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Research Report:

Preventive Animal Advocacy – Preventing the intensification of factory farming in LMICs

Author: James Che
Review: Vicky Cox, Sam Hilton, and Michael St. Jules.
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For questions about the content of this research, please contact James Che at james@charityentrepreneurship.com. For questions about the research process, please contact Sam Hilton at sam@charityentrepreneurship.com.

Executive summary

Factory farming, characterized by mass-scale, high-intensity production, is rapidly becoming the dominant animal agriculture system globally. Primarily driven by population growth, increased wealth, and urbanization, factory farming accounts for an estimated 70% of farmed vertebrates worldwide. Unsurprisingly, this industrialization of animal agriculture is not limited to developed countries; many lower and middle-income countries (LMICs) have embarked on a similar trajectory.

A recent report by the OECD and FAO estimates that the majority of growth in meat production in the next decade will occur in developing regions, accounting for 84% of the additional output. In the coming decade, poultry production in LMICs is forecasted to rise by ~15%, far outpacing the 4.8% increase expected in high-income countries (HICs). The trend toward more industrialized meat production systems as countries' wealth increases is well documented and appears near-universal.

Animal advocacy efforts have predominantly concentrated on HICs, leaving a significant opportunity to address animal welfare in LMICs. A charity focusing on preventing the intensification of factory farming in these regions could be highly cost-effective. By concentrating on preemptive action, such an organization could sidestep some of the challenges of reversing entrenched industrial practices and leapfrog path dependencies.

That said, the practicality of this endeavor presents its challenges. LMICs, with their acute concerns for food security, may pose significant obstacles. Yet, global case studies reveal a growing acknowledgment of animal welfare laws, suggesting the possibility of successful advocacy even under these circumstances.

Considering the rising demand for animal products, we recognize that entirely preventing a shift from extensive to semi-intensive farming in LMICs might be unrealistic. Nonetheless, we see a viable opportunity to influence the trajectory of animal farming practices away from the most intensive forms of factory farming. The aim would be to promote higher animal welfare standards without significantly impacting yield.

We have identified several strategies and policy asks for convincing policymakers. Particularly topical are arguments such as keeping up with Western standards to access their markets due to their stricter import laws and global health reasons for preventing zoonosis.

Our proposal has generated considerable excitement among experts, who point to the significant scale and neglectedness of the issue. There's a mixture of opinions on the best approaches, reflecting the relative lack of testing these strategies have undergone.

Our geographic assessment has identified several LMICs that could potentially be targeted, including Benin, Bangladesh, Ghana, Niger, and Ethiopia. While speculative, our cost-effectiveness estimates suggest that even preventing a moderate 10% shift to battery cages could yield significant welfare improvements, averaging 242 welfare points per dollar spent in the top 10 target countries. This high cost-effectiveness is partly helped by the lower salary costs of working in poorer countries.

Nevertheless, potential challenges abound. Finding local founders with the suitable skill set could be difficult, and fundraising might prove challenging given the relative lack of funding for preventive work in LMICs. Although EA Funds have expressed willingness to support African organizations, other more prominent donors have been more skeptical. Despite these potential obstacles, we believe the opportunity to influence animal welfare practices in LMICs is a compelling prospect deserving of serious consideration by prospective charity founders.

Ultimately, we decided against recommending this charity idea to entrepreneurs, mainly because we were uncertain about the tractability of influencing policymakers in LMICs on animal welfare issues due to the limited evidence of past successes and adequate legislation enforcement. Although the overall problem was convincing, we did not identify a convincing theory of change/ approach as robust as other interventions we looked at. We may revisit this idea if and when more evidence presents itself, especially in the tractability of LMIC political advocacy. And we would be interested in supporting existing advocacy groups, in part to gain more certainty around our tractability concerns.

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1 Introduction

This report has been produced by Charity Entrepreneurship (CE). CE's mission is to cause more effective charities to exist in the world by connecting talented individuals with high-impact intervention opportunities. We achieve this goal through an extensive research process and our Incubation Program. In 2023, our research process focused on Preventive Animal Advocacy.

Preventing the intensification of factory farming in LMICs was chosen by CE research staff as a potentially promising intervention within this category. This decision was part of a six-month process designed to identify interventions that were most likely to be high-impact avenues for future charity entrepreneurs. This process began by listing 365 ideas and gradually narrowing down, examining them in more and more depth.

