/2002 (Animal by-products Regulation), OJ L 300, 14.11.2009, 1, ELI : http://data.europa.eu/eli/reg/2009/1069/oj.

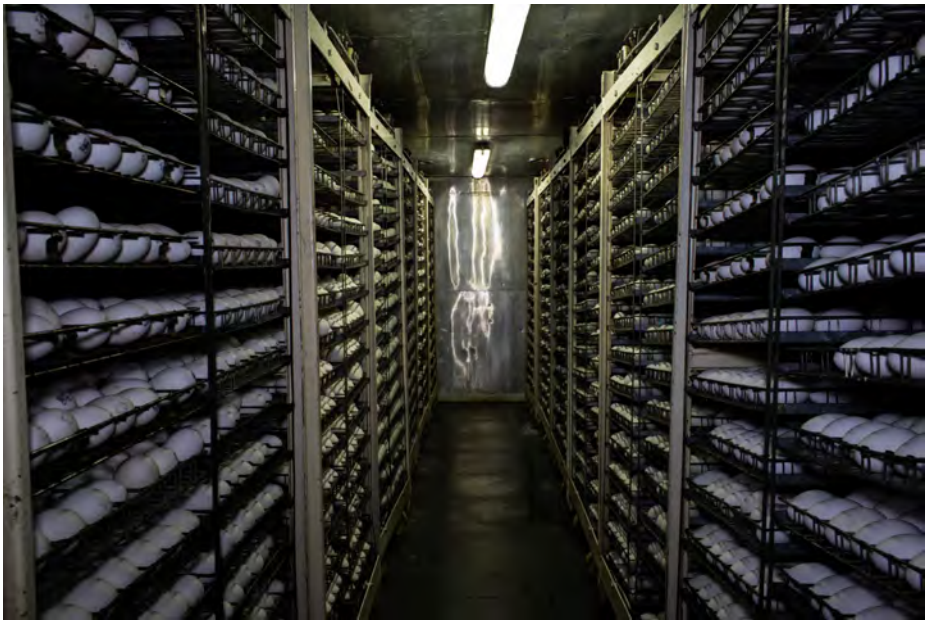

Figure 6. Eggs in duckling hatchery incubator, Photo-Credit : Human Cruelties

Another part of the hatcheries' in-ovo sexing costs are covered by consumers. It is estimated that higher production costs will increase egg prices from around 1 to 3 cents per egg, [157] whereas the French Minister of Agriculture, Julien Denormandie, estimated that the increase in retail price for in-ovo sexing was only 1 Cent per box of six eggs. [158]

Additionally some in-ovo sexing methods can also be used to detect unfertilised eggs and cut energy costs to incubate them as well. It is estimated that one-third of eggs are female, one-third are male and up to one-third are unfertilised. [159] Unfertilised and male eggs, therefore, would not need to be incubated, which can save energy costs. [160]

Labour costs can be reduced due to redundancy of employing chick sexers, which also removes animal stress and welfare risks that result from the handling of the chicks. [161] It is estimated that costs for sexing of hatched chicks range from 0.6 to 3.8 cents per animal, depending on the applied sexing method. [162]

For the egg industry of the **United States of America**, it is estimated that preventing male chick killing could save the egg industry approximately USD$500 million from wasted eggs and labour. [163] [164]

157. Von der Crone, C., Gault, M., Mau, M., Lang, H. (2020), Ausstieg aus dem Verfahren des Tötens männlicher Küken Umsetzung und Möglichkeiten, Kriterien und Standards für ökologische und konventionelle Aufzucht, Gazdaság & Társadalom, Journal of Economy & Society 2018/3 - 4, pp. 108.
158. Le Monde (July 18th 2021), La France veut interdire le broyage et le gazage des poussins mâles en 2022, lemonde.fr (last visited November 29th 2022).
159. Informal discussions with German egg producers and technology companies at EuroTier Fair, November 16th 2022.
160. Vogel, G. (2019), 'Ethical eggs could save day-old chicks from slaughter', Science Vol. 365 Issue 6454, pp. 627.
161. Fernyhough, M., Nicol, C.J., van de Braak, T., Toscano, M.J., Tønnessen (2019), M., The Ethics of Laying Hen Genetics, Journal of Agricultural and Environmental Ethics (2020):33, pp. 15, 25.
162. Seemann, G. (2003), Organisational framework for hatcheries, World's Poultry Science Journal 59, pp. 59.
163. McDougal, T. (2022), Contestants compete to determine a chick's sex before hatching, Poultry World (last visited November 29th 2022).
164. Business Wire (October 27th 2016), Vital Farms Takes Major Step toward Ending the Industry-Wide Practice of Killing Male Newborn Chicks, businesswire.com (last visited December 7th 2022).

Savings for the industry in **Germany** were estimated to around € 92.4 million. [165] In Germany, compliance costs for the economy, therefore, were estimated to an average all-in cost of € 147.5 million per year. [166]

For some in-ovo sexing methods, research was funded by the German Federal Ministry of Agriculture. For example, the ministry funded a € 2.4 million research and development study to use raman-spectroscopy for in-ovo sexing, with the funding set to end by the end of 2023. The research is further funded by the Lower Saxony Ministry of Food, Agriculture and Consumer Protection. [167]

The **French egg industry** estimated that the implementation of in-ovo sexing technologies will increase production costs by € 64 million, equivalent to 4% of the industry's gross revenue. [168] The **French government** determined the costs would be € 50 million per year, or around € 1 per previously killed chick.

Using funds from the EU Recovery Plan, "France Relance" and "France 2030", the French government granted between € 10 to 15 million in financial support for hatcheries to accelerate the implementation of the prohibition. [169] [170] Recently, the involved parties agreed on a compensation plan for the additional costs related to in-ovo sexing. Packing stations will charge retailers a fee of 59 cents per 100 eggs and give it to Interprofession des Oeufs (CNPO, Comité National pour la Promotion de l'Œuf), and CNPO will give the hatcheries € 1.11 for each sold chick. [171]Currently, this only regards shell eggs but the inclusion of processed eggs and egg products is planned.

Very early sex determination, ideally before incubation, would be a goal that not only benefits animal welfare but also food production efficiency. The amount of eggs that layer hens currently have to lay in order to be profitable could be reduced if an amount of eggs could come from the parent stock of layer hens. However, it is important that this does not not lead to even more eggs being sold as the production of animal products needs to be lowered for climate, environmental, human health and animal welfare reasons.

Dual Purpose breeds

Because of the higher food conversion rate of dual purpose breeds, the longer fattening period and approximately 20% lower egg laying performance, **the additional costs for dual purpose breed chickens is estimated at € 5–6 per kg**. On a per-egg basis, however, the estimated cost increase is **only up to an additional 2 cents per egg**. [172] The German Government is supporting research and development of dual purpose breeds, with € 5.1 million overall until the end of 2026. [173]

165. Von der Crone, C., Gault, M., Mau, M., Lang, H. (2020), Ausstieg aus dem Verfahren des Tötens männlicher Küken Umsetzung und Möglichkeiten, Kriterien und Standards für ökologische und konventionelle Aufzucht, Gazdaság & Társadalom / Journal of Economy & Society 2018/3 - 4, pp. 108.
166. German Parliament, German Government Draft for a Prohibition on Chick Killing (March 7th 2021), Gesetzentwurf der Bundesregierung Entwurf eines Gesetzes zur Änderung des Tierschutzgesetzes – Verbot des Kükentötens, BT-Drs. 19/2763.
167. Lower Saxony Ministry of Food, Agriculture and Consumer Protection (September 30th 2022), Ministerin Otte-Kinast : „Durchbruch beim Ausstieg aus dem Kükentöten" ml.niedersachsen.de (last visited December 8th 2022).
168. DGS Magazin (November 11th 2022), In Frankreich endet das Kükentöten, dgs-magazin.de (last visited November 29th 2022).
169. Le Monde avec AFP (February 6th 2022), Le broyage des poussins mâles désormais interdit dans la filière des poules pondeuses, lemonde.fr (last visited November 29th 2022).
170. DGS Magazin (November 11th 2022), In Frankreich endet das Kükentöten, dgs-magazin.de (last visited November 29th 2022).
171. Ibid.
172. Von der Crone, C., Gault, M., Mau, M., Lang, H. (2020), Ausstieg aus dem Verfahren des Tötens männlicher Küken Umsetzung und Möglichkeiten, Kriterien und Standards für ökologische und konventionelle Aufzucht, Gazdaság & Társadalom, Journal of Economy & Society 2018/3 - 4, pp. 108, 115.
173. German Parliament, Ökologische und ökonomische Auswirkungen des Kükentötens in Deutschland, Answer to

