

Economics of Animal Welfare: opportunities and challenges in an evolving market

Ortiz-Heredia, María A.¹; González-Lozano, Miguel²; Ortega-Cerrilla, María E.¹; Bárcena-Gama, José R.¹; Rogers-Montoya, Nathaniel A.³; Domínguez-Olvera, Daniel A.^{3*}

¹ Posgrado en Recursos Genéticos y Productividad-Ganadería. Colegio de Postgraduados, Campus Montecillo, Montecillo, Texcoco, Estado de México, México. C.P. 56264.

² Centro de Enseñanza, Investigación y Extensión en Producción Porcina, Facultad de Medicina Veterinaria y Zootecnia, Universidad Nacional Autónoma de México. Jilotepec, Estado de México. México. C.P. 54240.

³ Departamento de Genética y Bioestadística, Facultad de Medicina Veterinaria y Zootecnia, Universidad Nacional Autónoma de México. Ciudad Universitaria, Colonia C.U., Coyoacán, Ciudad de México, México. C.P. 04510.

* Correspondence: iazdalonso@gmail.com

ABSTRACT

Objective: This review article examines the economic benefits of animal welfare, focusing on how welfare-friendly practices can improve production efficiency and open new market opportunities.

Design/Methodology/Approach: The review draws on a critical analysis of existing literature on animal welfare and its economic impact, considering both the direct and indirect benefits of these practices.

Results: The findings show that animal welfare enhances product quality, lowers long-term costs, and offers competitive advantages in a market increasingly concerned with animal ethics. Effective management also helps prevent economic losses by maximizing the production system's potential.

Limitations of the Study/Implications: Although implementing animal welfare practices may require upfront investments in infrastructure and management, the long-term benefits include greater profitability and access to new markets. Distinguishing between direct and indirect benefits is therefore essential to maximizing economic returns.

Findings/Conclusions: Prioritizing animal welfare is not only a moral responsibility but also provides significant economic and social benefits. Embedding animal welfare into agricultural strategies can foster a more sustainable and prosperous future for all stakeholders.

Keywords: Animal welfare, livestock sustainability, profitability.

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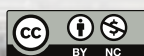
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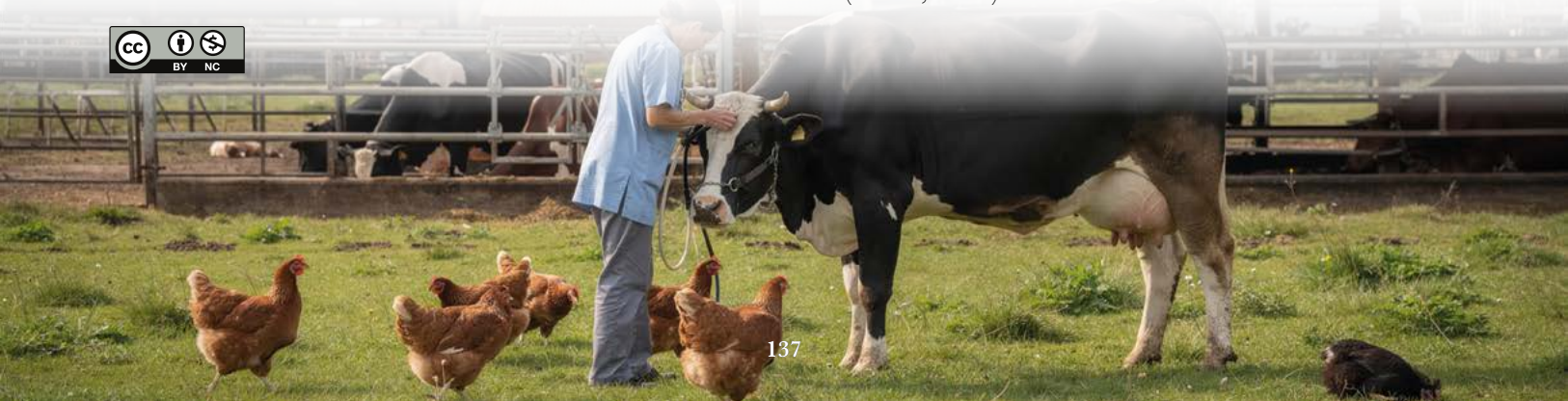
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INTRODUCTION

Animal welfare is the state in which an animal adapts to and copes with its physical and social environment, integrating its physical and mental condition across living and dying circumstances, thus enabling a quality-of-life assessment from the animal's perspective (Hernández & Martínez, 2020; García & López, 2018). This perspective recognizes that even under similar circumstances, individuals may experience different levels of well-being due to internal and external factors (Smith, 2019).



Stress, understood as the organism's adaptive response to environmental challenges, can aid adaptation and survival. However, when excessive or prolonged, it undermines animal welfare (Hernández & Martínez, 2020). The concept has since broadened into an integrated framework that also addresses social, economic, and sustainability dimensions, known as One Welfare (Mellor *et al.*, 2020). Animal welfare assessment was historically guided by the "Five Freedoms," though these have been found to sometimes conflict and offer limited measurability. Today, the "Five Domains" model is the preferred framework, providing an objective, science-based evaluation of nutrition, environment, health, behavior, and mental state (Mellor *et al.*, 2020; Mellor & Beausoleil, 2015). Economic factors are also significant, as animal welfare influences productivity and the market value of animal products, yet a purely utilitarian view is discouraged (Fraser, 2008).

Legally, some countries now recognize animals as sentient beings with rights, highlighting welfare as an intrinsic value rather than solely an economic consideration (Cicardini-Milla, 2022). Welfare is assessed using both direct indicators (physiological and behavioral) and environment-based measures, with a clear understanding of each species' normal behavior being essential (Whay *et al.*, 2003).