In order to assess how promising interventions would be for future charity entrepreneurs, we use a variety of different decision tools such as group consensus decision-making, weighted factor models, cost-effectiveness analyses, quality of evidence assessments, case study analysis, and expert interviews.

This process was exploratory and rigorous, but not comprehensive – we did not research all 365 ideas in depth. As such, our decision not to take forward a charity idea to the point of writing a full report should not be seen as a view that the idea is not good.

2 Background

2.1 Cause area

The focus of our animal advocacy research this year is on interventions and policies that prevent future harm done to animals instead of solving current problems. We will be looking for interventions that, as well as having some short-run evidence of impact, will prevent future problems, i.e., have the biggest impact on farmed animals in the future, say 35 years from now.

At this stage, we are open to considering interventions and policies that lead to: i) a future where some animals live on farms with less suffering, ii) a future where some animal farming is significantly curtailed, iii) preventing a worse-case future where there is a huge growth of animal farming.

We are particularly keen to identify interventions that prevent the growth of farming (e.g., in LMICs, of new species, etc) as we see this as a likely future with a high moral weight.

2.2 The drivers of intensification

Over the past half century, drivers such as population growth, rising incomes, and urbanization have driven a sharp increase in meat consumption and a shift towards factory farming to meet demand. An estimated 70% of farmed animals are now raised in this system. Many LMICs have started industrializing their animal farming systems at pace and scale (FAIRR, 2016).

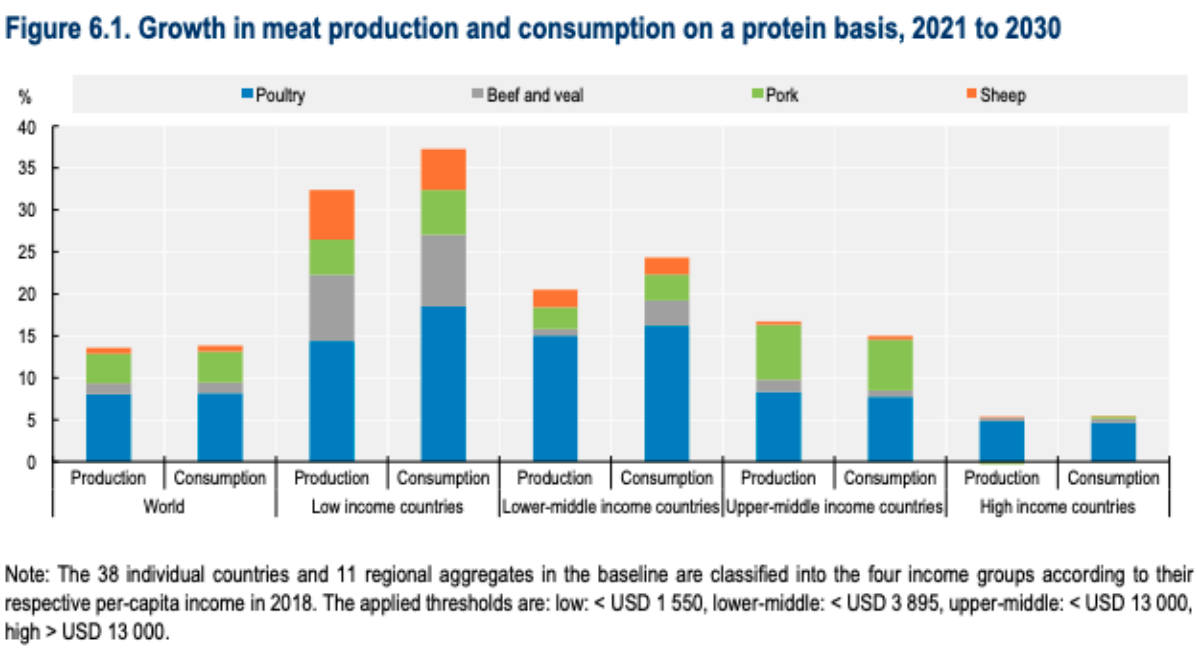


Figure 1: Growth in meat production and consumption by animal categories, 2021 to 2030 (OECD/FAO, 2021)

According to an OECD and FAO report, most meat production growth will occur in developing regions, accounting for 84% of the additional output (37 out of 44 metric tonnes; OECD/FAO, 2021). From 2021 to 2030, poultry production in LMICs is expected to increase by ~15% compared to 4.8% in HICs(OECD/FAO, 2021). On average, per-capita meat consumption increases as countries become wealthier and the meat production system becomes more industrialized (Blyth & Springlea, 2023). These drivers for intensification are verified by a study looking at data from 137 countries (Milford et al., 2019).