The current availability of dual purpose breeds is still limited, but it is increasing. The problem remains, however, that compared to layer hybrids and broilers in their respective specialisation, dual purpose breeds are not currently economically competitive. Therefore, as long as selective breeding for higher productivity is not regulated by law, dual purpose breeds likely cannot compete with these higher performance breeds.

Additionally, dual purpose breeds are currently primarily found in organic farming, as they are more suitable for a higher priced niche segment. [174] In organic farming, egg prices vary between 50 to 80 cents per egg and between € 14 to 19 per kg of meat. [175] Nonetheless, demand for eggs and meat from dual purpose breeds seems to be increasing. Big German retailers like *Edeka*, *Rewe* and *Tegut* are already purchasing these products on a regular basis. [176]

Brother roosters

Rearing costs per rooster range from € 3.8 up to € 10 [177] in **conventional farming** and € 11.58 [178] in **organic farming**. Slaughter houses only pay a few cents per rooster. [179] The rearing of brother roosters is expensive and while it is **cross subsidised by higher egg prices of 2–4 cents per egg**, it is still not cost effective. [180]

In **Europe**, there is currently **no real market for the meat** as meat-eating consumers prefer the breast meat of broiler chickens that they are accustomed to. [181] Brother rooster meat has a different look and structure, which European consumers aren't used to and which requires different cooking methods and recipes. Therefore, this meat comes to market without any real current demand in Europe. The only real exception is in the high-price organic sector, where brother rooster meat is marketed as a niche-product for the conscious consumer. [182]

To compete with broiler meat and find acceptance on the European market, consumers would need to be educated about the production and higher costs. Although the rearing of brother roosters has been done in Germany for some years, [183] a real trend toward higher demand of this meat could not be seen. In contrast, the interest in eggs without chick killing grew even before the prohibition passed into law.

Currently, the **meat of brother roosters** is used either for **processed foods or pet food** [184]. As for these kinds of food, the industry already uses the meat of layer hens that are at the end of their profitable laying cycle, there is not really a need for rooster meat on the market. Moreover, the fact that there is not even a demand in Europe for the meat of male layer breed chickens

brief enquiry (March 7th 2022), BT-Drs 20/942.

174. Ökologische Tierzucht GmbH, Was ist ein Zweinutzungshuhn?, das-oekohuhn.de (last visited December 6th 2022).

175. Ökolandbau (June 1st 2021), Welches Potenzial hat die Haltung von Zweinutzungshühnern im Öko-Landbau? , ökolandbau.de (last visited November 29th 2022).

176. Ibid.

177. Ibid.

178. Alpers, A. (October 2022), Facetten der Öko-Bruderhahnaufzucht, Naturland Nachrichten 05/ October 2022, pp. 10.

179. Waterloh, B. (2021), Zwischen Leben und Tod, Wochenblatt für Landwirtschaft und Landleben 12/2021, pp. 18.

180. Ibid.

181. Bundesanstalt für Landwirtschaft und Ernährung (April 2022), Bericht zur Markt- und Versorgungslage mit Eiern 2022, p. 52.

182. Alpers, A., Müller, F. (October 2022), Naturland Bruderhähne werden gemästet, Naturland Nachrichten 05/Oktober 2022, pp.8.

183. See, e.g., Brudertier Initiative Deutschland (Brother Animal Initiative Germany), which has been operating since 2013.

184. Theile, M. (July 22nd 2022), Kükentöten : Piep?, Die ZEIT, zeit.de.

reveals even more clearly the pointlessness of this phenomenon.

There are numerous reports of rooster meat being **exported to African countries**—primarily Ghana, Benin and the Democratic Republic of Congo. And yet, the supply chains are intransparent, and many producers that rear brother roosters in Germany do not even know the final destination of the meat of these roosters.[185] Similarly, out of 20 egg producers and companies asked by journalists in Germany, only five were able to give detailed information on the locations where the brother roosters are even raised, while 14 could not or would not give any information.[186]

It is estimated that the already devastating consequences of poultry meat exports to African countries are worsening as a result of the meat of male chicks raised in the EU being dumped on African markets.[187] For decades, poultry imports from the EU to African countries have been **destroying the livelihood of local farmers**.[188] For example, already 90% of the poultry meat in Ghana is imported.[189]

It would need to be observed further whether this brother rooster meat replacing broiler meat in the above-mentioned African countries would, therefore, reduce animal suffering because roosters are typically healthier than broiler chickens.[190] Because mostly "old" layer hens are exported to those African countries, it is likely that not much broiler meat would be replaced by rooster meat. Regardless, the livelihood of local farmers in the importing countries is destroyed.

Because of the higher feed intake, longer rearing periods and subsequent higher energy costs, it is likely that the raising of male chicks for meat will decrease especially with the current extreme expansion of feed prices and feed resources becoming scarce worldwide.[191] Moreover, the costs of brother rooster meat production are further increased due to the special methods and increased manual work required in the slaughter process, as well as the inconsistent availability of meat-cutting lines in the "old" layer hen slaughter facilities where brother roosters are typically processed.[192], Leipzig University, Faculty of Veterinary Medicine, on Behalf of the Hessian Ministry for the Environment, Energy, Agriculture and Consumer Protection (HMUELV), pp. 9.

5.1.2 Willingness to pay

Studies and polls on the **willingness to pay (WTP)** more for eggs without chick killing tend to show a high acceptance rate.
In a **Dutch survey, 41.9%** of respondents **were willing to pay more for eggs without chick killing**, and 45.3% were willing to pay equal to the general costs for 10 eggs.[193]

185. Schönherr, H.P. (October 7th 2022), Tod im Ei - Umgang mit männlichen Küken, taz.de (last visited November 29th 2022).
186. Barthel, U., Kleine, S. (June 22nd 2022), Eier ohne Kükentöten : Ein wirklicher Fortschritt im Tierschutz? , RBB, rbb24.de (last visited November 29th 2022).
187. Jost, L., SWR2 Podcast (July 31st 2022), Kükentöten verboten - Deutschlands Alleingang für mehr Tierschutz , swr.de/swr2 (last visited November 29th 2022).
188. Livingstone, E., Marks, S. (August 31st 2020) Wie billige Importhühner aus der EU Ghananer zur Flucht treiben, WELT, welt.de (last visited November 29th 2022).
189. Press Release by Brot für die Welt (September 7th 2017), EU-Hähnchenfleisch überschwemmt Afrikas Märkte, brot-fuer-die-welt.de (last visited November 29th 2022).
190. Expert Report on Husbandry of Brother Males : Krautwald-Junghans, M. (June 20th 2021),Sachverständigengutachten zur Haltung sog. Bruderhähne, Leipzig University, Faculty of Veterinary Medicine, on Behalf of the Hessian Ministry for the Environment, Energy, Agriculture and Consumer Protection (HMUELV), pp. 9.
191. Bundesanstalt für Landwirtschaft und Ernährung (April 2022), Bericht zur Markt- und Versorgungslage mit Eiern 2022, p. 52.
192. Expert Report on Husbandry of Brother Males : Krautwald-Junghans, M. (June 20th 2021), Sachverständigengutachten zur Haltung sog. Bruderhähne
193. De Haas, E.N., Oliemans, E., van Gerwen, M. (2021), The Need for an Alternative to Culling Day-Old Male Chicks : A Survey on Awareness, Alternatives, and the Willingness to Pay for Alternatives in a Selected Population of Dutch

