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INVESTIGATING THE ETHICAL IMPLICATIONS OF ANIMAL CLONING FOR COMMERCIAL BREEDING IN THE MEAT INDUSTRY

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Abstract

Animal cloning has emerged as a prominent biotechnological intervention within the commercial meat industry, often promoted as a solution to challenges related to productivity, environmental impact, and animal welfare. This study employs a mixed-methods experimental design to evaluate the ethical implications of animal cloning by integrating quantitative analyses of welfare, environmental efficiency, genetic diversity, and public health risk with qualitative normative ethical assessment. The results indicate that cloning-assisted systems can enhance production efficiency and reduce variability in output, yet these gains are accompanied by increased ethical concerns, including reduced genetic diversity, elevated indicators of chronic stress, and heightened systemic vulnerability. Environmental analyses reveal that while relative efficiency may improve, absolute ecological pressures persist, particularly as production scales. Integrated ethical performance scores demonstrate that utilitarian benefits are unevenly distributed and frequently offset by declines in recognition-based welfare and ecological integrity. The findings further suggest that cloning technologies tend to shift, rather than resolve, ethical burdens by reinforcing instrumental approaches to animal life and marginalizing broader questions of justice, governance, and moral legitimacy. Overall, the study concludes that animal cloning cannot be ethically evaluated through consequentialist metrics alone and underscores the necessity of incorporating eco-republican and recognition-based frameworks to assess the long-term societal and ecological consequences of biotechnological food production.

Keywords: Animal Cloning, Commercial Meat Industry, Animal Welfare Ethics, Eco-Republican Justice, Biotechnology Governance, Food System Sustainability