We have also modeled projected growth trends in production using available data and found some interesting and worrying findings. Some illustrative examples include:

- Bangladesh will overtake the US in the number of laying hens in the next six years
- Countries like Tanzania and Egypt will overtake the UK in number of laying hens in around 15 years, Kenya in around 20, Ghana and Ethiopia in around 30 years.

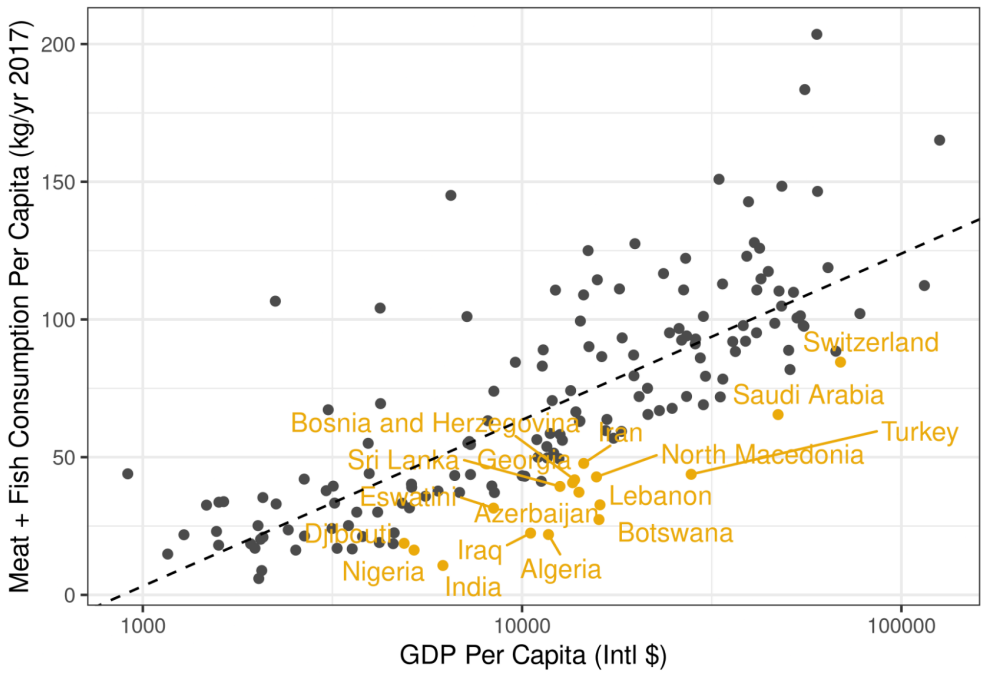


Figure 2: Economic growth of a country is highly correlated with increased animal product consumption. (Blyth & Springlea, 2023)