Similarly, a 2019 representative survey on **German** consumers' societal attitudes towards **in-ovo sexing** as an alternative to chick killing indicates that **price increase seems to be no barrier** for the implementation of in-ovo sexing technologies for **69%** of respondents.[194] In a class of respondents who were only slightly price-sensitive and were asked to respond about pricing for a box of 10 eggs, WTP ranged from a very high total of € 8.26 for eggs that were sexed at Day 1 of incubation to € 3.43 for eggs that were sexed at Day 9 of incubation.[195] In a class of respondents with high price-sensitivity, WTP was still between a premium of € 0.42 and € 0.74 per box of 10 eggs.[196] [197] The authors of the study stated that the high WTP values indicate that in-ovo sexing could also be an interesting option for producers in countries where chick killing is not prohibited by law. Furthermore, the high WTP should be understood as an invitation to politicians to consider the legal foundations for a meaningful use of by-products of in-ovo sexing.[198]

The **WTP** more for eggs and meat in case of use of **dual purpose breeds** was observed in a **2017 Swiss Survey**. WTP more for eggs from dual purpose breeds was slightly higher than WTP more for dual purpose chicken meat.[199] On average, respondents were willing to pay **CHF 37.4 per kg of dual purpose chicken breast** and **CHF 4.39 for a box of six dual purpose eggs**. The WTP values were 13% and 29% higher, respectively, than for observed prices in conventional Swiss chicken breast and eggs, but 34% and 9% lower, respectively, than for organic products. It was also suggested that dual purpose systems would profit from increased consumer awareness about poultry-production methods in general.

In another **German survey from 2017** on consumers' perspective on **dual purpose chickens**, only a few participants said they were not willing to pay a surcharge. Most of the participants said that they would be willing to pay an additional charge with the aim of eating meat and eggs with a good conscience.[200]

5.1.3 Current economic situation in 2022

Currently producers and Member States have the **concern that with rising energy and feed prices** it could be too burdening for the egg industry that already has to face several problems with increasing costs giving them even more regulations.[201] [202]

In-ovo sexing methods could actually save energy costs as male and unfertilised eggs do not need to be incubated until the end.

Citizens, Frontiers in Veterinary Science Vol. 8 (2021), Article 662197, in : Kemper, N., Renaud, D.L., Giersberg, M.F. (Ed.), Perspectives in Dealing with Surplus Male Farm Animals (2021), Frontiers Media SA.

194. Reithmayer, C., Danne, M., Mußhoff, O. (2019), Societal attitudes towards in ovo gender determination as an alternative to chick culling, Agribusiness 2021/37, pp. 306, 317.

195. Ibid.

196. Ibid.

197. The study was followed by another study on the topic that examined the effect of pictures on the consumer preferences : Reithmayer, C., Danne, M., Mußhoff, O. (2020), Look at that! - The effect pictures have on consumer preferences for in ovo determination as an alternative to culling male chicks, Poultry Science 2021, 200 (2), pp. 643

198. Ibid.

199. Gangnat, I.D.M., Mueller, S., Kreuzer, M., Messikommer, R.E., Siegrist, M., Visschers, V.H.M. (2017), Swiss consumers' willingness to pay and attitudes regarding dual-purpose poultry and eggs, Poultry Science 2018:97, pp. 1089.

200. Brümmen, N., Christoph-Schulz, I., Rovers, A. K. (2017), Consumers' Perspective on Dual-Purpose Chickens , Proceedings in System Dynamics and Innovation in Food Networks, International Journal On Food Systems Dynamics 2017, pp. 164, 167, 168.

201. Agriculture and Fisheries Council, Public Session (October 17th 2022), https://video.consilium.europa.eu/event/en/26212 (last visited November 25th 2022).

202. Phone correspondence with a staff member of the German Federal Ministry of Agriculture, September 22nd 2022.

With the background of drastically increased feed costs the rearing of brother roosters is likely to become less attractive to producers as the roosters feed conversion rate is very high.

In general the current situation shows the **low sustainability and crisis resilience of animal husbandry systems** for animal based food production. For 1 kilocalorie in chicken meat around 9 kilocalories need to be fed to the chicken beforehand [203] while these plant based kilocalories could nurture people directly. A general reduction of animal numbers and consumption is therefore the better target for a future oriented sustainable food system.

5.2 Chicks as feed for captive animals

One objection that is commonly used against a ban on killing chicks and ducklings is their utilisation as **feed for captive animals** in zoos, shelters, falconries and private shelters.

In Austria as well as France, regardless of the prohibition of male chick killing in principle, if a hatchery can prove that the chicks are used for animal feed, it will still be allowed to kill them. An exemption was considered to be included in the German legislation prohibiting chick killing as well, but finally did not become a part of the law.

Captive animals that are currently fed with whole carcass day-old chicks are : **reptiles, birds of prey (raptors) and owls, animals in circuses and zoos**, as well as packs of hounds or **dogs and cats** in some animal shelters (as part of a "*Biologically Appropriate Raw Food*", or *B.A.R.F.*, diet). [204]

There are **no official numbers** on how many animals are actually fed or need to be fed with day-old chicks. The German government, for example, did not carry out its own calculations on a needs assessment, since before the ban, existing figures were likely to be overestimated as day-old chicks were also fed to animals that, for physiological reasons, do not necessarily need to eat whole carcasses. [205]

As shown above, the practice of killing male chicks exists entirely for economic reasons. Male day-old chicks, therefore, are an economically unwanted result of layer hen production and became economically usable for animal feeding purposes. As these male day-old chicks are a by-product of the egg industry, they provide a cheap animal feed opportunity. [206] This likely has contributed to animal keepers feeding day-old chicks to animals that **physiologically are not dependent on whole carcass feed for a species-appropriate diet.** [207] Furthermore, as animal keepers are legally required to provide the animals in their care with a balanced diet, feeding animals with day-old chicks alone likely is not common practice—or, at least it should not be.

Moreover, captive animals, like raptors and owls, are already fed with a variety of other food as part of their diet. Therefore, even with a prohibition against the killing of chicks and a subsequent reduction or elimination of this food source for certain captive animals, not the entire source of feed for those animals would be omitted.

203. Yale Center for Business and the Environment (October 12th 2016), Disrupting Meat cbey.yale.edu (last visited December 8th 2022).
204. Wissenschaftliche Dienste des Deutschen Bundestags (2021). Kurzinformation, Zur Verfütterung gefrorener Eintagsküken.
205. German Parliament, Ökologische und ökonomische Auswirkungen des Kükentötens in Deutschland, Answer to brief enquiry (March 7th 2022), BT-Drs 20/942.
206. Ibid.
207. Ibid.