While ethical, legal, and scientific consensus is spreading around the welfare of food animals, adoption remains varied across livestock systems because the benefits of welfare improvements generally require upfront investments and recurrent management costs, whereas their economic returns are uncertain, shared by multiple actors and are conditioned by verification and governance devices. This generates a well-defined economic challenge in which producers and intermediaries must determine the if, when, and how of welfare investment under incomplete information, heterogeneous willingness-to-adopt and changing enforcement. In this context, it is important to be aware of the most relevant economic channels through which animal-friendly practices impact: (1) production-related results (health, losses and productivity; and product quality) and (2) indirect market outcomes (price premiums, market access, reputational risk, and regulatory compliance). This review hypothesizes that welfare investments are most likely to generate positive net returns when efficiency gains and market rewards together outweigh incremental costs. By integrating available evidence into a unified economic frame, the article addresses a gap in the animal welfare literature, which is often rich in ethical and biological arguments but less explicit about decision-relevant economic mechanisms and the conditions under which welfare becomes a competitive strategy in livestock systems.

MATERIAL AND METHODS

A narrative review was conducted, gathering literature about animal welfare and its economic consequences from the official sources and peer-reviewed articles. Provision of outputs was structured under a decision-focused framework that separates direct channels either enhancing animal health, loss avoidance, productivity or product quality from indirect ones (price premium, market access, reputational risk and regulatory compliance). It was organized in thematic sections reflecting mechanisms, from a conceptual foundation to economic outcomes.

Animal welfare as a key pillar of market dynamics

Evidence

Animal welfare is a fundamental concept, referring to the fulfillment of animals' basic needs, which must be met without exception. Understanding its economic relevance requires defining the market as the exchange of goods and services between different entities. As Herrera (2013) notes, market research aims to gather information that supports decision-making and guides long-term planning. In this context, it is essential to explore how animal welfare can address specific needs in different scenarios and how these opportunities may contribute to economic advantage.

The animal welfare market shows strong growth potential, driven by increasing public awareness of ethical animal treatment and rising demand for products that meet high welfare standards. This trend offers producers and marketers the opportunity to adapt their practices and products to align with consumer expectations, as animal welfare becomes a progressively more important factor in purchasing decisions (Cicardini-Milla, 2022). Moreover, implementing regulations that promote animal welfare can yield economic benefits for both producers and consumers by enhancing product quality and fostering sustainable practices (Broom, 2011).

In Mexico, animal welfare legislation exists but is poorly enforced. For instance, the Official Mexican Standard NOM-045-ZOO-1995 sets zoosanitary requirements for handling animals in markets, yet many operate in violation of these rules (FMVZ-UNAM, 2021). Inadequate infrastructure in such markets undermines animal welfare and poses a public health risk due to the sale of animals under unsuitable sanitary conditions.

Initiatives led by institutions such as SENASICA and UNAM have proven effective in improving market conditions. Training programs and the dissemination of animal welfare regulations have brought about significant changes in vendor behavior (FMVZ-UNAM, 2021). Nevertheless, sustained efforts are vital to consolidate these gains and prevent a relapse into harmful practices.

Economic implications

Overall, the evidence suggests that animal welfare operates as a market attribute that shapes consumer demand, competitive positioning, and regulatory compliance. As demand for welfare certified products increases, producers face a combination of incentives and constraints that ultimately determine profitability and investment orientation. These include potential price premiums and improved market access, as well as the costs of infrastructure upgrades, staff training, and ongoing monitoring. Poor welfare can generate negative externalities, including public health risks and reputational damage, particularly where enforcement is weak, and it can limit the market's ability to capture surplus from welfare improvements. Conversely, where education and regulation strengthen compliance, welfare enhancement can generate economic returns through premiums linked to higher perceived quality, lower losses associated with poor handling, and greater consumer trust when institutional efforts are sustained.

Legal framework of animal welfare: challenges and opportunities for implementation

Evidence

In many countries, animal welfare legislation aims to align with the guidelines of the World Organization for Animal Health (OIE) while also reflecting earlier regulations, codes of good practice, technological innovations, and scientific progress (Huertas *et al.*, 2014). Morales and Morales (2017) describe laws that still classify animals as “things” as “archaic and regressive.” In recent years, however, growing public concern for animal welfare has begun to challenge legal frameworks that reduce animals to mere property (Brels, 2012; Morales and Morales, 2017).

Although Mexico’s animal welfare regulations date back to 1940, Morales and Morales (2017) argue that public policies have fallen short of adequately protecting domestic species. In response, several states have enacted specific laws to prevent animal cruelty and ensure humane treatment. These regulations promote responsible ownership and impose administrative penalties for violations (Ambrosio-Morales, 2017).

The 2007 Federal Animal Health Law marked a milestone in Mexico’s animal welfare legislation by setting standards for the treatment of animals raised for livestock production. However, its implementation is hindered by the lack of effective enforcement mechanisms and adequate public policies (Morales & Morales, 2017). While regulations exist to ensure the humane treatment of animals for human consumption, they are frequently viewed as insufficient or unclear.

Effective enforcement of animal welfare standards is crucial. Current regulations impose stricter penalties, which can lead to financial losses for companies or imprisonment for offenders. However, the variation in state-level laws results in a confusing and fragmented enforcement landscape (Rivero-Sosa, 2017).