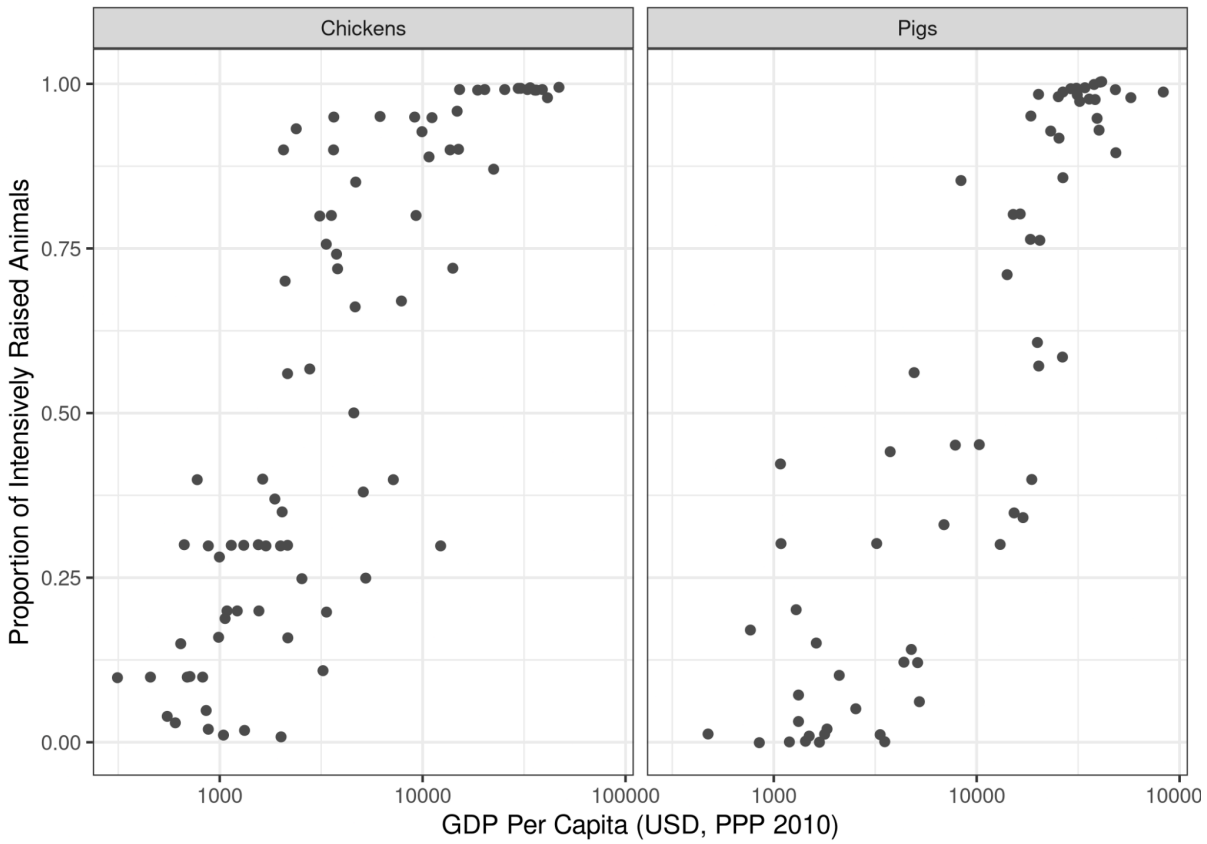


Figure 3: Economic growth of a country is highly correlated with more intensified farming practices. (Blyth & Springlea, 2023)

Importantly, this data shows variation in meat consumption and production trends across developing countries, suggesting that nations and people can become wealthier while minimizing animal harm (Blyth & Springlea, 2023).

Intensification

There is hardly any consensus behind the definitions often used when discussing factory farming. In Western countries, the meat industry has even used this to dispute that factory farming exists, as was the case during the counter-campaign of the Swiss ballot initiative to end factory farming (How I learned to love shrimp, 2023).

The intensification of animal agriculture describes how farming operations maximize output (like meat, milk, or eggs) per input unit (such as land, feed, or labor). Intensification is a spectrum ranging from extensive to intensive farming.