Figure 7. Falcon feeding on a day-old chick, Photo-Credit : Malivan Iuliia/Shutterstock

In a hearing held during the **German legislative process**, experts were asked to give statements. Only one expert was asked about how many chicks are currently used for feed and for which species ; however, this expert likely had a conflict of interest as a zoo veterinarian and curator. [208] The number of dead chicks he cited as supposedly necessary for captive animal feed were very high. Overall, it was estimated that, in Germany alone, 30.68 million dead chicks were needed as animal food per year. [209] However, a closer look into the numbers reveals that they are unreliable since they were calculated using **non-representative samplings**. Zoos and falconries were asked to report numbers in random sample surveys that could not represent the actual demand nor specify which of the animals that are fed dead chicks are actually dependent on eating whole animal bodies. For example, the number of chicks needed for falconries and wild animal shelters are stated to be 9.4 million without mentioning any source for this number. Numbers for zoos are stated to be 19.6 million relying on personal conversations and non-representative samples. [210]

A study by students of University Of Applied Sciences Südwestfalen on the numbers of

208. Fischer, D. (2021), Stellungnahme des Einzelsachverständigen für die 81. Sitzung des Ausschusses für Ernährung und Landwirtschaft am Montag, dem 3. Mai 2021.
209. Ibid.
210. Ibid.

day-old chicks needed for captive animal feed in zoos and falconries, **cannot be seen as scientifically valuable**. Numbers estimated by those students rely on very small samples of contacted zoos and animal shelters.[211] Moreover, and of particular note, the authors themselves stated that the extrapolation of 315 million day-old chicks being used as animal feed in German falconries per year alone was entirely too high.[212] The students concluded that more day-old chicks are needed than "produced" in Germany, resulting in a large part having to be imported additionally. On the other hand, in an interview *Lohmann* —one of the world market leaders in poultry breeding— stated that, before the ban, almost all male day-old chicks they produced and killed were sold from Germany to Spain and, from there, exported to falconries in Middle Eastern and North African countries.[213] This shows how uncertain and intransparent the actual demand and import and export numbers of day-old chicks for feed purposes are.

In addition, this kind of objection to the ban of chick killing in Germany has also strongly focused on raptors and owls. However, this neglects that, at least in Germany, only a few such birds are held in captivity.[214]

Besides the estimated numbers it is also not clear **which animals physiologically rely on whole carcass feeding**. Whole carcass feeding may be suitable to easily provide the nutritional needs of certain animals, but it is not the only option. Alternatives that provide a nutritious diet for raptors and owls are : venison, rabbits, small rodents, pheasants, quails and other poultry.[215] Currently, young chickens are already used, and adult chickens could be considered an alternative as well.[216] In means of reducing individual numbers of animals being killed, the use of larger animals rather than many small ones, should be preferred as well as the use of by-products. Additionally, from an animal protection perspective, mice are not a recommended alternative, as they would have to be bred for the sole purpose of being killed and fed to captive animals.

Notably, explanations by the expert in the German legislative hearing referenced a physiological dependence by birds of prey on whole carcass feeding in order for them to form pellets. However, there is **no scientific consensus on the necessity of forming pellets in raptors and owls**. This could mean that these birds do not necessarily need to eat indigestible body parts to be healthy. Also of note, other animals besides raptors and owls that had been previously cited as being fed with day-old chicks were not mentioned in the experts' statement's section on physiological dependence. This reinforces the assumption that animals other than birds of prey are not necessarily relying on this kind of food, but were fed it nevertheless.

Furthermore, the physiological nutrient composition of day-old chicks is undeniably well suited for raptors and owls, but it also involves the risk of salmonella infections and provoked cannibalism in breeding birds.[217] Additionally, a diet of exclusively day-old chicks should not be

211. Schulze Walgern, A. Hegemann, L., Schütz, K., Wittmann, M., Mergenthlaer, M. (2020), Umfang und Verwertung männlicher Eintagsküken in Deutschland Notizen aus der Forschung. 31/2020. .

212. Ibid.

213. Lutteri, A., Weber, T. (May 2nd 2016), Bruderhahn & Eintagsküken : Oh Brother, Where Art Thou?, Biorama, biorama.eu. (last visited December 9th 2022

214. Arbeitskreis 6 der Tierärztlichen Vereinigung für Tierschutz (TVT) (2006). Hinweise für die Überwachung von Greifvogelhaltungen. Merkblatt Nr. 107. p. 3.

215. Lüdtke, M. (2009). Vergleichende Untersuchungen an einheimischen Greif-und Eulenvögeln (Buteo buteo, Falco tinnunculus, Bubo bubo) zur Futteraufnahme, Zusammensetzung der Gewölle und Exkremente sowie zur Nährstoffverdaulichkeit bei Angebot von adulten Mäusen und Eintagsküken (Doctoral dissertation, Hannover, Tierärztliche Hochschule).

216. Personal conversation with a raptor specialised veterinarian.

217. Lüdtke, M. (2009). Vergleichende Untersuchungen an einheimischen Greif-und Eulenvögeln (Buteo buteo, Falco tinnunculus, Bubo bubo) zur Futteraufnahme, Zusammensetzung der Gewölle und Exkremente sowie zur Nährstoffverdaulichkeit bei Angebot von adulten Mäusen und Eintagsküken (Doctoral dissertation, Hannover, Tierärztliche

fed to raptors and owls, and especially not to their young chicks, as the calcium concentration in day-old chicks is low. [218] Due to the process of freezing day-old chicks, the thiamine concentration can be lowered causing further nutrient deficiency. [219]

The whole of the considerations laid out above show that, in light of the strong ethical concerns of chick killing and the fact that the reason to kill them is based solely on economics, objections to a ban on killing chicks and ducklings should carry sway against the higher goal of animal welfare and ethics in animal production systems.

In the end, if an exemption for animal food purposes were still considered in a possible EU law prohibiting the killing of male chicks and ducklings, **realistic numbers would need to be carefully and independently evaluated** and independent experts would need to be heard on which animals necessarily rely on whole carcass feed.

Hochschule), p. 56.

218. Ibid., p. 57.

219. Carnarius, M., Hafez, H. M., Henning, A., Henning, H. J., & Lierz, M. (2008). Clinical signs and diagnosis of thiamine deficiency in juvenile goshawks (Accipiter gentilis). Veterinary Record, 163(7), pp. 215.

ANIMAL SOCIETY

THE OPPORTUNITY

Foto-Credit: Gabriela Penela / We Animals Media

6 The Opportunity

The European Commission's effort to revise the animal welfare legislation in order to bring it in line with current scientific standards presents a **great opportunity to meaningfully improve the welfare of animals** in Europe.

The killing of male chicks and female ducklings is a disturbing result of years of selective breeding and profit-motivated business decisions. For decades, the egg industry has been able to establish a system in which animals are seen merely as products and are bred to maximise profits. If these animals do not have economic value, they can be discarded without any responsibility. However, it is ethically unacceptable to bring millions of chicks and ducklings into the world only to kill them after they have hatched as though they had no inherent worth. Chick killing shows very clearly just how separated the industrial farming of animals has become from our actual ethical standards and beliefs.

With the revision of the animal welfare legislation, the European Commission can assure the establishment of equal ethical standards in the EU. With this step, the Commission can actively acknowledge the evolving awareness of animal welfare issues by EU Member States and citizens and meet the EU's high global reputation in animal welfare standards.

While this report focuses on ending chick and duckling killing, we do see that this is part of a larger problem in desperate need of solutions :

- **Selective breeding** – This is what has caused male chick killing to become systematic in the first place, and it still remains a significant animal welfare concern. Finding alternatives to chick killing should be directed towards reducing suffering for the chicks themselves. Additionally, it should be aimed at finding solutions that move away from the current systems of selective breeding, which causes severe suffering in layer hens as well as broiler chickens.
- **Climate change** – Worldwide and increasing across Europe, it has become clear just how easily supply chains can be disrupted by wars, droughts and interdependencies. More broadly, the suffering of animals and the detrimental environmental impact of industrial farming that causes that suffering are deeply intertwined in the issues of climate change. We must work towards a system where we respect the natural limits of this planet and see the animals that we share it with as the sentient beings they are.

After all, with this report we want to make sure that the issue of chick and duckling killing is part of the revision of the animal welfare legislation, because it is just such an obvious violation of what we think we are : ethical and humane.

