SUPPLEMENTARY MATERIALS

S1 Search Methods and Keys

Search key construction

The technological landscape of papers and patents was respectively made using a scientific literature database (i.e., Web of Science) and a patent database (i.e., PATSTAT 2021b version). The data were extracted in January 2022. A composed search key was constructed starting from the relevant search terms combined with Boolean operators. Gradually, terms were added one by one and if an additional search term added relevant records to the dataset, it was retained in the key. This iterative process was repeated until the search key captured no new relevant literature without adding false positives. First, the patent search key was completed which was subsequently used to generate the paper search key. In the end, the two keys were not identical because of the different terminology used in each of the domains.

The search output was used to generate a patent and a paper dataset respectively and manual operations were performed to standardize the information. The patent citations were manually retrieved from the Web of Science and the legal statuses from Espacenet, the local patent offices, or PatSnap analytics (PatSnap analytics, London, UK). The patent search results were analyzed regarding their publication date and -number, the filed country, the patent family, the inventors, and the applicants. Next, the legal statuses were characterized as active (i.e., for granted patents with active status), pending (i.e., patents under examination before publication), rejected patents by the examiner, discontinued (i.e., patents abandoned before grant), ceased (i.e., patents lapsed or expired after being granted), and patents in which the fees were not paid. For the cases in which the legal status was not available, the countries' local patent offices were consulted. For the scientific publications, the publication date, the institution, the country, the authors, the journal, and the citation numbers were considered for the analysis.

PATSTAT search key:

((upper(appln_title) like '%PRE_HATCH%' or upper(appln_title) like '%PREHATCH%' or upper(appln_title) like '%EMBRYO%EGG%' or upper(appln_title) like '%EGG%EMBRYO%' or upper(appln_title) like '%UNHATCH%EGG%' or upper(appln_title) like '%BIRD%EGG%' or upper(appln_title) like '%BIRD%EMBRYO%' or upper(appln_title) like '%AVIAN%EMBRYO%' or upper(appln_title) like '%AVIAN%EGG%' or upper(appln_title) like '%HEN% EGG%' or upper(appln_title) like '%HEN% EMBRYO%' or upper(appln_title) like '%CHICKEN% EGG%' or upper(appln_title) like '%CHICKEN% EMBRYO%' or upper(appln_title) like '%EMBRYONATED EGG%' or upper(appln_title) like '%POULTRY EMBRYO EGG%' or upper(appln_title) like '%EGG%BIRD%' or upper(appln_title) like '%EMBRYO%BIRD%' or upper(appln_title) like '%EGG %HEN%' or upper(appln_title) like '%EMBRYO %HEN%' or upper(appln_title) like '%EGG %CHICKEN%' or upper(appln_title) like '%EMBRYO %CHICKEN%')
and (upper(appln_title) like '%SEX%' OR upper(appln_title) like '%GENDER%'))
or upper(t.appln_title) like '%OVO%' and upper(t.appln_title) like '%SEXING%'
or upper(appln_title) like '%SEX OF AN EGG%'

Web of Science search key:

TS=((("PRE HATCH*" OR "BIRD EGG*" OR "BIRD EMBRYO*" OR "AVIAN EMBRYO*" OR "AVIAN EGG*" OR "HEN EGG*" OR "HEN EMBRYO*" OR "CHICKEN EGG*" OR "CHICKEN EMBRYO*" OR "EMBRYONATED EGG*" OR "POULTRY EMBRYO EGG*" OR "EGG HEN*" OR "EMBRYO HEN*" OR "EGG CHICKEN*" OR "EMBRYO CHICKEN*" OR "HATCHING EGG*" OR "BRED EGG*" OR ((EGG NEAR ODO*R) AND AVIAN)) AND ("SEX*" OR "GENDER*")) OR ("OVO" AND "SEXING") OR "SEX OF AN EGG" OR "sex in egg*" OR ((KILLING OR CULLING OR EUTHANASIA) NEAR (("DAY-OLD" OR Male) NEAR CHICK*)) OR ("SEX REVERSAL" AND CHICKEN))

S2 Countries allowing or blocking GMO importation

Table S2: Countries belonging to the groups where production is not allowed, but GMO products are imported, and countries where GMOs have a complete block. The remaining group that allows both producing and importuning (or is without legislation regarding GMOs) is not mentioned in this table. Remarkably, within the EU, countries such as Spain and Portugal produce GMO maize (1)