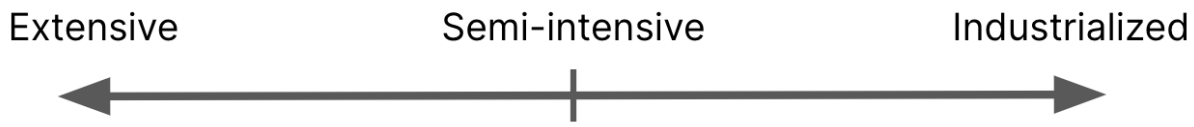


Figure 4: Spectrum of intensification

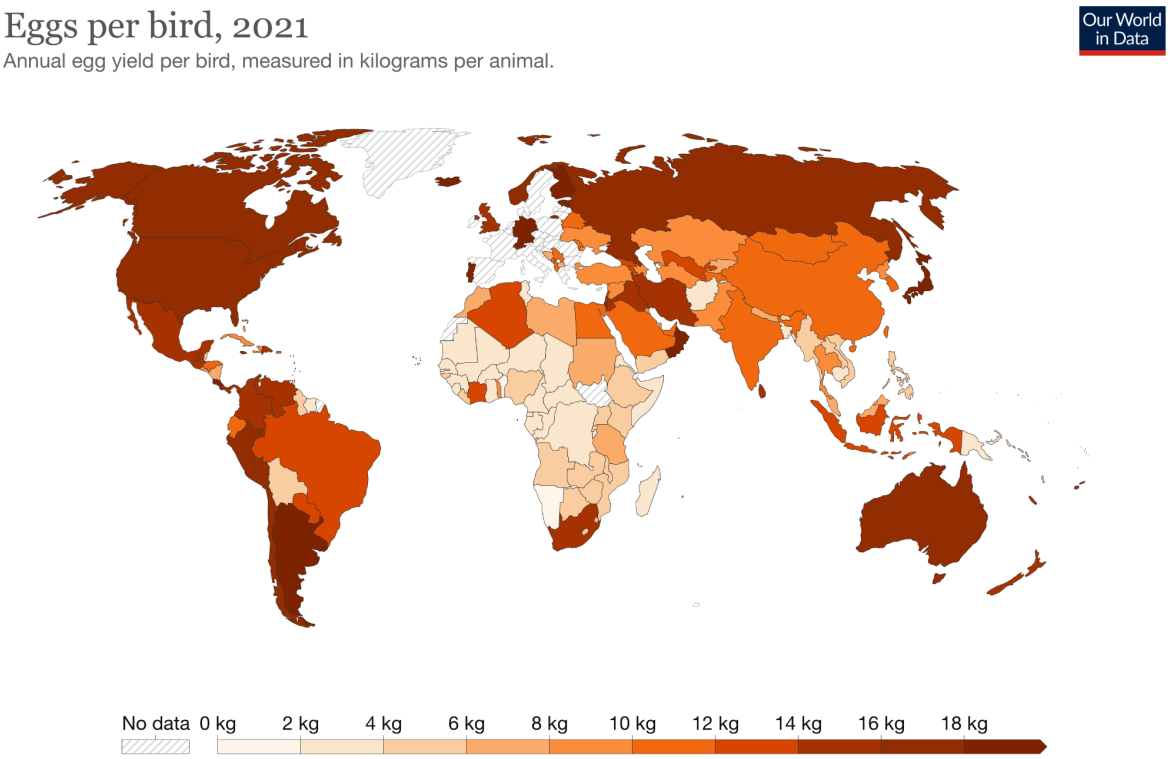
Extensive Farming: Animals are free-ranging, relying primarily on natural forage, with lower stocking densities. An example is pastoral grazing.

Semi-intensive Farming: A blend of extensive and intensive practices. Animals have outdoor access but also receive supplemental feed. Examples include free-range poultry farms.

Intensive Farming: Also known as factory or industrialized farming, animals are housed in confined spaces with highly controlled diets and high stocking densities, like in a broiler chicken operation.

Intensification in Sub-Saharan Africa

Most chickens in countries with below $3000-4000 GDP per capita are still primarily (>50%) extensively farmed (Gilbert et al.,2015). Although we don't have exact numbers regarding how many animals are caged or not, for example, using the yield of animal products as a proxy for intensification, it is clear that the majority of farming in Sub-Saharan Africa is still extensive and produces yields that are several-fold lower than high-income countries. However, this is expected to change rapidly in the next couple of decades.