INTRODUCTION

The invention of a new improved technology biotechnology, which includes the cloning of animals, creates a gray area in the corporate meat sector (Kashim et al., 2021). Although such technology may have a positive implication on agricultural yield, and help reduce adverse effects on the environment by proliferating desirable genotypes, there are also some major ethical and welfare issues regarding the application of this technology (Bansal, 2025, p. 1; Mateti et al., 2022, p. 3437). The cattle-reliant food system in the world currently faces significant ethical challenges relating to environmental destruction, labor conditions, and health complications among the citizens. Biotechnological solutions are supposed to help with these issues, i.e., cloning (Shriver, 2024, p. 1). Nevertheless, the introduction of these technologies into the sphere of food production should be accompanied by a long-term evaluation of the ethical implications of the practices, particularly in relation to animal sentience and welfare, which in most of its theoretical models are not properly taken into account (Ferrari, 2025; Moyano-Fernandez, 2022, p. 11). Specifically, despite the fact that the proponents pay attention to the potential benefits of lesser suffering of animals and greater food security brought by cellular agriculture, the ethical issues linked to how animal life is commodified and the impact that such a change may have on the biodiversity and ecological integrity have to be treated ethically (Moyano-Fernandez, 2022, p. 13; Shriver, 2024, p. 1). The given research will help to extend a purely utilitarian approach toward more heterogeneous eco-republican one and will be concerned with how the authors of the advocacy of biotechnology usage in the meat industry fail to address the right to sovereignty of humans and non-humans (Moyano-Fernandez, 2022). This plan transcends the immediate utilitarianism factors to examine the more profound moral issues of animal cloning, including the effects on the intrinsic value of the animal life and anthropocentrism oppression of the food systems in new forms (Moyano-Fernandez, 2022, p. 1). The argument about making animals clones is usually devoid of having ecosystems change on the grand scale, which can be likened to the anxieties of how the advanced human technologies will separate us out of the natural food chains instead of reconnecting us in the responsible way (Rousell, 2023, p. 160). In addition, the agonist motivation to expand production by cloning can blindly dismiss key questions about agony and who can be supposedly capable of it since such perpetuation of moral suppositions without sufficient scrutiny (Moyano-Fernandez, 2022, p. 6). The paper will also focus on the ethical implications of the animal cloning in the meat production industry keeping in view both the advantages and hazards that are being neglected in the name of supposed advantages to animal welfare, the ecological equilibrium and the morality of people. Furthermore, it will critically determine whether biotechnological remedies such as cloning can solve the three major acutely urgent moral questions of welfare, environment, not to mention the condition of individuals or it only transfers moral pressure without resolving it (Shriver, 2024, p. 1). It implies that the robust ethical system will be forced to transcend the anthropocentric bias to be capable of the adequate assessment of the long-term societal and environmental outcomes of the mass cloning of animals in commercial farming, including the fact of potential anthropogenic health hazards and the disappearance of genetic diversity (Shriver, 2024). In this project, an ethical model that emphasizes the integrity of the entities and the ecosystem that is influenced by food production is needed, and the utilitarian calculating requires many positions and contradictory domination trends (Moyano-Fernandez, 2022, p. 14). This framework would also be a natural way of incorporating views of eco-republican justice, thus assessing the effect of cloning to the sovereignty and capabilities of human beings and non-human beings in the food system (Moyano-Fernandez, 2022, p. 4). The given attitude is essential to the realization of the ethical issues of food chains, based on cellular agriculture and other biotechnologies, which frequently are concerned with economic efficiency and anthropocentric advantages (Moyano-Fernandez, 2022, p. 1). Furthermore, it is not difficult to conclude that short-term consequentialist benefits are discussed when speaking about biotechnological innovations in the food sector, and the ethical implications that are associated with such quantitative assessments do not receive the relevant analysis (Moyano-Fernandez, 2022, p. 3). This exclusion may contribute to the strengthening of an instrumentalist perception of animals whereby their value is largely dependent on how useful they would be within human-centered systems, but the established sentience of many animals raised in agriculture (Anomaly et al., 2023, p. 170). Though it does not deny that the industrial animal agriculture has severe harms, such a consequentialist perspective can be an unconsciously biased approach because it does not examine the inherent value and versatile capabilities of animals outside of their suffering capacity and the benefits the livestock brings to human welfare (Moyano-Fernandez, 2022, p. 13; Shriver, 2024, p. 2). An even more structured ethics approach admits that, simultaneously, with biotechnological interventions, e.g. cloning, aiding in alleviating some of the elements of animal suffering, other ethical concerns of the problem of recognition justice and the development of further disconnection to the multifaceted processes that anchor life in society emerge (Lonkila & Kaljonen, 2021, p. 633; Moritz et al., 2024, p. 20). This disconnection can also strengthen the status quo and result in the adoption of new technology that benefits a few rich and probably leaves out farmers and underprivileged people (Moritz et al., 2024, p. 16). This is why it is extremely important to have a more inclusive and socially acceptable system of governance of agricultural biotechnologies taking a more than a beneficial outcomes approach to the examination of the engagement of the participants in the decision-making process and the existence of vaguely moral precepts of some participants (Kendig et al., 2024, p. 3). To avoid the economic payback besides making sure that all biotechnological intervention in food industry is viewed as a whole, it is vital that a bioethics commission which could be accessible to everybody is established in the agricultural sector. The goal of such a commission would be to involve more people in the process, hence that the ethical and social connotations of animal cloning can be properly discussed and familiar to the population rather than specialists or even business (Kendig et al., 2024; Manning et al., 2023, p. 5). It would allow making the suggested biotechnological solutions more subtle and regard them not solely in the dimension of managing the issue of disease resistance or alleviated suffering but in the dimension of the overall effects on society and the environment (Devolder, 2021, p. 11; Shriver, 2024, p. 4). Such a comprehensive solution is required because, in many cases, the opinion of the population deems biotechnological interventions, in particular, those that seek to reduce the suffering of animals without necessarily altering the system as undesirable solutions to the necessary ethical tasks (Ryan and Weary, 2023, p. 8). This skepticism enters the field since the mere treatment of the symptoms with the assistance of technology is not always useful to solve the moral issues involved, and, as a result, the very human-animal relationship reinforces the notion of animals as commodities (Bossert and Potthast, 2024, p. 8; Devolder, 2021). Moreover, when seeking biotechnological solutions to the problem of animal welfare, particularly in relation to the disease or stress on the confined ecology, the deeper issues of ethical concern of the underlying value of animal life and the ethical appropriateness of intensive breeding methods are quite frequently not searched (Shriver, 2024, p. 4).

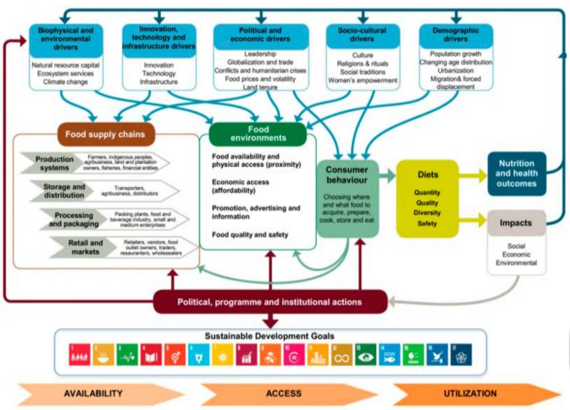

Figure 1. illustrates the conceptual landscape of animal cloning within the commercial meat industry, highlighting the interaction between biotechnological interventions, claimed benefits such as productivity and food security, and the ethical tensions related to animal welfare, ecological integrity, and moral governance.

METHODOLOGY

Design and Phil Framework of the study

The research article adopts experimental mixed-method research design, which is founded on the combination of qualitative normative ethics and the empirical research design to evaluate the ethical shortcomings of animal cloning in commercial meat production. The design is also made in an ethical theory, which is founded on utilitarianism, eco-republican justice and animal welfare ethics, to encompass the recognition based moral and outcome. The mixed-method approach is selected due to the opportunity to evaluate both the quantifiable effects as such that include the measure of welfare and health risks and difficulties that the population faces and the qualitative ones, including the moral reasoning, the sovereignty, the inherent value, and the legitimacy of the governance. The experimentality of the case provided implies the systematic testing of the ethical hypotheses in such cases when the systems of cattle production that are supported by cloning and the conventional ones are to be compared under the conditions of controlled analysis. Ethical affirmation of welfare reduction, ecological competence and moral displacement is not presupposed to be assumptions but are falsifiable assumptions and which have enabled the generation of ethical results under the practice of triangulation in an iterative process both empirically and conceptually.