Economic implications

Producing and value chain actors face unambiguous economic incentives and risks in this legal environment. Higher penalties would in theory make the cost of non-compliance (expressed through fines, lawsuits or possible business interruptions) more costly while loose and poorly enforced rules reduce predictability required to be able to invest in welfare improvements. In these circumstances, the economic returns to welfare investment are influenced by not just on-farm costs but also regulatory predictability, level of enforcement, and capacity to convert compliance into market entry and reputational gains.

Consumer interest in animal welfare: a key driver of the sector’s economy

Evidence

Consumer interest in animal welfare has become a decisive factor in driving the adoption and continuation of practices that guarantee the ethical treatment of animals (Matas, 2013).

Consumers today can make informed choices about their food, selecting products such as free-range eggs or meat from humanely raised animals. However, the allowance of products with verified animal welfare standards remains limited (Lusk, 2011).

Studies indicate that consumers are willing to pay a premium for products that ensure animals are treated humanely and without cruelty (Matas, 2013; Huertas *et al.*, 2014; Moyano *et al.*, 2015). This willingness is driven both by inherent human empathy and by the belief that better animal welfare leads to higher-quality products (Moyano *et al.*, 2015).

Worldwide, demand for cruelty-free products is rising, fueled by international markets and regulations designed to uphold ethical production standards (Huertas *et al.*, 2014). In developed countries, consumers focus not only on price and food safety but also on production conditions, including the handling, transport, and slaughter of animals. In lower-income nations, meeting basic needs remains the priority; however, a growing segment of consumers is willing to pay a premium for products that guarantee humane animal treatment.

Economic implications

These trends suggest that animal welfare is becoming a marketplace attribute which could generate price premiums, build brand equity and open doors to regulated or premium market segments. Simultaneously, the small availability of substantiated welfare products indicates that there are supply side constraints (such as certification costs and monitoring, but also investment in welfare related infrastructure and management). With increased awareness, noncompliance will be economically relevant: not achieving welfare aspirations or benchmarks may lead to loss of consumer confidence and demand with follow-on revenue impact and reputational damage. Given such context, the profitability of welfare improvements relies on the trade-off between additional output and verification costs on the one hand and market returns -in terms of premiums offered or increased access to the market- and reduction in risk exposure within markets on the other.

Labeling and certification in the economics of animal welfare

Evidence

In developed nations, a well-established market for animal products has emerged, driven by consumer interest in animal welfare and the resulting adoption of stricter regulations.

In the Netherlands, initiatives have been introduced to establish high animal welfare standards, segmenting the market into three tiers: Conventional, meeting only the minimum legal requirements; Mid-Market, offering products that surpass conventional standards but fall short of organic; and Premium, encompassing organic products or those that meet the highest animal welfare criteria (Gocsik *et al.*, 2015).

Producers may determine their level of commitment to animal welfare, which entails complying with auditable standards and submitting to regular inspections. Some have gone further by installing surveillance cameras to support and streamline these processes (Lusk, 2011; Gocsik *et al.*, 2015).

In many countries, verification protocols are designed to be both accessible and flexible, encouraging producers to implement systems that promote animal welfare. However, once higher welfare standards are achieved, producers are expected to uphold them consistently. Despite progress, many countries offer no government incentives, and regulations are often seen as overly strict and rigid in enforcement. As a result, some producers resist adopting

animal welfare practices, particularly when added costs are not offset by higher sale prices. However, products meeting high animal welfare standards can command substantially different prices depending on certification level. Gocsik *et al.* (2015) note that the economic benefits linked to the highest welfare standards are significant.

Economic implications

This evidence suggests that animal welfare standards are promoting a differentiated market structure in which compliance and verification function as quality signals, enabling segmentation and price discrimination. These tiered systems allow producers to choose an adoption pathway that fits their cost structure and investment capacity. At the same time, audits and monitoring increase both fixed and variable costs related to certification, inspections, documentation, and, where relevant, surveillance technology. In the absence of public incentives, adopting welfare measures becomes a business decision. Uptake is more likely when price premiums, access to contracts, or reduced risk compensates for the added costs. Because certification premiums tend to rise with higher levels of compliance, the greatest potential rents lie at the top tiers, but realizing them depends on credible verification, sustained adherence to standards, and market conditions that translate welfare attributes into higher sale prices.

Infrastructure as a tool for animal welfare: economic implications

Evidence

Optimal facility design should ensure safety, functionality, and protection from environmental conditions (Grandin, 2008), while also minimizing social tension and stress (Lindberg, 2001). Space allowance refers to the area an individual needs to remain comfortable and free from social stress (Kido-Cruz *et al.*, 2022). Research shows that animal behavior and social hierarchy are highly influenced by housing conditions and space allowance (Kondo & Hurnik, 1990), which in turn impact many aspects of production and, ultimately, animal welfare (DeVries *et al.*, 2004; Landaeta-Hernández *et al.*, 2004).

Landaeta-Hernández and Drescher (2011) emphasize that facility design should prioritize animal welfare over purely economic considerations. For pig production, studies show that retrofitting existing facilities can cost 25% to 45% more than constructing them initially with suitable design and infrastructure.

Economic implications

Designing facilities that provide adequate space allowance not only enhances animal welfare but also delivers long-term economic gains. Landaeta-Hernández (2011) reports that providing animals with more space enhances their health and overall welfare, leading to higher productivity and improved product quality. For instance, Lee *et al.* (2012) compared steers housed at 8 m² and 32 m², finding that increased space boosted average daily gain (ADG) and rib eye area (REA). Animals in optimal conditions are less susceptible to stress and disease, lowering veterinary costs and minimizing losses from mortality or poor performance (Arrebola *et al.*, 2014). Thus, investing in well-designed facilities is both

an ethical commitment to animal welfare and a sound financial strategy that can improve profitability for producers.