Importation is allowed	Complete block
Azerbaijan, Belize, Bosnia and Herzegovina, Cyprus, Ecuador, Moldova, Norway, Saudi Arabia, Serbia, Switzerland, Turkey, France, Germany, Austria, Greece, Hungary, The Netherlands, Latvia, Lithuania, Luxemburg, Bulgaria, Poland, Denmark, Malta, Slovenia, Italy, Croatia, Wallonia, Scotland, Wales, Northern Ireland	Algeria, Bhutan, Kenya, Kyrgyzstan, Madagascar, Peru, Russia, Venezuela, Zimbabwe

S3 Patent publication numbers

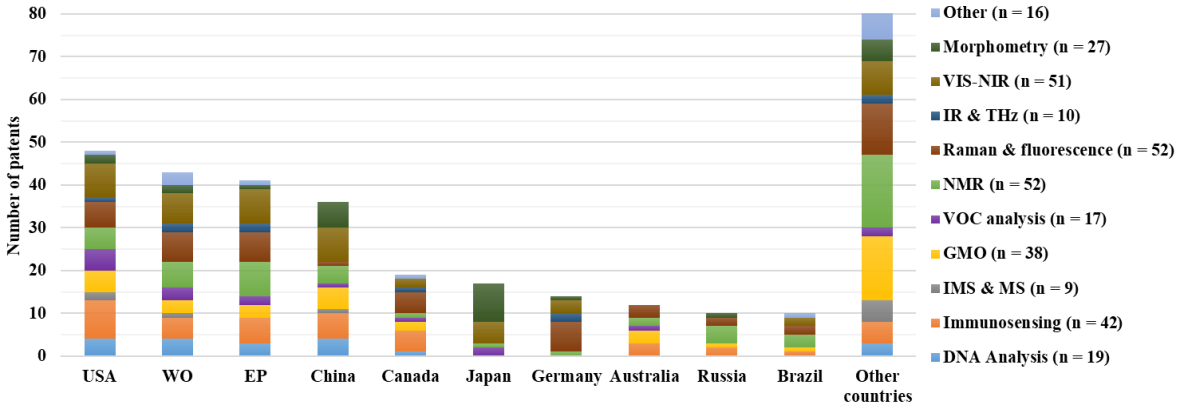

Figure S3: Country distribution of the published patents on in ovo sexing by their category. The figure depicts countries with 10 or more filed patents and also includes world (WO) and European patents (EP). A total of 333 publications on in ovo sexing was found. The categories were heterogeneously spread over regions such as the USA, WO, EP, China, and Canada. Japan predominantly protected morphometric and VIS-NIR approaches, whereas Germany focused on optical techniques only.

S4 Distribution of actively publishing Journals

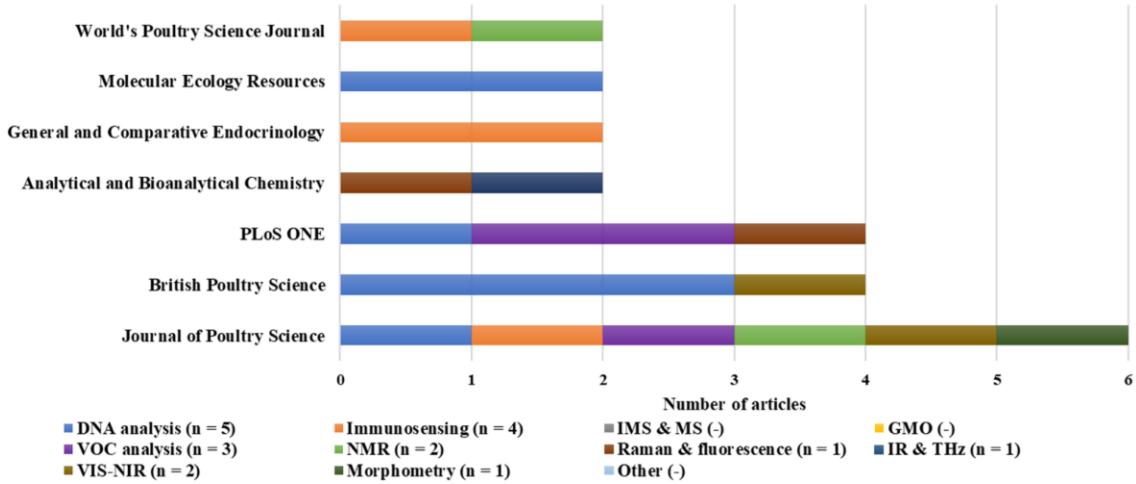

Figure S4: Distribution of the papers on in ovo sexing regarding the institutions of origin and category. The total number of publications per category is indicated in between parentheses next to the category