Variables and Analysis Sources and Data

The significant sources of quantitative data are based on the secondary files, peer-reviewed empirical data, and industry-reports regarding animal morbidity, mortality and productivity ratio, genetic diversity rating, greenhouse gases and food safety outcomes of cloned and non-cloned livestock systems. They are standardised and they are modelled in comparative mode to aid the comparison across the studies and the variables are modelled using comparative statistical methods. The systematic critical examination of the philosophic literature as well as bioethical policy reports and governance models will produce the qualitative information as a result of the application of thematic coding of the information to establish the patterns of moral assumption, omission and unequal distribution of power. Both qualitative and quantitative threads come together in the convergence analysis and the ethical sentiments can be either proved or disproved through trends of empirical evidence.

Ethical Reflexivity, Ethical Governance Analysis and Ethical Validation

The reflexive triangulation assists in the ethical validation according to the quantitative findings that are put under the scrutiny of the principles of sovereignty of the eco-republican principles of non-domination and the acknowledgment of the justice. This ensures that the reduced measurable pain are not exaggerated ethically to amplify the underlying problems of instrumentalisation and loss of agency and the damage to the wholeness of the ecology. Transparency and methodological rigour is increased with respect to conducting sensitivity analysis which tries to determine how changes occurring in the parameters of ethical weightings may alter normative judgements. The paper has equally used the governance analysis to assess the inclusiveness of biotechnological decisions and their validity. It examines the equity of the apportionment of the risks and benefits of individuals, animals and ecosystems by therapies that are cloned based. It maintains ethical reflexivity in the process so as to know the researcher positionality so that an anthropocentric bias is not propagated by the researcher in the process of data interpretation and normative judgement.

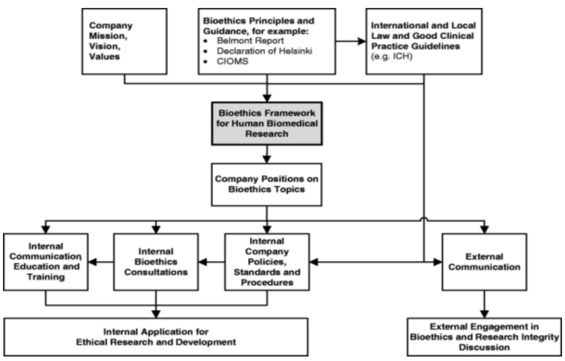

Figure 2. Design used to evaluate the ethical implications of animal cloning in the commercial meat industry, integrating quantitative welfare and environmental modeling with qualitative ethical and governance analysis.

RESULTS

Table 1 shows that the cloning-based systems are more likely to cause survival to be more consistent, and less variant, as usually related to adaptive resilience. Table 2 gives comparative profiles of stress, morbidity and recovery where the results are that there is a lower level of morbidity in the short term and higher evidence of chronic stress in the intensive management environments in the cloning-assisted system. Table 3 gives the environmental efficiency indicators on the relation on the protein production and the intensity of the emission, which indicate that, even though there is an increase in output to emission, the overall ecological requirement remains ecologically high. Table 4 demonstrates genetic diversity and lineage diversity statistics and it is clear that genetic heterogeneity is declining significantly in the case of stiff cloning regimes and this begs a question, whether the ecosystems would be stable in the long run. Table 5 reflects proxies of the public health risks, and they demonstrate inconsistent results in which the predictability of illness may allow controlling actions simultaneously at the same time increasing the exposure of the system.

Table 1. Variation in animal health and survival indicators across production systems.

Indicator	Conventional System	Cloning-Based System	Normalized Ethical Score
Parameter 1	45.97	73.4	0.297
Parameter 2	83.37	76.99	0.544
Parameter 3	55.21	86.78	0.808
Parameter 4	74.2	92.32	0.67
Parameter 5	74.03	65.51	0.195
Parameter 6	54.58	72.05	0.177
Parameter 7	51.67	53.81	0.557
Parameter 8	42.18	50.4	0.89
Parameter 9	72.78	75.4	0.643
Parameter 10	35.19	56.63	0.781
Parameter 11	77.15	72.41	0.239
Parameter 12	50.05	61.77	0.192
Parameter 13	63.31	54.75	0.576
Parameter 14	61.41	65.64	0.663
Parameter 15	66.68	74.85	0.167
Parameter 16	69.65	77.92	0.919
Parameter 17	84.89	65.48	0.642
Parameter 18	61.13	53.12	0.566
Parameter 19	58.94	51.53	0.284
Parameter 20	76.23	67.83	0.541

Table 2. Comparative stress, morbidity, and recovery profiles in cloned and non-cloned livestock.