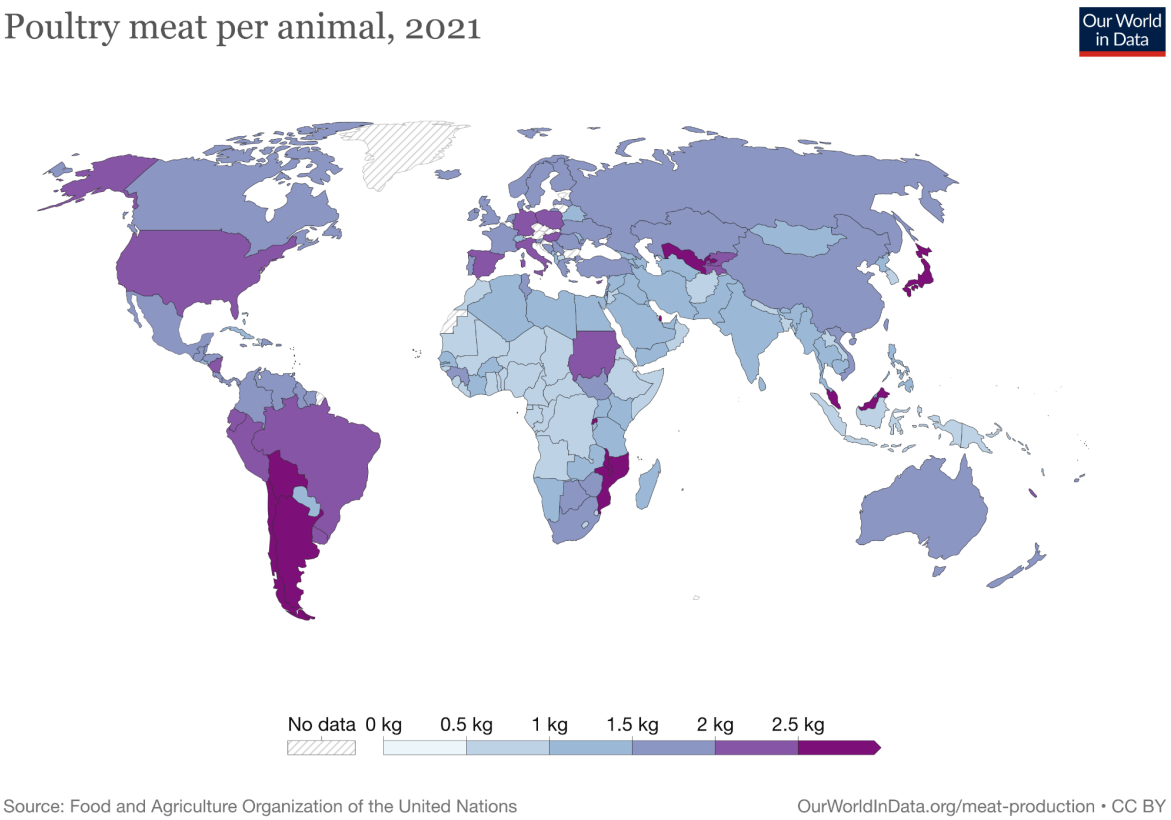


Figure 5: Yield for animal product (Eggs and Poultry meat) production for each country

2.3 The high-level case for and against working in LMICs

A common belief in the animal rights movement is that it is less valuable for actors to work in LMICs contexts. We expect Western actors' and funders' keenness to drive this focus to work in or give money to the countries they are most familiar with. But this focus is also justified by the facts that:

- Policymakers' concern for Animal Welfare is lower
- Their concern for food security is more significant and more prevalent
- Most animals that are industrially reared are reared in high-income countries
- Most of the evidence for successes in the animal movement so far are from high-income countries
- HIC have better rates of enforcement

We recognize that the quality of evidence and tractability of engaging people might be lower than in HICs. However, we think the scale of such change could be massive, even within a single country, as there is the possibility of shaping the path of the animal agriculture sector early on in its development. Path dependency is a concept in economics and social science that refers to the idea that decisions, events, or outcomes we face today are primarily influenced by the decisions or events that have taken place in the past. Once a particular path is chosen, even if chosen randomly, it can become self-reinforcing due to various factors such as learning effects, coordination effects, and adaptive expectations. This can lead to "lock-in" effects where certain practices or technologies persist even when they are no longer the most efficient or beneficial simply because the costs of switching to something different are perceived to be too high.

In the context of animal welfare, HICs have already intensified, so in this scenario, path dependency refers to the social costs of switching back to less intensified farming considering large parts of the economy have already been shaped by the industry, including jobs, culture, perception, expectations of meat prices, the meat lobby and policymakers. It may be easier to prevent intensification from happening in the first place in HICs and avoid the worst forms of factory farming. In addition to cheaper operation costs due to lower salary costs, prevention in LMICs could be highly cost-effective.

Scope of a new charity

We think that it would be unrealistic for a charity to prevent these countries from moving from extensive farming to semi-intensive farming. However, we believe there's

a window of opportunity to shape the trajectory of agriculture away from the most intensive forms of factory farming and direct practices that have higher animal welfare while maintaining relatively high yields.

For this report, we use the World Bank's definition of LMICs, which encompasses Low-income Countries (<$1,135 GNI per capita), Lower Middle-Income countries ($1,136 and $4,465 GNI per capita), and Upper Middle-Income Countries ($4,466 and $13,845 GNI per capita). About 6.68 billion people live in LMICs, growing at about 0.9% per year, with GDP growing at an average of 3.5% per year. Because we are focused on countries that have not yet intensified, we focus on countries with <$5000 GNI per capita.