A ban on the practice of chick and duckling killing would be a significant demonstration of a commitment to addressing animal welfare issues. With a prohibition, the suffering of millions of animals can be avoided by eliminating a practice that is highly unethical, unnecessary, inefficient and uneconomic.

ANIMAL SOCIETY

THE SUPPORTERS

Foto-Credit: Human Cruelties

7 The Supporters

The killing of day-old chicks and ducklings is seen as unethical and gruesome by large parts of the public as well as politicians, Non-Governmental Organisations (NGOs), experts, industry and Member States.

7.1 Council of the EU

In order for a ban on the practice of chick killing to happen, the majority of Member States would have to agree as the **Council of the EU** will be involved in the legislation process after the European Commission proposes the law. Many Member States have already called for an EU-wide ban.

France and Germany, two of the top EU agriculture producing countries, have already prohibited the practice. Austria and Italy have decided on their own bans as well, and they will be going into force in the coming years

On a July 15th 2021 meeting, during the AgriFish Council, Austria, France, Germany, Ireland, Luxembourg, Portugal and Spain called on the European Commission to conduct an impact assessment on a prohibition of systemic chick killing in the EU in the context of the revision of the Animal Welfare Legislation and in consideration of the welfare of unhatched embryos. [220] Austria, Portugal, Slovakia, Sweden, Belgium, the Netherlands, Cyprus, Estonia, Denmark, Romania, Spain, Finland, the Czech Republic, Ireland, Latvia, Hungary, Lithuania and Italy supported the call for an impact assessment. [221]

During an AgriFish Council meeting on October 17th–18th 2022, French and German delegations again insisted that the European Commission should enact an EU-wide ban on the killing of day-old chicks for the sake of animal welfare and to harmonise legislation in the EU. [222] They were supported by Austria, Belgium, Cyprus, Luxembourg, Finland, Portugal and Ireland. [223]

As Member States could each give their opinion, all of the 22 delegations speaking on the topic agreed on the practice being unethical, and most were in clear favour of a ban. Even those who had concerns were not in disapproval in general, but highlighted that financial help would be needed and that a ban's socioeconomic impact should be evaluated. [224]

German Agricultural Minister, Cem Özdemir, remarked that an EU-wide ban would be a huge step for animal welfare in Europe and would lead to fair conditions for competition. He further states that killing newly hatched chicks because they have the wrong sex does not add up to the expectations of European consumers especially since alternatives are already available. [225]

220. Council of the European Union, Information from the French and German Delegations, on behalf of the Austrian, French, German, Irish, Luxembourg, Portuguese and Spanish Delegations on the Prohibition of the Systematic Killing of Male Chicks in the Laying Hens Sector, July 5th, 2021.
221. O'Donovan, R., Lyddon, C. (2021), Agri Ministers Give Mixed Reactions to ECI 'End the Cage Age' - Paris & Berlin ban killing male chicks in eggs sector [*10670/1/21 REV 1], AgraFacts No.62-21.
222. Council of the European Union, EU-wide End to the Systematic Killing of Male Chicks, Information from the French and German Delegations on behalf of the Austrian, Belgian, Cyprus, Finnish, French, German, Irish, Luxembourg and Portuguese Delegations, October 17th 2022.
223. Ibid.
224. Agriculture and Fisheries Council, Public Session (October 17th 2022), https://video.consilium.europa.eu/event/en/26212 (last visited November 25th 2022).
225. Zeit Online (October 16th 2022), Deutschland und Frankreich drängen die EU, das Kükentöten zu stoppen, zeit.de (last visited November 29th 2022).

7.2 European Commission

EU Commissioner for Health and Food Safety, Stella Kyriakides, stated at the Council of EU's AgriFish Council meeting : "The killing of large numbers of day-old chicks is, of course, an ethical issue." She also announced that the EU executive would use the upcoming review of the EU animal welfare legislation to "look very carefully at the issue and find the best possible solution." [226] She stated : "We must ask ourselves how in our modern society, we find it acceptable to kill animals systematically as mere by-products and take responsibility of the effects of our desire for cheap food" [227]

At the AgriFish Council meeting on October 17th–18th 2022, Commissioner Kyriakides replied to member state delegations' calls that it is good to know everyone is on the same page on the topic. She called the systematic killing of male chicks a "very disturbing phenomenon" that is raising important ethical concerns and "highlights practices that come from a different time and date". [228] Citizens of the EU care for animal welfare and do not accept such practices, she said. She further stated that she wants to propose a phase-out of the practice and that she hopes she can count on the support of the member states. Later, she emphasised that purely economic reasons cannot justify such large scale industrial killing. [229]

7.3 European Food Safety Authority (EFSA)

In a 2019 Scientific Opinion, the **European Food Safety Authority (EFSA)** identified many risks to chick animal welfare in the context of chick culling. [230] EFSA's Scientific Opinion therefore recommended the encouragement of technology to prevent the necessity of killing surplus/unproductive animals (e.g., male day-old-chicks from layers' genotypes in single-farm-scale as well as in bigger scale e.g. maceration in big hatcheries). [231]

7.4 Producers

Even **producers** themselves support an EU-wide ban of chick killing. As they see consumers demanding higher animal welfare standards, they see a market opportunity. For this reason, many egg producers and retailers are already voluntarily shifting away from chick killing in countries where there is no prohibition in force yet. Another reason why the German poultry industry, in particular, is in favour of an EU-wide ban is, of course, for competitive reasons, as they currently see a disadvantage compared to the industry in other Member States.

The **German egg industry** called for an EU-wide ban as they are facing problems due to market disruption. The German Federal Egg Association ("*Bundesverband Ei*") has called for an EU-wide ban to establish consistent standards for all Member States. They stated that high levels of animal welfare could only be provided if German hatcheries can operate under the same conditions as their competitors in other EU states. They also stated that it has to be identifiable for consumers if processed foods contain eggs with or without chick killing. [232]

226. O'Donovan, R., Lyddon, C., Agri Ministers Give Mixed Reactions to ECI 'End the Cage Age' - Paris & Berlin ban killing male chicks in eggs sector [*10670/1/21 REV 1], AgraFacts No. 62-21.
227. Ibid.
228. Kyriakides, S. Statement at Agriculture and Fisheries Council, Public Session (October 17th 2022), https://video.consilium.europa.eu/event/en/26212(last visited November 29th 2022).
229. Agriculture and Fisheries Council, Public Session (October 17th 2022), https://video.consilium.europa.eu/event/en/26212 (last visited November 29th 2022).
230. EFSA (2019), Scientific Opinion : Killing for purposes other than slaughter : poultry, EFSA Journal 2019 ;17(11):5850, p. 29.
231. Ibid., p. 75.
232. Zentralverband Deutscher Geflügelwirtschaft e.V. (June 26th 2022), Exportschlager Kükentöten / Heimische Brüterein sterben , agrar-presseportal.de (last visited November 29th 2022).

7.5 Citizens

Citizens increasingly call for higher animal welfare regulations as they realise what is happening to animals on a daily basis.[233] The public concern voiced after the chick killing practice became known by a wider audience shows that people, upon learning about the common practices of the animal industry, widely do not support them.