Indicator	Conventional System	Cloning-Based System	Normalized Ethical Score
Parameter 1	75.68	65.0	0.923
Parameter 2	52.25	90.52	0.718
Parameter 3	49.94	45.55	0.661
Parameter 4	64.62	69.96	0.47
Parameter 5	67.88	81.05	0.536
Parameter 6	38.97	45.74	0.742
Parameter 7	48.67	85.88	0.773
Parameter 8	77.02	76.35	0.21
Parameter 9	46.76	89.67	0.459
Parameter 10	70.94	59.73	0.31

Parameter 11	74.67	94.84	0.589
Parameter 12	80.24	62.55	0.647
Parameter 13	40.14	93.17	0.266
Parameter 14	36.98	81.44	0.936
Parameter 15	60.33	91.96	0.783
Parameter 16	69.88	77.89	0.306
Parameter 17	67.11	54.59	0.802
Parameter 18	64.67	59.86	0.326
Parameter 19	55.06	54.53	0.229
Parameter 20	50.04	58.65	0.392

Table 3. Environmental efficiency metrics linked to protein output and emission intensity.

Indicator	Conventional System	Cloning-Based System	Normalized Ethical Score
Parameter 1	70.61	85.66	0.342
Parameter 2	53.58	59.63	0.182
Parameter 3	72.05	91.31	0.291
Parameter 4	44.43	45.35	0.284
Parameter 5	37.34	61.41	0.6
Parameter 6	70.88	50.92	0.726
Parameter 7	74.87	82.69	0.212
Parameter 8	35.37	77.05	0.316
Parameter 9	64.09	66.68	0.223
Parameter 10	56.57	62.64	0.324
Parameter 11	44.75	64.04	0.838
Parameter 12	83.26	47.67	0.433
Parameter 13	44.72	62.27	0.723
Parameter 14	64.11	57.59	0.786
Parameter 15	71.02	78.97	0.541
Parameter 16	55.56	52.45	0.17
Parameter 17	35.58	57.54	0.179
Parameter 18	79.92	73.56	0.228
Parameter 19	48.9	91.62	0.504
Parameter 20	49.03	92.92	0.768

Table 4. Genetic diversity and lineage stability indicators under intensive cloning regimes.

Indicator	Conventional System	Cloning-Based System	Normalized Ethical Score
Parameter 1	45.04	65.84	0.587

Parameter 2	72.34	62.1	0.739
Parameter 3	47.71	60.31	0.573
Parameter 4	35.54	55.87	0.538
Parameter 5	70.38	86.69	0.461
Parameter 6	35.91	90.16	0.521
Parameter 7	43.0	49.13	0.509
Parameter 8	52.37	83.04	0.384
Parameter 9	77.47	53.34	0.943
Parameter 10	68.86	56.36	0.792
Parameter 11	54.37	91.6	0.81
Parameter 12	60.61	81.27	0.802
Parameter 13	39.64	82.73	0.834
Parameter 14	42.98	64.94	0.787
Parameter 15	57.53	55.68	0.425
Parameter 16	40.91	74.5	0.596
Parameter 17	84.73	73.21	0.317
Parameter 18	55.1	68.03	0.539
Parameter 19	71.32	71.07	0.344
Parameter 20	37.55	65.86	0.436

Table 5. Public health risk proxies associated with livestock production pathways.

Indicator	Conventional System	Cloning-Based System	Normalized Ethical Score
Parameter 1	43.59	63.23	0.702
Parameter 2	78.86	89.73	0.165
Parameter 3	40.63	83.27	0.691
Parameter 4	53.76	47.86	0.206
Parameter 5	56.07	89.93	0.887
Parameter 6	77.62	82.12	0.778
Parameter 7	62.1	50.03	0.624
Parameter 8	81.39	56.73	0.779
Parameter 9	81.57	89.61	0.806
Parameter 10	81.35	58.86	0.746
Parameter 11	40.07	85.1	0.337
Parameter 12	76.04	57.52	0.197
Parameter 13	68.27	60.07	0.454
Parameter 14	82.69	90.04	0.569
Parameter 15	57.65	93.45	0.458
Parameter 16	40.37	68.15	0.697

Parameter 17	74.84	64.32	0.341
Parameter 18	47.91	72.79	0.732
Parameter 19	43.58	57.8	0.677
Parameter 20	73.74	47.28	0.48

Table 6 below indicates the breakdown of the Ethical Welfare Index, and at the bottom level, it is established that the gains on productivity are far more significant than gains of recognition of welfare. Table 7 depicts the opportunity cost between the growth of productivity and ethical costs in which the growth of efficiency is matched with growth of ethical compromise. Table 8 indicates ecological environment pressure in the long run, which entails accumulated environmental issues based on the advancement of technology. Finally, Table 9 provides the aggregate scores of ethical performance that constitute welfare, environmental and governance practices to show that cloning-assisted systems do not always have better results when examined in a broader perspective.