3 Theories of change

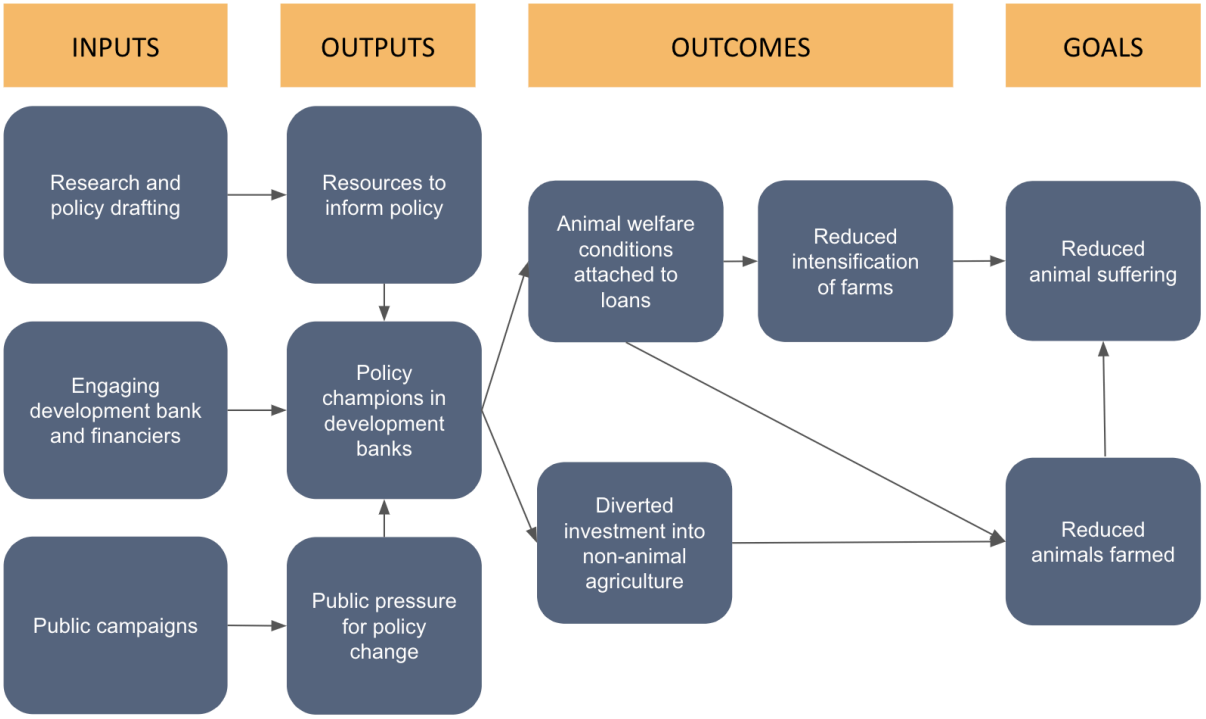
The global food system is an intricate web of interdependencies deeply rooted in our economies, societies, and ecosystems. Because animal welfare work in LMICs has been neglected, existing theories of change aimed at limiting factory farming and improving animal welfare have not been extensively tested or implemented, especially within LMICs. We have brainstormed multiple approaches that a new charity could take:

1. **Policy Advocacy:** Influence legislation to regulate or discourage factory farming, encouraging animal welfare standards and alternative farming incentives - we are prioritizing researching this idea in the rest of this report.
2. **Awareness and Education:** Stimulate consumer demand for humane or plant-based alternatives by raising awareness of factory farming's impacts - we deprioritized because we have skeptical priors surrounding the cost-effectiveness of awareness-raising campaigns.
3. **Corporate Engagement:** Convince corporations to adopt better animal welfare standards, impacting industry practices through partnerships or public campaigning - We deprioritized because this is, in many countries, less neglected compared to other ideas given the support of the Open Wing Alliance for corporate campaigns for chicken welfare. This is still neglected in some countries, but it would be hard to have much impact in such countries, e.g., because corporations are small on the whole.
4. **Financial Sector Activism:** Lobbying the World Bank and other financiers to incorporate stricter animal welfare standards in agricultural investments and promoting animal-inclusive ESG criteria and shareholder activism within corporations. - We explored this in more detail but later deprioritized, see the ToC below.
5. **Research and Innovation:** Foster humane alternatives to current farming practices by funding research into areas like cultured meat, plant-based proteins, or improved husbandry techniques - we deprioritized because this is less neglected than other ideas, and we don’t have a competitive advantage in alt protein.
6. **Alternative Livelihoods Support:** Assist farmers in transitioning from factory farming to more humane and sustainable agricultural methods - We deprioritized because we primarily look at preventative measures.
7. **Coalitions and Partnerships:** Amplify impact by collaborating with other organizations, treating factory farming as part of broader sustainability efforts – we deprioritized because this is less neglected than other ideas. Animal Advocacy Africa, Africa Network for Animal Welfare, and Open Wing Alliance already fill this role.