It has to be emphasised though that knowledge about poultry production practices tends to be generally low. For example, in a **Swiss Survey**, over 75% of the respondents thought that female broilers were used for eggs and meat and that males were used for producing meat regardless of their genetic background.[234]

In countries where there has been a public debate about the practice, knowledge is higher. Asked in a 2019 **German** survey, 70% of the participants knew about the details of chick-killing-practice and 18% had already heard about it but could not explain it. After being neutrally educated about the topic, a vast majority of almost 80% regarded the issue as "very problematic" or "problematic".[235] A 2020 representative survey showed that 85% of German consumers were in favour of a ban of chick killing.[236]

A 2018 **Dutch** public survey on awareness of the problem and acceptance of alternatives revealed that almost 50% of Dutch citizens disagreed with the practice of male chick killing and would rather search for alternative approaches or indicated that it should stop immediately.[237] Knowledge about the practice was quite low, which was assumed to be a factor influencing the lower levels of disagreement with the practice of chick killing. Regarding the ranking of alternatives in this survey, no strong preferences could be found; but, peoples' high interest in food safety and good treatment of animals could be highlighted.[238] In another Dutch survey from 2021, roughly 52% of respondents knew about the practice of male chick killing, 50% of respondents preferred in-ovo sexing as an alternative to chick killing.[239]

Finally, a 2021 survey in **France** showed that 77% of respondents were against duckling maceration.[240]

7.6 Animal Welfare Organisations

Animal welfare organisations have advocated for the end of systematic chick killing for years and took a big part in the prohibitions in some countries. A coalition of 18 NGOs, including the authors, sent an open letter to the members of the AgriFish Council asking to enact national

233. Animal Society (November 2021), Tier(schutz)politik im Spiegel der Gesellschaft - eine Analyse basierend auf einer repräsentativen Umfrage durch die SINUS Markt- und Sozialforschung GmbH (Heidelberg) , pp. 26.
234. Gangnat, I.D.M., Mueller, S., Kreuzer, M., Messikommer, R.E., Siegrist, M., Visschers, V.H.M. (2017), Swiss consumers' willingness to pay and attitudes regarding dual-purpose poultry and eggs, Poultry Science 2018:97, pp. 1089.
235. Busse, M., Kernecker, M. L., Zscheischler, J., Zoll, F., Siebert, R. (2018), Ethical Concerns in Poultry Production : A German Consumer Survey About Dual Purpose Chickens, Journal of Agricultural and Environmental Ethics (2019):31, pp. 905, 913.
236. Verbraucherzentrale (March 17th 2022), Verbraucher lehnen Kükentöten ab und wünschen sich klare Informationen, Citizens Survey on the topic of chick killing - GfK eBUS® on behalf of Verbraucherzentrale (December 2020) (last visited November 29th 2022).
237. Gremmen, B. Bruijnis, M.R.N., Blok, V., Stassen, E.N. (2018), A Public Survey on Handling Male Chicks in the Dutch Egg Sector, Journal agricultural environmental ethics (2018):31, pp. 93, 100.
238. Ibid., p. 104.
239. De Haas, E. N., Oliemans, E., van Gerwen, M. (2021), The Need for an Alternative to Culling Day-Old Male Chicks : A Survey on Awareness, Alternatives, and the Willingness to Pay for Alternatives in a Selected Population of Dutch Citizens, Frontiers in Veterinary Science Vol. 8 (2021), Article 662197, in : Kemper, N., Renaud, D.L., Giersberg, M.F. (Ed.), Perspectives in Dealing with Surplus Male Farm Animals (2021), Frontiers Media SA.
240. YouGov & L214, Tracker - Gavage & Foie Gras.

legislation banning the killing of day-old male chicks and female ducklings and to support the adoption of an EU-wide ban in the revision of the EU farm animal welfare legislation for the EU to finally live up to its reputation when it comes to animal protection. [241]

241. L214 (June 1st 2022), Open Letter to the Council of the European Union (AgriFish Council).

ANIMAL SOCIETY

THE LAW

Foto-Credit: Gabriela Penela / We Animals Media

8 The Law

What could and should a law prohibiting the killing of day-old-chicks include? We ask the European Commission to **include the following points** in their proposal for a prohibition on chick killing :

1. **Prohibition of the killing of male chicks and female ducklings :**
   The prohibition should include male chicks in the egg industry as well as female ducklings in the foie gras industry as there is no ethical difference. A reason for an arbitrary unequal treatment of what is basically equal cannot be justified.

2. **Phase out the rearing of brother roosters :**
   Because of all the above-mentioned negative effects of the raising of brother roosters, including Europe already having overproduction of meat and no real market for the produced rooster meat, this alternative should be set as a bridge solution until in-ovo sexing and dual purpose breeds are feasible for large scale production.
   Overproduction cannot be the outcome of a well meaning prohibition of chick killing. Similarly, the answer to decreasing meat consumption in Europe cannot be to produce even more meat to export to other countries. Above all, raising brother roosters in a system that treats these living beings merely as a product is not an ethical or animal welfare improvement. The rearing of brother roosters for meat should be prohibited when in-ovo sexing technology is ready to cover all hatcheries with the exemption of males hatched due to in-ovo sexing failures. Therefore the rearing of brother roosters should be set as an interim solution only.

3. **Extraterritorial ban :**
   To ensure that European producers do not face disadvantages with concurring producers from non-EU countries, but also to avoid evasion of the prohibition, imports from non-EU countries must abide by the same standards, including imported young layer hens, shell eggs and processed foods containing eggs.

4. **Transparent, consistent labelling :**
   For consumer transparency, egg packages and products containing eggs must be labelled to indicate which alternative method to chick killing was used in the production process.

5. **Scientific standards :**
   Depending on the results of current research on perception of pain in chick embryos, the stunning of chick and duckling embryos before destruction of the egg should be made obligatory until methods that are effective at an earlier stage in the incubation process are available. As soon as earlier in-ovo sexing methods are available, the prohibition should be further restricted to align with the latest scientific evidence available at that time regarding the perception of pain in chick and duckling embryos.

6. **Public Funding :**
   The development of dual purpose breeds should be publicly funded as a way out of selective breeding and its painful outcomes for layer hens and broiler chickens. Also, the cultivation of plant-based protein sources and research into plant-based, cellular or fermentational egg alternatives should be publicly funded.

7. **Transition period :**
   A transition period of two years should be set.

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Table 2: In-Ovo Sexing Technologies For Chicken Embryos In Egg Production
Desirable scenario for hatcheries: An **accuracy of 98.5%** while the rate should range between **20.000 and 30.000 sexed eggs per hour**[1]

Category	Name	Technology	Capacity-rate	Testing Period	Advantages	Disadvantages	Status
Spectroscopy	CHEGGY[2] by AAT EW Group Company (GER) additionally: electrical stunning-method for chick embryo: STUNNY	HYPERSPECTRAL MEASUREMENT TECHNOLOGY (Feather Colour)	20.000 eggs/hour	13th day of incubation	- non-invasive - 95% accuracy - also identifies unfertilised eggs	- works only for brown layer lines - late in the incubation process	in use[3]: Lohmann Germany Hy-Line France Ibertec Spain Pluriton Belgium
	Raman-Spectroscopic Method[4] by AAT EW Group Company and Technical University Dresden[5] (GER)	RAMAN SPECTROSCOPY	30.000 to 40.000 eggs/hour could be possible[6] (testing phase, no market maturity yet)	3rd - 4th day of incubation (under laboratory conditions) 5th - 6th day (expected in large scale practice)	- egg membrane is not infringed - hatchability not affected - early in the incubation process - 95% accuracy[7]	- invasive - hole of more than 1 cm diameter in the egg shell - not ready for large-scale	testing phase: Lohmann Hatchery in Dorum, Germany
	ELLA by In Ovo[8] (NL) additional research EGGR for utilisation of surplus eggs	SPECTROSCOPY + BIOMARKER DETECTION (endocrinological)	stated to enable hatching of 5 million hens/year[9]	9th day of incubation	- white and brown layer lines	- invasive - late in the incubation process	in use: HetAnker Netherlands Lohmann Hatchery in Dorum, Germany[10]
	Hyper-Eye (CAN) by CAAIN, RCAIA, MatrixSpec[11]	HYPERSPECTRAL IMAGING, A.I., MACHINE LEARNING	currently low, no specific numbers[12]	day of laying	- pre-incubation - 95% accuracy (99% in bench-scale model[13]) - non-invasive	- not ready for large-scale	in development: no updates on the status
	vis-NIR[14]	VISIBLE NEAR-INFRARED	N/A	14th day of incubation	- 98.46% accuracy	- only applicable on eggs from	in development