Economics of animal transport: costs, benefits, and welfare opportunities

Evidence

Rising market demand has driven up production costs linked to animal transport, particularly for long-distance journeys. Inefficient transport can cause 26% to 76% losses, depending on the species, and is further exacerbated by poor ventilation and road accidents. Such accidents often stem from extended work hours, inadequate routes, and corporate pressure to meet demanding delivery targets (Miranda-de la Lama, 2013).

Implementing robust tools and protocols to reduce physiological stress during pre-slaughter handling and transport is critical. Pre-slaughter stress, often underestimated, has a substantial impact on animal welfare and on final product quality.

Quantifying transport costs is challenging, but effective management can cut them by up to 25% when key factors are addressed, such as: proper handling at origin, reasonable travel times, appropriate vehicles, trained staff, suitable loading densities, and optimal routes (Miranda-de la Lama, 2013). Accordingly, investing in transport improvements is crucial to ensure animal welfare and enhance sector profitability.

Pre-slaughter transport stress is a key driver affecting animal welfare and profitability in the meat sector. Recent evidence shows the resulting economic losses are measurable and multifaceted, degrading meat quality and reducing slaughterhouse efficiency.

DFD (dark, firm, dry) meat, caused by pre-slaughter glycogen depletion, can reduce carcass value by up to 30% (Miranda-de la Lama *et al.*, 2017). In cattle, average losses are about \$88.58 per carcass, with prevalence reaching 47.63% in some Mexican plants. Transport-related trauma also leads to condemnations costing roughly USD 146 per animal in South American systems, largely due to overloaded vehicles, slippery floors, and aggressive handling with electric prods (Temple *et al.*, 2016).

Transport mortality varies by region —0.03 to 0.5% in Europe for trips under 8 h— but under extreme conditions total losses can reach 20%. Additional losses arise from pre-slaughter liveweight loss due to dehydration (5-8% in heifers) and from bruising that reduces carcass yield. These risks intensify on long journeys (>12 h), where fasting and commingling unfamiliar groups heighten physiological stress (González-Rivas *et al.*, 2020). Miranda-de la Lama *et al.* (2017) present a logistics optimization model that can cut costs by 25% by:

- setting appropriate loading densities (0.7–1.7 m²/animal) to reduce slips and injuries.
- training staff in low-stress, non-aversive handling to limit the use of electric prods.
- upgrading vehicle design, with non-slip flooring and forced ventilation to stabilize in-vehicle temperature.

These measures maintain meat quality by keeping final pH within 5.4-5.8 and preserving water-holding capacity, thereby minimizing postmortem drip loss.

Economic implications

This evidence indicates that transport is both a welfare sensitive stage and a major cost center, where preventable stress and injury translate into measurable economic losses through reduced carcass value, condemnations, mortality, dehydration related shrink, bruising, and lower slaughterhouse efficiency. Because these losses tend to be concentrated in long distance journeys and are amplified by operational factors such as routing, loading density, vehicle condition, and handling practices, targeted improvements in transport management can generate high returns. In particular, measures that reduce stress and trauma are likely to pay off through lower losses and more consistent meat quality, while logistics optimization and staff training can reduce costs and strengthen compliance with welfare expectations, improving profitability across the value chain.

Animal welfare and product quality: a sustainable economic relationship

Evidence

Animal stress markedly degrades meat quality, altering physical and sensory attributes. Stress-driven hormonal shifts; especially around handling and pre-slaughter, can result in PSE (pale, soft, exudative) or DFD meat, depending on species and circumstances (Rodríguez-Calleja *et al.*, 2005; Barbut *et al.*, 2008).

These effects impair meat appearance, shorten shelf life, and increase susceptibility to bacterial contamination (Eikelenboom *et al.*, 1990).

DFD meat has lower market value because consumers link its color to poor quality. On the other hand, PSE meat often shows off-odors and higher cook loss, leading to substantial economic losses (O'Neill *et al.*, 2003). Thus, effective pre-slaughter stress management is essential to ensure meat quality.

Injuries incurred during loading, transport, and unloading can seriously compromise meat quality. Common injuries, such as bruises, fractures, and muscle tear, stem from the physical and psychological stress animals undergo at these stages (Pérez *et al.*, 1999).

Bruises (hematomas) are blood accumulations from ruptured capillaries that make meat unfit for consumption and subject to condemnation (Paramio, 2000). Wounds also promote bacterial growth and hasten spoilage (Arrebola *et al.*, 2014). Evidence shows that poor transport conditions markedly raise bruising-related condemnations, degrading product quality and driving substantial economic losses for producers (Godoy *et al.*, 1986; Eikelenboom *et al.*, 1990).

Hides are valuable by-products, but they are easily damaged by poor handling along the chain, both pre- and post-slaughter (Acero, 2009). Improving transport welfare and adopting proper handling practices increases hide value and reduces losses; mistreatment degrades not only hides but also the overall quality of meat products (Acero, 2009; Arrebola *et al.*, 2014).

Stress and mishandling can cause bruising and tissue damage, lowering market value and driving substantial losses for producers (Godoy *et al.*, 1986; Eikelenboom *et al.*, 1990). Prioritizing animal welfare is therefore essential; not only on ethical grounds, but because it improves product quality and profitability.

Animal mistreatment directly undermines the quality of animal-derived products. Prioritizing profit over welfare harms animal health and, in turn, reduces the quality of meat and by-products. The consequences are both ethical and economic: low-quality outputs translate into substantial losses for the industry (Télez, 2022; CIWF, 2021).