S5 Actively publishing universities and applicants

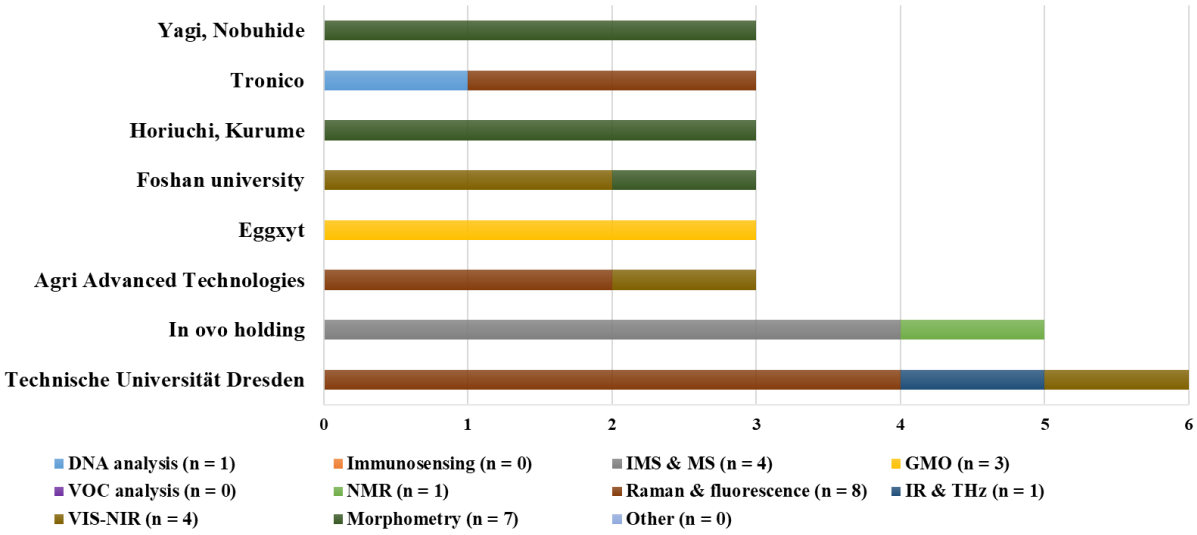

Figure S5: Distribution of the patent families regarding their applicants and category. The total number of publications per category is indicated in between parentheses next to the category

S6 Top journals and individuals

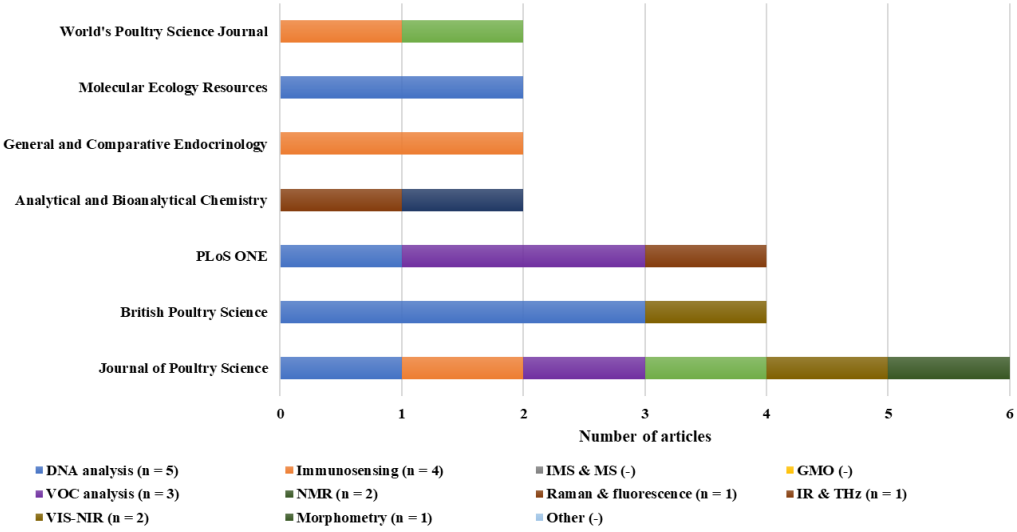

Figure S6: Papers distribution by the journal per category. Most of the journals were directly related to poultry (World's Poultry Science Journal, n = 2, British Poultry Science, n = 4, and Journal of Poultry Science, n = 6). Specific techniques could also be found in their related journals, such as DNA analysis papers published in Molecular Ecology Resources or immunosensing-related techniques published in General and Comparative Endocrinology.

References

1. Güneş E, Movassaghi H, Unsal F, Güneş NT. GMO Policies and Practices: A Global Overview with Special Focus on Turkey. In: Policy Issues in Genetically Modified Crops: A Global Perspective. 2020. p. 29–56.