[1] Phelps P., Bhutada A., Bryan S., Chalker A., Ferrell B., Neuman S., Ricks C., Tran H., Butt T. (2003), Automated identification of male layer chicks prior to hatch, World's Poultry Science Journal 2003/59, 33–38.
[2] CHEGGY, agri-at.com/en (last visited December 7th 2022).
[3] AAT EW Group Company, European Hatcheries are introducing Cheggy, agr-at.com/en (last visited December 7th 2022).
[4] AAT Raman-Spectroscopic Method, agri-at.com/en agri-at.com/en (last visited December 7th 2022).
[5] Krautwald-Junghanns, M., Cramer, K., Fischer, B., Förster, A., Galli, R. Kremer, F., Mapesa, E.U., Meissner, S., Preisinger, R., Preusse, G., Schnabel, C., Steiner, G., Bartels, T. (2017), Current approaches to avoid the culling of day-old male chicks in the layer industry, with special reference to spectroscopic methods, Poultry Science 2017, pp. 749, 753.
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[13] *Ibid*.
[14] Corion, M., Keresztes, J., De Ketelaere, B., Seays, W. (2022), In ovo sexing of eggs from brown breeds with a gender-specific color using visible-near-infrared spectroscopy: effect of incubation day and measurement configuration, Poultry Science 2022 May; 101(5): 101782.

		SPECTROSCOPY		(possible at 12th day but resulting in only 86 % accuracy)	- non-invasive	brown breeds with a gender-specific color - late in the incubation process - not ready for large-scale	
	2-λ-Fluorescent Spectroscopy	TWO-WAVE-LENGTH FLUORESCENT SPECTROSCOPY[15]	N/A	3.5 - 5th day of incubation	- early in the incubation process - 96% accuracy (in 1600 tested eggs) - no impact on the hatching rate	- invasive - not ready for large-scale	in development
	TeraEgg by Ovabrite in cooperation with Novatrans (ISR) and Vital Farms (USA)[16]	TERAHERTZ SPECTROSCOPY	N/A	2nd day of incubation	- also identifies unfertilised eggs - non-invasive	- not ready for large-scale	development of commercial product was anticipated for end of 2017[17]; no updates since
Optical	Omegga[18] (GER)	OPTICAL TECHNOLOGY	N/A	before 7th day of incubation	N/A	N/A	in development
	ChickMale Saver by LIVEgg (ISR) in combination with CrystalEgg[19]	ELECTRO OPTICAL TECHNOLOGY MONITORING SENSORY PARAMETERS, MACHINE LEARNING	50.000 - 60.000 eggs/hour	7th day of incubation	- non-invasive - early in the incubation process	- not ready for large-scale	in development: has been anticipated to be ready for sales in 2020[20]; no updates since
Magnetic Resonance Imaging (MRI)	Orbem Genus[21] (GER) and Technical University Munich cooperation with Vencomatic (NL)[22] (among other things for utilisation of surplus	MAGNETIC RESONANCE IMAGING, A.I.	up to 24.000 eggs/hour[23] (in several machines)	12th - 13th day of incubation	- non-invasive - for poultry eggs of any breed	- late in the incubation process	in use: two installations with capacities of 6.000 and 12.000 eggs/hour in two French locations by January 2023[24]

[15] Preuße, G., Porstmann, V., Bartels, T., Schnabel, C., Galli, R., Koch, E., Oelschlägel, M., Uckermann, O., Steiner, G. (December 3rd 2022), Highly sensitive and quick in ovo sexing of domestic chicken eggs by two-wavelength fluorescence spectroscopy, Analytical and Bioanalytical Chemistry (2022).
[16] TeraEgg, ovabrite.com (last visited December 7th 2022).
[17] Heater, B. (October 3rd 2016), An emerging technology that could end the mass grinding of newly hatched chicks, TechCrunch, techcrunch.com (last visited December 7th 2022).
[18] Omegga, linkedin.com (last visited December 9th 2022).
[19] LIVEgg, livegg.co.il (last visited December 9th 2022).
[20] Johnson, R. (April 17th 2019), LIVEgg: A data-driven hatchery, The Poultry Site, thepoultrysite.com (last visited December 9th 2022).
[21] Orbem Genus, orbem.ai (last visited December 9th 2022).
[22] GateGarching (July 7th 2022), Orbems' strategic partnership for in ovo sexing of poultry eggs, gategarching.com (last visited December 9th 2022).
[23] Presentation by Volz, J., *Orbem Genus* at EuroTier Fair in Hannover, November 15th 2022.
[24] GateGarching (July 7th 2022), Orbems' strategic partnership for in ovo sexing of poultry eggs, gategarching.com (last visited December 9th 2022).

	eggs)						
Endocrinological/ Molecular Genetics	SELEGGT (GER)	HORMONE ANALYSIS BIOMARKER DETECTION of sex hormones in allantois fluid	3.600 eggs/hour (in one machine)	9th day of incubation	- minimally invasive - 98 - 99% accuracy[25] - also identifies unfertilised eggs	- late in the incubation process; earlier not possible as there would not enough allantois fluid	in use: currently, around 10% of hens in Germany are selected with this technology[26] Lohmann Hatchery in Ankum, Germany, Verbeek Broederij BV Netherlands Respeggt Sex Determination Centers in Barnveld and Wader, Netherlands[27]
	PlantEGG[28] (GER)	POLYMERASE CHAIN REACTION (PCR) TEST for sex chromosome in allantois fluid	3.000 eggs/hour (in one machine)	9th day of incubation	- 99.5% accuracy	- late in the incubation process; earlier not possible as there would not enough allantois fluid	in use: Ter Heerdt in Zevenaar, Netherlands[29]
Genome editing	eggXYt[30] (ISR)	CRISPR/Cas FLUORESCENT GENE OF JELLYFISH IN MALE CHICK EMBRYOS	-	1st day of incubation	- non-invasive - very early in the incubation process - female chicks and the table-eggs they lay are non-GMO	- ethical concerns - possibly opposing GMO-legislation - lack of acceptance	N/A
	CSIRO[31] (AUS)	CRISPR/Cas FLUORESCENT GENE IN MALE CHICK EMBRYOS	-	1st day of incubation	- non-invasive - very early in the incubation process - female chicks and the table-eggs they lay are non-GMO	- ethical concerns - possibly opposing GMO-legislation - lack of acceptance	N/A
	NRS Poultry Sustainability &	UV-LIGHT ACTIVATING CRISPR/Cas	-	1st day of incubation	- non-invasive - very early in the	- ethical concerns - possibly	N/A

[25] Presentation by Breloh, L., *Respeggt*, Status Quo der Geschlechtsbestimmung im Brutei mit dem SELEGGT-Verfahren, at EuroTier Fair in Hannover, November 17th 2022.
[26] Jost, L., SWR2 Podcast (July 31st 2022), Kükentöten verboten - Deutschlands Alleingang für mehr Tierschutz, swr.de/swr2 (last visited November 29th 2022).
[27] Presentation by Breloh, L., *Respeggt*, Status Quo der Geschlechtsbestimmung im Brutei mit dem SELEGGT-Verfahren, at EuroTier Fair in Hannover, November 17th 2022.
[28] PLANTegg, plantegg.de/ (last visited December 9th 2022).
[29] Press Release PLANTegg(November 13th 2022), PLANTegg und Ter Heerdt verlängern erneut Zusammenarbeit, plantegg.de (last visited December 9th 2022).
[30] eggXYt, https://www.eggxyt.com/ (last visited December 9th 2022).
[31] CSIRO, csiro.au (last visited December 9th 2022).