Economic implications

Taken together, these data show that stress and mishandling generate financial losses at multiple points in the chain through reinforcing pathways. These include carcass downgrading, such as PSE or DFD, shorter shelf life and higher contamination risk, condemnations due to bruising and wounds, and the loss of value in co-products such as hides. Because these losses occur at identifiable stages, including the farm, transport, and handling, welfare-oriented management functions as a practical quality assurance tool that protects revenue and reduces waste. Accordingly, investments in low-stress handling, improved transport conditions, and effective preslaughter stress control can increase profitability by preserving product quality, raising the share of saleable output, and maintaining the value of by-products.

How welfare practices affect income

Evidence

Poor animal welfare leads to production losses such as: lower performance, reduced by-product quality, animal injury and mortality, and inefficient resource use; and can even constitute a criminal offense.

Economic implications

Consequently, investing in animal welfare can generate revenue through multiple channels. Adopting robust welfare practices can reduce avoidable losses and improve productivity; low-stress handling enhances by-product quality and overall system efficiency, translating into greater revenue (Acero, 2009; Arrebola *et al.*, 2014). Humane, ethical handling also helps secure production by safeguarding quality and reducing the risk of condemnation and other losses that directly impact revenue, while consistent quality can strengthen consumer loyalty and producer reputation (Télez, 2022). In addition, prioritizing animal welfare can expand access to new markets by attracting buyers who value ethically produced goods, enabling premium pricing and strengthening competitiveness in domestic and export contexts (FAO, 2023). Overall, animal welfare is both an ethical imperative and a sound economic strategy, as welfare-focused practices can enhance profitability and support the long-term sustainability of livestock operations.

Animal welfare: a strategy for sustainable production

Evidence

Animal welfare is a pillar of modern livestock production, with benefits that extend well beyond regulatory compliance. In many countries, legal recognition and protection of animals are expanding, reinforcing the state's duty to safeguard animal rights for future generations (Rivero-Sosa, 2017).

Globally, animal-protection movements have driven the adoption of welfare standards and regulations. Beyond the ethical case, these advances open access to domestic and international markets for producers.

The rising concern of consumers for ethical animal treatment shapes their purchasing decisions and enhances producers' reputations (Infortambo Andina, 2022). Animal welfare also delivers economic gains: adopting good practices improves efficiency and product quality. Proper handling during transport and slaughter elevates meat and by-product quality, strengthening market competitiveness (OMSA, 2024).

Economic implications

Investing in animal welfare is therefore both an ethical imperative and a sound economic strategy that benefits animals and producers alike. Aside from the ethical argument, such developments can provide producers with access to national and international markets. Key advantages include lower disease pressure due to reduced illness and less veterinary intervention, increased product quality through improved handling, better market access via improved sentinel measures compared with current standards and more consumer confidence as welfare enters more buying decisions. And in general, increasing the productive potential of any production system either raises productivity or leads to economic gains. Animal welfare is a moral and financial imperative. If we invest in animal welfare.

Economic balance: direct and indirect production benefits

At first glance, animal welfare may not appear to yield direct profits, yet it is crucial for production efficiency and market access (see Table 1). As Forbuena-Borrás (2017) notes, it helps to distinguish between direct and indirect gains. The direct gains include cost reductions in the final product, since good handling prevents defective inputs, shortens processing, and, by speeding time to market, lowers mortality and morbidity, boosting profitability.

Indirect gains stem from better product quality: humane handling produces more uniform, higher-quality products. This adds value to processed goods: products from well-treated animals are typically of higher quality than those from stressed or mistreated animals (Forbuena-Borrás, 2017). Research also supports these findings; for example,

Table 1. Economic Impact of Improving Animal Welfare on Productivity.

Aspect	Economic impact	Reference
Meat product quality.	10-20% improvement and fewer defects.	OMSA (2024)
Disease burden.	15-30% lower veterinary costs with better management.	Huertas <i>et al.</i> (2021)
Productivity.	Up to 25% more piglets per sow per year under improved welfare.	Jääskeläinen <i>et al.</i> (2014)
Worker safety.	Savings up to \$5,000 per facility/year from fewer injuries.	OMSA (2024)
Reproductive performance.	10-15% shorter inter-farrowing interval with good practices.	Jääskeläinen <i>et al.</i> (2014)
Premium markets.	15-30% higher prices for certified, welfare-standard products.	Agrovet Blog (2023)
Feed efficiency.	Up to 20% less feed per animal due to better health and lower stress.	OMSA (2024)
Social & environmental outcomes.	5-10% higher social acceptance and improved system sustainability.	OMSA (2024)

Romo-Valdez *et al.* (2021) found that cattle provided with an appropriate environment and adequate space allowance achieve superior growth and performance, reducing operating costs and boosting productivity.

Enhancing logistics and transport conditions can cut operating costs by up to 25% (Miranda-de la Lama *et al.*, 2019). Preventive health programs further reduce veterinary spending by 30-40% (Sánchez Rodríguez Castillo, 2023).

Animal welfare reduces stress and disease, lowering veterinary costs and boosting production efficiency. From a market standpoint, meeting welfare standards strengthens public trust and opens access to domestic and international markets.

Rising demand for ethical, sustainable goods is leading consumers to favor products that ensure humane animal treatment (OMSA, 2024).