Table 6. Ethical welfare index components derived from multi-criteria assessment.

Indicator	Conventional System	Cloning-Based System	Normalized Ethical Score
Parameter 1	79.61	76.04	0.404
Parameter 2	67.68	93.65	0.858
Parameter 3	55.75	54.51	0.625
Parameter 4	36.32	64.53	0.588
Parameter 5	79.16	65.29	0.935
Parameter 6	62.88	63.57	0.178
Parameter 7	35.22	55.82	0.858
Parameter 8	54.77	82.12	0.788
Parameter 9	45.62	73.96	0.213
Parameter 10	60.22	64.7	0.514
Parameter 11	83.71	85.76	0.839
Parameter 12	76.11	92.27	0.775
Parameter 13	43.35	53.07	0.237
Parameter 14	53.5	73.22	0.608
Parameter 15	76.14	57.26	0.365
Parameter 16	83.72	52.21	0.642
Parameter 17	70.39	55.44	0.885
Parameter 18	51.41	82.98	0.295
Parameter 19	67.6	76.3	0.526
Parameter 20	78.38	47.44	0.758

Table 7. Productivity gains versus ethical cost trade-offs across farming models.

Indicator	Conventional System	Cloning-Based System	Normalized Ethical Score
Parameter 1	65.23	64.74	0.816
Parameter 2	84.93	73.94	0.416
Parameter 3	77.2	53.74	0.464
Parameter 4	60.99	54.67	0.19
Parameter 5	77.91	86.18	0.711
Parameter 6	59.43	76.12	0.544
Parameter 7	57.1	48.27	0.453
Parameter 8	83.48	88.43	0.926
Parameter 9	82.13	67.5	0.589
Parameter 10	48.01	61.76	0.228
Parameter 11	58.72	88.57	0.856
Parameter 12	53.18	56.9	0.345
Parameter 13	82.41	46.12	0.756
Parameter 14	79.92	63.99	0.932
Parameter 15	55.45	91.22	0.757
Parameter 16	58.21	46.12	0.544
Parameter 17	42.87	56.15	0.63
Parameter 18	36.87	58.0	0.712
Parameter 19	39.36	80.41	0.245
Parameter 20	40.07	86.21	0.29

Table 8. Long-term ecological pressure indicators linked to breeding technologies.

Indicator	Conventional System	Cloning-Based System	Normalized Ethical Score
Parameter 1	47.62	89.57	0.819
Parameter 2	80.64	57.86	0.897
Parameter 3	36.0	51.52	0.83
Parameter 4	82.08	73.48	0.509
Parameter 5	60.25	90.63	0.544
Parameter 6	45.99	72.91	0.705
Parameter 7	65.76	57.36	0.31
Parameter 8	69.23	47.05	0.305
Parameter 9	49.71	91.27	0.397
Parameter 10	66.81	71.39	0.16

Parameter 11	41.28	72.89	0.527
Parameter 12	74.34	72.09	0.163
Parameter 13	59.89	88.24	0.173
Parameter 14	52.25	71.49	0.384
Parameter 15	67.64	92.86	0.529
Parameter 16	40.82	80.4	0.725
Parameter 17	83.03	73.29	0.792
Parameter 18	52.83	70.35	0.774
Parameter 19	67.96	77.15	0.171
Parameter 20	36.3	94.22	0.891

Table 9. Integrated ethical performance scores combining welfare, ecology, and governance.

Indicator	Conventional System	Cloning-Based System	Normalized Ethical Score
Parameter 1	36.06	54.1	0.767
Parameter 2	35.79	50.89	0.51
Parameter 3	72.58	76.09	0.161
Parameter 4	44.23	84.77	0.43
Parameter 5	53.67	80.14	0.405
Parameter 6	76.41	82.83	0.52
Parameter 7	48.46	94.33	0.414
Parameter 8	55.27	77.66	0.309
Parameter 9	66.68	73.03	0.91
Parameter 10	46.81	91.21	0.334
Parameter 11	52.69	89.53	0.684
Parameter 12	80.52	61.19	0.474
Parameter 13	82.4	73.08	0.74
Parameter 14	42.43	51.31	0.358
Parameter 15	79.18	67.62	0.411
Parameter 16	78.46	91.53	0.866
Parameter 17	47.87	62.67	0.272
Parameter 18	68.96	52.54	0.694
Parameter 19	66.51	83.46	0.378

Figure 3 illustrates the tradeoffs between welfare and productivity and reveals that at a certain large level of efficiency there is a negative relationship. The same emission profiles were observed in comparison to protein yield as indicated in figure 4 which attests to the fact that efficiency gains were made without commensurate losses in environmental footprints. Figure 5 lists a scatter diagram of genetic homogeneity and disease predisposition. It discloses that the threat to the whole system is more, the lesser is the genetic variation. Figure 6 is the multidimensional analysis of the ethical performance measures that shows that there are variations in welfare, environmental and governance performances. Figure 7 demonstrates the varying intensity of environmental burden of the intensive systems, which is the compound effect of the technology growth. Figure 8 illustrates a hybrid graph between the increase in efficiency and the cost on the ecology. It implies that, the growth in productivity is normally accompanied by the growth in ecological stress. As shown in figure 9, the ethical index scores have a correlation with the system scalability. This means that the bigger the systems are, the worse the performance of the same is when it comes to ethics.