	Transformation[32]	LETHAL GENE FOR THE MALE EMBRYO TO DIE			incubation process - female chicks and the table-eggs they lay are non-GMO	opposing GMO-legislation - lack of acceptance	
Sex Reversal	SOOS[33] (ISR)	COMBINATION OF FREQUENCIES, HUMIDITY AND TEMPERATURE IN THE INCUBATOR TO INFLUENCE BI-POTENTIAL GONADS IN BIRDS	N/A	-	- non-invasive - genomic male chicks present female phenotype (ovaries) and function (laying eggs)	- only 30 % less male chicks - not ready for large-scale	in development

Table 3: In-Ovo Sexing Technologies For Duck Embryos In Foie Gras Production

Category	Name	Technology	Capacity	Testing Period	Advantages	Disadvantages	Status
Spectroscopy	LUNIX by Grimaud Frères[34,35] (FR)	SPECTROSCOPY, A.I. (Eye colour)	N/A	9th day of incubation	- non-invasive	N/A	in development: stated be ready for commercialisation starting January 2023[36], no update
N/A	Orvia[37] (FR)	N/A	N/A	N/A	N/A	N/A	in development: prototype in 2020; was stated to be ready for commercialisation by 2022; no update
N/A	Nectra[38] (FR)	N/A	N/A	allegedly very early in the incubation process	N/A	N/A	allegedly ready for commercialisation in 2023[39]

[32] NRS Poultry, Poultry by Hummin, nrspoultry.com (last visited December 9th 2022).
[33] SOOS, soos.org.il (last visited December 9th 2022).
[34] Brockotter, F. (June 17th 2020), In-ovo sexing of Muscovy and Mule duck eggs, poultryworld.net (last visited December 9th 2022).
[35] Puybasset, A. (June 11th 2020) Les canards Grimaud Frères sexés dans l'œuf dès 2021, reussir.fr (last visited December 9th 2022).
[36] Reussir (October 27th 2021), Grimaud Frères : L'ovosexage des canards opérationnel début 2023, reussir.fr (last visited December 9th 2022).
[37] Le Douarin, P. (June 11th 2020), "Orvia commercialisera des canetons mulards ovosexés en 2021", reussir.fr (last visited December 9th 2022).
[38] Personal conversation at Nectra Exhibitor Booth at EuroTier Fair in Hannover, November 15th 2022.
[39] Personal conversation at Nectra Exhibitor Booth at EuroTier Fair in Hannover, November 15th 2022.

Table 4: Plant Based Egg Alternatives[40]

Category	Name	Ingredients	Egg-part	Usage	Advantages	Disadvantages	Status
Precision Fermentation	EVERY[41] (USA)	Yeast Sugar	egg-white	wide variety of applications including baking or as nutritional supplement	- no animal exploitation - sustainable - healthy (no cholesterol) - environmentally friendly - cost efficient	- only egg-white	available for commercial sale
	OnegoBio[42] (FIN)	Fungi-based: microflora *Trichoderma reesei*	egg-white	foaming egg-white replacements, e.g. for baking meringues	- no animal exploitation - sustainable - healthy (no cholesterol) - environmentally friendly - cost efficient	- only egg-white	in development
	Fumi Ingredients[43] (NL)	Natural microorganisms like yeast and microalgae	egg-white	powdered egg-white for baking, cooking	- no animal exploitation - sustainable - healthy (no cholesterol) - environmentally friendly - cost efficient	- only egg-white	in development
	OTRO[44] (BEL)	Yeast	egg-white	baking , cooking	- no animal exploitation - sustainable - healthy (no cholesterol) - environmentally friendly - cost efficient - real egg white protein, identical to those produced by chickens	- only egg-white	in development
Plant-based	Crackd[45] (UK)	Pea	liquid plant-based egg replacement like mixed egg-white and yolk	scrambled eggs, baking, cooking	- no animal exploitation - sustainable		available

[40] Non-exhaustive list; for detailed information, please see: Good Food Institute (GFI), Alternative protein manufacturers and brands database, gfi.org (last visited December 9th 2022).
[41] EVERY, theeverycompany.com/do (last visited December 9th 2022).
[42] OnegoBio, onego.bio (last visited December 9th 2022).
[43] Fumi Ingredients, fumiingredients.com (last visited December 9th 2022).
[44] OTRO, otrofoods.com (last visited December 9th 2022).
[45] Crackd, crackd.com (last visited December 9th 2022).

					- healthy (no cholesterol) - environmentally friendly - domestic ingredients		
	Wunder Eggs by Crafty Counter[46]	Cashew Almond	plant-based hard boiled egg replica	hard boiled egg	- no animal exploitation - sustainable - healthy (no cholesterol) - environmentally friendly - one of the first whole plant-based eggs		to be launched soon
	EggField[47] (CH)	Chickpea	egg-whites and whole egg, focusing on mimicking the functionality of egg proteins	cooking, baking	- no animal exploitation - sustainable - healthy (no cholesterol) - environmentally friendly	- exclusivity	available exclusively for gastronomy and industry
	EVO Foods[48] (IND)	Mung Bean Liquid	lentil-based egg replica	hard boiled egg replicas	- no animal exploitation - sustainable - healthy (no cholesterol) - environmentally friendly		available
	JustEgg[49] (USA)	Fava Bean	liquid plant-based egg replacement like mixed egg-white and yolk	scrambled eggs, baking, cooking	- no animal exploitation - sustainable - healthy (no cholesterol) - environmentally friendly	- just scrambled eggs	available
	Neggst[50] (GER)	Broad Bean Pea Sweet Potato Vegetable Oil	whole egg in a shell, with distinctly separated egg-white and yolk	Fried egg, boiled egg, scrambled egg, baking, cooking	- no animal exploitation - sustainable - healthy (no cholesterol) - environmentally		in development

[46] Crafty Counter, Wunder Eggs, craftycounter.com (last visited December 9th 2022).
[47] EggField, eggfield.com (last visited December 9th 2022).
[48] EVO Foods, evofoods.in (last visited December 9th 2022).
[49] JustEgg, ju.st (last visited December 9th 2022).
[50] Neggst, neggst.co (last visited December 9th 2022).

				friendly - whole egg in shell - domestic ingredients		
Le Papondu[51] (FR)	N/A	whole egg in a shell, with distinctly separated egg-white and yolk	fried egg, boiled egg, scrambled egg, baking, cooking	- no animal exploitation - sustainable - healthy (no cholesterol) - environmentally friendly - whole egg in shell		in development
Umami United[52] (JAP)	Konjak	plant-based egg powder made with konjac powder and has umami flavour added to it thanks to an innovative enzyme process	scrambled egg, baking, cooking	- no animal exploitation - sustainable - healthy (no cholesterol) - environmentally friendly		in development
The VGN[53] (GER)	Broad Bean	liquid egg substitutes	scrambled egg, baking, cooking	- no animal exploitation - sustainable - healthy (low cholesterol) - environmentally friendly - domestic ingredients		available
Yo! Egg[54] (ISR)	Plant-based proteins Sunflower oil Water Flour	whole egg with distinctly separated egg-white and yolk	fried egg, boiled egg, scrambled egg, baking, cooking	- no animal exploitation - sustainable - healthy (low cholesterol) - environmentally friendly		in development
ZeroEgg[55] (ISR)	Soy Chickpea Potato protein	liquid egg substitutes	scrambled egg, baking, cooking	- no animal exploitation - sustainable - healthy (low cholesterol) - environmentally friendly		available for gastronomy and industry

[51] Le Papondu, papondu.fr (last visited December 9th 2022).
[52] Umami United, umamiunited.com (last visited December 9th 2022).
[53] The VGN, thevgn.de (last visited December 9th 2022).
[54] Yo! Egg, yo-egg.com (last visited December 9th 2022).
[55] ZeroEgg, zeroegg.com (last visited December 9th 2022).