CONCLUSIONS

This review is distinctive in that it integrates ethical considerations and welfare outcomes within an explicit economic theory framework. It clarifies the mechanisms through which welfare interventions affect performance by separating direct production impacts, such as productivity gains and loss reduction, from indirect market and governance effects, such as reputational risk, market access, and regulatory compliance. Welfare investment becomes economically efficient when verification is credible and enforcement is predictable, allowing compliance to translate into measurable financial returns. Under these conditions, animal welfare programs are not only ethically justified but also economically compelling, improving operational efficiency, product quality, and consumer trust, and thereby strengthening competitive positioning. Strategically targeted investments in infrastructure and transport can further reduce avoidable losses, lower costs, and raise rates of return. As demand for humane practices continues to grow, producers that adopt these measures are better positioned to contribute to public welfare and to remain viable in an increasingly competitive marketplace, with animal welfare becoming a core element of long-term agricultural strategy.

REFERENCES

- Acero Adámed, P. (2009). Planificación y manejo de la explotación de vacuno de carne (Tomo II). Colección Prácticas Agropecuarias. Consejería de agricultura y ganadería. https://d1wqtxts1xzle7.cloudfront.net/34385273/VACUNO_CARNEop-libre.pdf
- Alende, M. (2011). Bienestar animal y reducción del estrés en el feedlot. Estación Experimental Agropecuaria Anguil, La Pampa. https://www.produccion-animal.com.ar/informacion_tecnica/invernada_o_engorde_a_corral_o_feedlot/96-Bienestar.pdf
- Ambrosio Morales, M. T. (2017). El maltrato y la crueldad contra los animales: Su importancia desde la perspectiva de la criminología. En M. T. Ambrosio Morales & M. Anglés Hernández (Eds.), *La protección jurídica de los animales* (pp. faltantes). Instituto de Investigaciones Jurídicas, Universidad Nacional Autónoma de México.
- Arrebola Molina, F. A., Elías Ordoñez, M., & Yruela Morillo, M. (2014). Bienestar animal en explotaciones porcinas. Junta de Andalucía. Consejería de Agricultura, Pesca y Desarrollo Rural. <https://www.juntadeandalucia.es/servicios/publicaciones/detalle/77764.html>
- Arrebola, M. (2014). Impact of transport stress on meat quality. *Meat Science*. <https://doi.org/10.1016/j.meatsci.2014.03.002>
- Barbut, S., Sosnicki, A. A., Lonergan, S. M., Knapp, T., Ciobanu, D. C., Gatcliffe, L., & Wilson, E. W. (2008). Progress in reducing the pale, soft and exudative (PSE) problem in pork and poultry meat. *Meat Science*, 79(1), 46-63. <https://doi.org/10.1016/j.meatsci.2007.07.031>

- Bennett, R. (1998). Investigando los estilos musicales. Akal.
- Brels, S. (2012). Tendencias actuales en bienestar animal. *Revista de Protección Animal*, 5(1), 23-30.
- Brels, S. (2012). La protección del bienestar animal: Una preocupación universal que se debe considerar globalmente y seriamente en derecho internacional. *Derecho Animal. Forum of Animal Law Studies*, 3(2), 1-6. <https://doi.org/10.5565/rev/da.178>
- Broom, D. M. (2011). Animal welfare: An old and new concept. *Journal of Animal Science*, 89(3), 1-10.
- Broom, D. M. (2011). Bienestar animal: Conceptos, métodos de estudio e indicadores. *Revista Colombiana de Ciencias Pecuarias*, 24(3), 306-321. <https://www.redalyc.org/pdf/2950/295022382010.pdf>
- Cicardini Milla, D. (2022). Proyecto de ley “que modifica el código civil en relación a la categoría de cosas corporales muebles de los animales y los reconoce como seres sintientes” (Boletín 14993-12). Cámara de Diputadas y Diputados de Chile.
- Cicardini Milla, J. A. (2022). Bienestar animal y su impacto en la producción agrícola. *Revista Mexicana de Ciencias Pecuarias*, 13(1), 45-58.
- Compassion in World Farming (CIWF). (2021). Crueldad animal. Recuperado el 29 de enero de 2025, de <https://www.ciwf.es/campaigns/crueldad-animal/>
- DeVries, T., von Keyserlingk, M., & Weary, D. (2004). Effect of feeding space on the inter-cow distance, aggression, and feeding behavior of free-stall housed lactating dairy cows. *Journal of Dairy Science*, 87, 1432-1438. 10.3168/jds.S0022-0302(04)73293-2
- DeVries, T. J. (2004). The influence of space allowance on the behavior and welfare of cattle. *Applied Animal Behaviour Science*, 88(3-4), 277-290.
- Eikelenboom, G., Bolink, A. H., & Sybesma, W. (1991). Effects of feed withdrawal before delivery on pork quality and carcass yield. *Meat Science*, 29(1), 25-30. [https://doi.org/10.1016/0309-1740\(91\)90020-Q](https://doi.org/10.1016/0309-1740(91)90020-Q)
- Food and Agriculture Organization of the United Nations (FAO). (2023). Bienestar animal: Un enfoque para mejorar la producción sostenible. Recuperado el 29 de enero de 2025, de <https://www.fao.org/welfare-animal/en/>
- Facultad de Medicina Veterinaria y Zootecnia, Universidad Nacional Autónoma de México (FMVZ-UNAM). (2021). Participación de la Facultad de Medicina Veterinaria y Zootecnia en el bienestar animal. https://fmvz.unam.mx/fmvz/principal/archivos/Bienestar_animal_mercados_ganaderos.pdf
- Fombuena Borrás, V. (2017). Descripción de ventajas económicas directas e indirectas en la aplicación de ensayos no destructivos (END) en un proceso productivo. <http://hdl.handle.net/10251/82149>
- Forbuena Borrás, V. (2017). Ventajas económicas del bienestar animal. Recuperado de <https://www.agrovetmarket.com/beneficios-economicos-bienestar-animal>.
- Francés, M. J. P. (2010). La importancia de enseñar economía. *Pedagogía Magna*, (8), 134-138. <https://dialnet.unirioja.es/descarga/articulo/3628034.pdf>
- Gocsik, E., Henningsen, A., & Matzdorf, B. (2015). The impact of animal welfare on market outcomes: Evidence from the Netherlands. *Journal of Agricultural Economics*, 66(1), 1-20.
- Gocsik, É., Oude Lansink, A. G. J. M., Voermans, G., & Saatkamp, H. W. (2015). Economic feasibility of animal welfare improvements in Dutch intensive livestock production: A comparison between broiler, laying hen, and fattening pig sectors. *Livestock Science*, 182, 38-53.
- Godoy, M. (1986). Effects of transport duration on bruising in cattle. *Veterinary Record*. <https://doi.org/10.1136/vr.119.12.277> (Consultado el 29 de enero de 2025)
- González-Rivas, P. A. (2020). Effects of heat stress on animal physiology, metabolism, and meat quality: A review. *Meat Science*, 162, 108025. <https://doi.org/10.1016/j.meatsci.2019.108025>
- Grandin, T., & Deesing, M. (1998). Genetics and behavior during handling, restraint and herding. En T. Grandin (Ed.), *Genetics and the behavior of domestic animals* (pp. 113-144). Academic Press.
- Grandin, T. (2008). Improving animal welfare in beef slaughter plants: A review of the literature. *Journal of Animal Science*, 86(E-Suppl), E1-E11.
- Herrera, J. E. P. (2013). Investigación de mercado: Un enfoque práctico. *Revista Internacional de Marketing*, 5(2), 15-28.
- Herrera, J. E. P. (2013). ¿Cómo se hace una investigación de mercados?. En J. E. P. Herrera (Ed.), [investigación de mercados] (cap. 3, pp. 133-150). Ecoe Ediciones.
- Huertas, J., García, M., & López, R. (2014). Desarrollo y avance en la legislación sobre bienestar animal. *Revista Mexicana de Ciencias Veterinarias*, 12(3), 45-60.
- Huertas, S. M., Gallo, C., & Galindo, F. (2014). Motores de las políticas de bienestar animal en las Américas. *Revue Scientifique et Technique (Office International des Épizooties)*, 33(1), 55-66.
- Huertas, S., González, A., & Rodríguez, M. (2021). La importancia del bienestar animal en los sistemas de producción silvopastoriles y forestales. *Revista Ciencia Animal*, 12(2), 101-110.