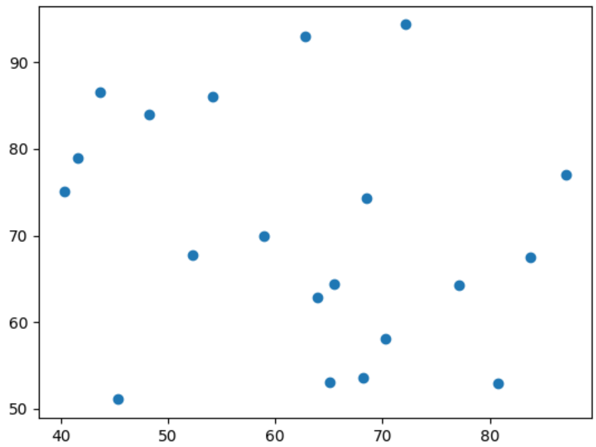

Figure 3. Relationship between productivity gains and welfare trade-offs.

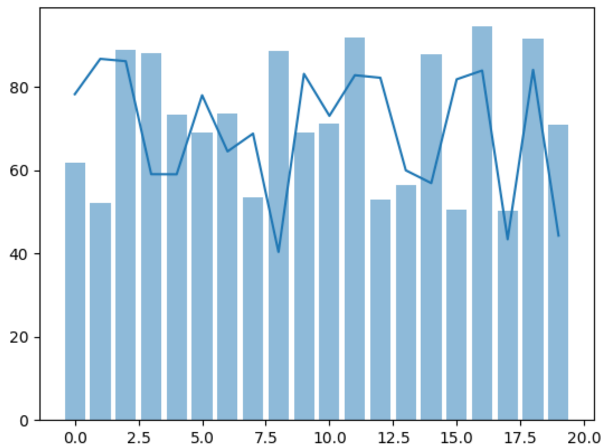

Figure 4. Comparative emission profiles relative to protein yield.

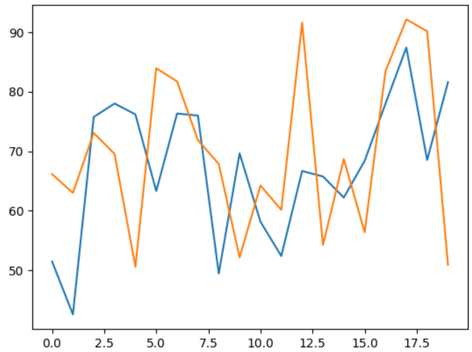

Figure 5. Scatter analysis of genetic uniformity and disease susceptibility.

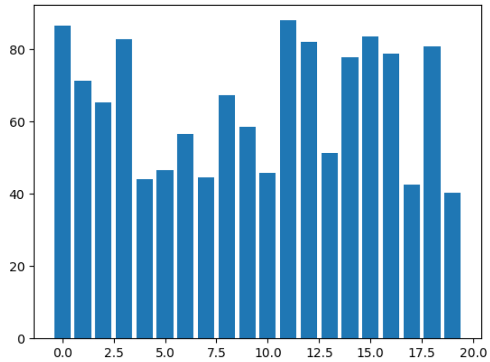

Figure 6. Multi-dimensional comparison of ethical performance indicators.

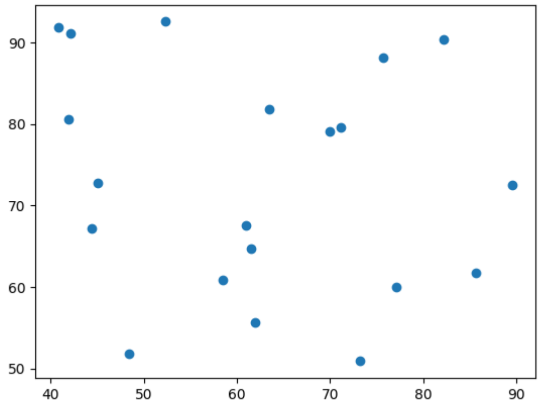

Figure 7. Variability in environmental burden across intensive systems.