- Infortambo Andina. (2022). Beneficios del bienestar animal. Recuperado de <https://infortamboandina.co/es/noticias/beneficios-del-bienestar-animal>
- Jääskeläinen, T., Kauppinen, T., Vesala, K.M., & Valros, A. (2014). Relationships between pig welfare, productivity and farmer disposition. *Animal Welfare*, 23(4), 435-443. <https://doi.org/10.7120/09627286.23.4.435>
- Kido-Cruz, M. T., Martínez-Castro, C. J., Zúñiga-Marroquín, T., & Cotera-Rivera, J. (2022). Estimación del bienestar animal del bovino lechero en trópico, mediante criterios de acondicionamiento ambiental. *Revista MVZ Córdoba*, 27(3), e2676. <https://doi.org/10.21897/rmvz.2676>
- Kondo, S., & Hurnik, J. F. (1990). Stabilization of social hierarchy in dairy cows. *Applied Animal Behaviour Science*, 27, 287-297. [https://doi.org/10.1016/0168-1591\(90\)90125-W](https://doi.org/10.1016/0168-1591(90)90125-W)
- Kondo, S., & Hurnik, J. F. (1990). Effects of space allowance on the behavior of pigs in a group housing system. *Applied Animal Behaviour Science*, 27(1), 51-62.
- Landaeta Hernández, A. J. (2012). Instalaciones, conducta y bienestar animal en vacunos tropicales. *Mundo Pecuario*, 8(2), 121-131. https://www.produccion-animal.com.ar/etologia_y_bienestar/bienestar_en_bovinos/61-instalaciones.pdf
- Landaeta-Hernández, A. J., & Drescher, M. (2011). Espacio vital en sistemas de producción animal: Implicaciones para el bienestar animal. *Revista Brasileira de Zootecnia*, 40(3), 561-568.
- Lee, C., Hales, K. E., & Shike, D. W. (2012). Effects of increased space allocation on performance and behavior of feedlot steers. *Journal of Animal Science*, 90(Suppl. 3), 506-507
- León Guzmán, M. (2006). El bienestar animal en las legislaciones de América Latina. *Ciencias Veterinarias*, 24(2), 185-221. <https://www.revistas.una.ac.cr/index.php/veterinaria/article/view/4784>
- Lusk, J. L. (2011). Consumer preferences for animal welfare: A review of the literature. *Agricultural and Resource Economics Review*, 40(1), 1-19.
- Lusk, J. L. (2011). Consumer preferences for animal welfare: A review of the literature. *Agricultural and Resource Economics Review*, 40(1), 1-19.
- María, G. A., Villarroel, M., Sañudo, C., Olleta, J. L., & Gebresenbet, G. (2003). Effect of transport time and ageing on aspects of beef quality. *Meat Science*, 65(4), 1335-1340. [https://doi.org/10.1016/S0309-1740\(03\)00054-8](https://doi.org/10.1016/S0309-1740(03)00054-8)
- Matas Obrequé, C. (2013). Segmentación de consumidores según su actitud frente al bienestar animal en Santiago y Viña del Mar. <https://repositorio.uchile.cl/handle/2250/131635>
- Matas, A. (2013). El impacto del bienestar animal en las decisiones del consumidor. *Revista de Estudios Sociales*, 45(2), 25-34.
- McInerney, J. P. (2004). Animal welfare, economics and policy: Report on a study undertaken for the Farm and Animal Health Economics Division of Defra. UK Department for Environment, Food and Rural Affairs (Defra). <https://webarchive.nationalarchives.gov.uk/ukgwa/20130123162956/http://archive.defra.gov.uk/evidence/economics/foodfarm/reports/documents/animalwelfare.pdf>
- Miranda-de la Lama, G. C. (2013). Transporte y logística pre-sacrificio. SciELO México. Recuperado de https://www.scielo.org.mx/scielo.php?script=sci_arttext&pid=S0301-50922013000100004
- Miranda-de la Lama, G. C. (2019). Pre-slaughter cattle welfare indicators for use in commercial abattoirs. *Animals*, 9(6), 383. <https://doi.org/10.3390/ani9060383>
- Miranda-de la Lama, G. C., Villarroel, M., María, G. A. (2017). Behavioural and physiological profiles following transport in cattle: A multivariate analysis. *Applied Animal Behaviour Science*, 189, 22-29. <https://doi.org/10.1016/j.applanim.2017.01.003>
- Miranda de la Lama, G. C. (2013). Transporte y logística presacrificio: Principios y tendencias en bienestar animal y su relación con la calidad de la carne. *Veterinaria México*, 44(1), 31-56.
- Morales García, A. D., Morales García, J. J. (2017a). Reformas a la legislación ambiental asociado al bienestar animal en México. *dA. Derecho Animal: Forum of Animal Law Studies*, 8(2), 10-21. <https://www.raco.cat/index.php/da/article/view/v8-n2-morales>
- Morales García, A. D., & Morales García, J. J. (2017b). Bienestar animal y legislación: El reto de los animales destinados al consumo humano en México. *dA. Derecho Animal: Forum of Animal Law Studies*, 8(3), 1-24. <https://raco.cat/index.php/da/article/view/349379>
- Morales, J., & Morales, A. (2017). La cosificación del animal en la legislación mexicana. *Revista Jurídica Mexicana*, 15(2), 78-89.
- Moyano Estrada, E., Castro, F., & Prieto Gómez, J. (2015). Bases sociales y políticas del bienestar animal en la Unión Europea. <http://hdl.handle.net/10261/155377>
- Moyano, R., Salinas, M., & González, J. (2015). Percepción del bienestar animal: Implicaciones para el consumo responsable. *Revista Internacional de Sociología*, 73(1), 23-45.
- O'Neill, D. J., Lynch, P. B., Troy, D. J., Buckley, D. J., & Kerry, J. P. (2003). Effects of PSE on the quality of cooked hams. *Meat Science*, 64(2), 113-118. [https://doi.org/10.1016/S0309-1740\(02\)00117-1](https://doi.org/10.1016/S0309-1740(02)00117-1)

- Organización Mundial de Sanidad Animal [OMSA]. (2024). Bienestar animal: un bien vital para un mundo más sostenible. Recuperado de <https://www.woah.org/app/uploads/2024/01/es-omsa-visionpaper-bienestaranimal.pdf>
- Paramio, T. (2000). Manejo y producción de porcino: Breve manual de aproximación a la empresa porcina para estudiantes de veterinaria. Universitat Autònoma de Barcelona, Facultat de Veterinària. <http://bvirtual.infoagro.hn/xmlui/bitstream/handle/123456789/865/manual%20porcino%20final.pdf?sequence=1>
- Pordomingo, A. J. (2005). Feedlot: Alimentación, diseño y manejo (No. 636.2085). Instituto Nacional de Tecnología Agropecuaria.
- Rivero Sosa, I. G. (2017). Enfoque ético y jurídico de la protección animal. En M. T. Ambrosio Morales & M. Anglés Hernández (Eds.), *La protección jurídica de los animales*. Instituto de Investigaciones Jurídicas, Universidad Nacional Autónoma de México.
- Rivero-Sosa, M. (2017). Desafíos en la aplicación del bienestar animal en México. *Revista de Derecho Animal*, 10(1), 12-25.
- Rivero-Sosa, M. (2017). La protección jurídica de los animales: Un análisis contemporáneo. Recuperado de https://www.scielo.org.mx/scielo.php?script=sci_arttext&pid=S0187-55092017000100003
- Rodríguez Castillo, M. F. (2023). Bienestar en la producción de ganado bovino de carne*. Repositorio UAAAN. http://repositorio.uaaan.mx:8080/xmlui/bitstream/handle/123456789/49417/MAR%C3%8DA%20FERNANDA%20RODR%C3%8DGUEZ%20CASTILLO_locked.pdf
- Rodríguez Calleja, J. M., García López, M. L., Santos, J. A., & Otero, A. (2005). Development of the aerobic spoilage flora of chilled rabbit meat. *Meat Science*, 70(2), 389-394.
- Romo-Valdez, A. (2021). Impacto del bienestar animal en la producción bovina. Recuperado de <https://www.ganaderia.com/destacado/Bienestar-animal-del-ganado-vacuno>
- Téllez, M. (2022). La explotación animal y sus implicaciones éticas. *Revista de Ética Animal*. <https://www.revistaeticaanimal.com/articulo/explotacion-animal-implicaciones-eticas> (Consultado el 29 de enero de 2025)
- Temple, D., Mainau, E., & Manteca, X. (2016). Welfare issues during transport of pigs to slaughter. *Porcine Health Management*, 2(1), 1-8. <https://doi.org/10.1186/s40813-016-0035-0>