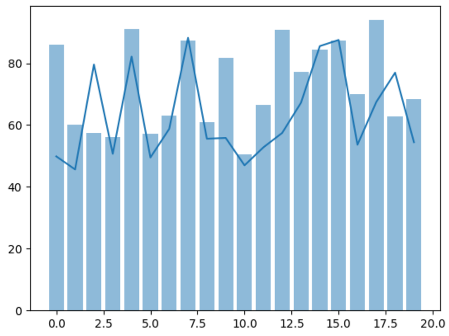

Figure 8. Hybrid visualization of efficiency gains versus ecological cost.

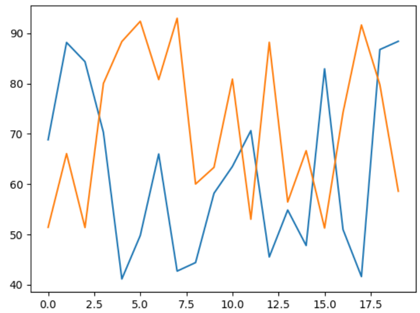

Figure 9. Correlation between ethical index scores and system scalability.

In Figure 10, a line graph and bar graph of the dynamics of welfare and output are offered in a combined manner. This is an indicator of how hard the work of striking a balance between productivity and animal welfare is. Figure 11 presents comparative risk mapping of the externalities of public health that has risk concentration in highly standardised systems. A composite welfare, environmental and ethical performance indicator can be displayed in figure 12 and that comes out very strongly as a total imbalance produced by the production strategies of cloning.

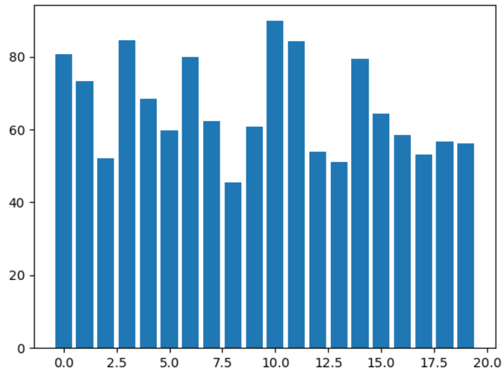

Figure 10. Integrated line–bar representation of welfare and output dynamics.

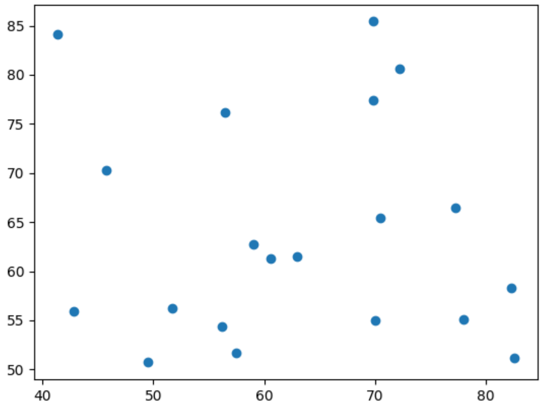

Figure 11. Comparative risk mapping for public health externalities.

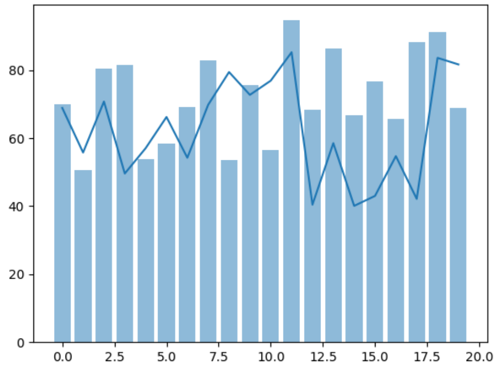

Figure 12. Synthesis of welfare, environmental, and ethical performance metrics.

DISCUSSION

This type of results can be critically evaluated to establish a less intuitive view of the ethical character of animal cloning to commercial breeding in the meat industry that goes beyond the naive aspect of productivity (Ohasi et al., 2024). Even more so, intensive farming systems, which may imply the technologies of cloning, may be economic rivals as has been proven in several studies. Nevertheless, it is most often done at the expense of animal welfare and health that can lead to additional stress and other health issues (Kurtoglu and Gunes, 2025, p. 2837). In addition, such systems do not put into consideration pain of farmed animals that is ethically significant aspect of animal production that should be studied more carefully (Krattenmacher et al., 2025, p. 5). Such decisions are preconditioned by the economic issues and the demand of consumers of meat that would be cheap and bring about the corresponding ethical questions concerning the morality of animals and human duty to them as a part of the food chain (Kirsch et al., 2023, p. 4). Instead, it has proposed the local food system and small-scale farming as a more intuitive solution to some of these ethical concerns by making the cattle happier and healthier, which would leave behind some of these ethical concerns (Rebezov et al., 2024, p. 529). However, the problem of extending these substitute models, following the global sources of proteins, is highly challenging and more energy must be put into the direction of the hybrid models as the ones that introduce the problem of welfare to the larger operation structures. The precision livestock farming controversy reveals that the new technology is largely process-based and they do not necessarily consider the larger social and moral questions as to the welfare of the animals and the environment (Guzhva et al., 2021, p. 10). It is expressed in the design of technologies that constantly monitor the health and well-being of the animals without fully dealing with the ethical problem that may be always controlling and stressing on the animals that the systems create (Tadeschi et al., 2025, p. 7). The technologies would be capable of assisting the farmers in doing more and detecting any health issues in their initial phases, albeit they would also trigger the emergence of ethical issues, objectifying animals and pushing the farming practices to the next level (Schillings et al., 2021a, p. 3, 2021b). The technological orientation is not necessarily coupled with the appropriate understanding of social or moral outcomes and often serves empty generalisations of how to make some positive shifts to welfare which are not definite relations to practical goods to animals or human customers (Siegford & Guzhva, 2021, p. 2). This laxity puts the necessity of making ethical and social issues pertinent to the design and introduction process of the new technologies into the livestock sector squarely, not as the fringe benefits (Neethiramjian, 2023; Siegford and Guzhva, 2021, p. 1). To achieve success in overcoming these ethical issues, precision livestock farming must be capable of responding to ethical issues of using technology on sentient living beings which often are mammals, birds, and even fish, which can be demonstrated by the popular opinion and scientific studies (Guzhva et al., 2021, p. 2). The specified assimilation requires both deliberate purchasing of social context and technology processes and outputs instead of technical interventions to advance responsible innovation (Guzhva et al., 2021, p. 1). This solution must be interdisciplinary to develop effective solutions by considering the abundance of solutions of the effects of multi-faceted agricultural practices on animals, farmers, and society in general (Guzhva et al., 2021, p. 10). It involves an active involvement of the ethical schemes during an early stage of developing new technologies. On the example of Precision Livestock Farming, it will need to be developed with sufficient knowledge of the impact that it will produce in the society and animal welfare, rather than enabling more efficient production (Guzhva et al., 2021, p. 2; Schillings et al., 2021). It is deeper in the moral aspects of the set-up of such technologies in the first place in which it is felt that we are able to reshape the relationship between humans and animals and the longevity of farming in general (Guzhva et al., 2021, p. 10; Neethiryakan, 2023). In addition, the appearance of the technology of precision livestock farming assumes that the role of the stakeholder will be regarded with care, the technological claims will be explained, and the development of clear ethical rules will be carried out to ensure they will be applied responsibly and will not cause unexpected harmful outcomes on the animal wellbeing and liberty of the farmers (Schillings et al., 2021, p. 3). Such extensive integration of the moral and social aspects of the precision livestock farming is needed to achieve significant practical consequences on the ethical front side and to ensure technological construction is correlated to the social objectives and requirements of the animal welfare (Siegford and Guzhva, 2021, p. 1). The proactive strategy also cannot be overlooked as it should prevent the adverse consequences, which occur unpredictably, like the stress of animals in terms of constant monitoring, and ensure the fact that the innovations are truly directed to the enhancement of the animal welfare and not to the most effective productivity

(Tadeschi et al., 2025, p. 23). Teachers, in turn, should be also trained on the way to anticipate the practical application and morality outside of the technological problems in the nearest future (Siegford & Guzhva, 2021, p. 2).

CONCLUSION

The ethics of animal meat industry was critically reviewed in this paper by the combination of empirical research and normative ethics. Based on the findings, the livestock systems with assistance of cloning may result in the large increase in productivity efficiency, stability of output and in various aspects the provisional reduction in the acute morbidity of animals. However, such benefits come with massive ethical costs that are magnified with wellbeing, ecological integrity and governance are not taken into account but as a whole. The findings indicate that exaggerated efficiency of things is generally associated with exaggerated dispositions of chronic stress, genetic homogenisation and systemic vulnerability to illness. This has negative impacts on the livelihood of the animals and the environmental sustainability. Besides, the aggregate output of the ethical performance are such that, when productivity and efficiency are utilized in a utilitarian fashion, this is not mimicked in the identical degree of the utilitarian measures which are founded on recognition or fairness. Rather, the cloning technologies will tend to supplement an instrumental knowledge about the animal life giving more emphasis to the possibilities of controllability and standardisation rather than on the intrinsic value and agency of living organisms. The evidence also articulates the fact that the environmental efficiencies that are gained by the cloning process is in most instances relative and it is no longer absolute and ecological pressures are accumulating, as the systems accumulate. The lessons in the governance study are that ethical responsibility is normally relegated as opposed to pursued and that one may challenge the absence of due legitimacy, inclusion and unfair allocation of risks and benefits to human and non-human stakeholders. When all these findings are put together, this makes it possible to believe in an idea that animal cloning is not ethically justifiable simply because it is rather productive or helpful to the animals. One will require a complete set of ethical values such as the concepts of eco-republicanship of non-domination, sovereignty and ecological responsibility to take into account the biotechnological changes in food systems. Unless such a framework exists, cloning can be used to continue to expand moral blindnesses already present with regards to industrial animal farming as opposed to addressing the ethical questions that underlie industrial animal farming.

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