After a short investigation and a few conversations with experts, we narrowed down the most promising approaches to 1 and 4, policy advocacy and financial sector activism, particularly lobbying of development banks.

3.1 Financial sector activism

Here is the theory of change for development bank lobbying:



These are the key uncertainties and assumptions regarding each stage of the theory of change:

Scale: key uncertainty, high uncertainty, some uncertainty, low uncertainty, unconcerned

In terms of lobbying development banks like the World Bank, there is already a coalition called The Stop Financing Factory Farming Campaign, including

organizations Sinergia and World Animal Protection, dedicating a total of ~10 FTE, that campaign for development banks to align their activities with stricter animal welfare standards. They recently ran a campaign explicitly targeting one loan by the World Bank to withhold a US$32 million investment to Brazilian dairy producer Alvoar Lácteos. The campaign was unfortunately unsuccessful. Overall the coalition's World Bank work has proven difficult, with success rates of <10%. Separate from the coalition, Compassion in World Farming also dedicates about 1 FTE to campaign against development banks.

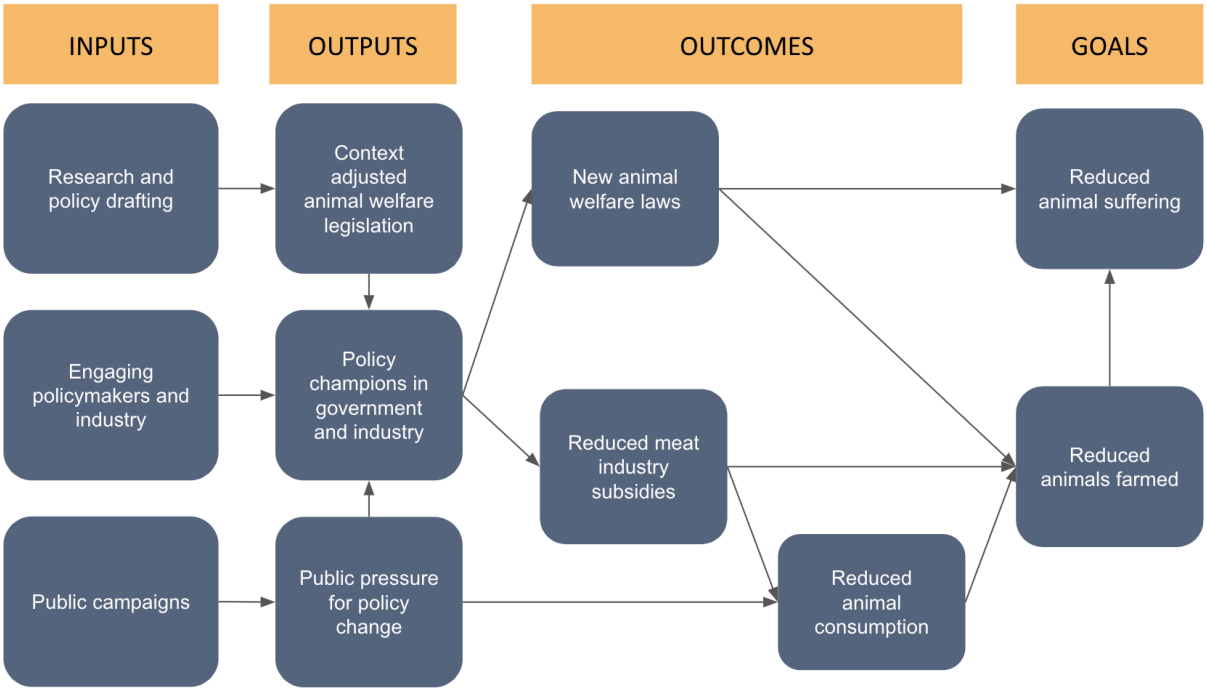
Sinergia Animal International also runs a campaign called BanksforAnimals for private commercial banks. Their biggest win is from the French bank BNP Paribas, which has announced a new policy that encourages all livestock farmers funded by them to "change their practices towards a system that is more respectful of animal welfare," taking the FARMS Initiative's Responsible Minimum Standards as a reference. This is combined with other efforts to align shareholders and banks to animal welfare standards, including the FARMS initiative and Farm Animal Investment Risk and Return (FAIRR).

Experts also flagged that this could be a reasonably low direct-impact approach as there are many financing providers other than the world bank. We estimate the World Bank gives about $10 billion of agricultural financing a year out of a total pool of $1-2 trillion annually. These Numbers are rough but suggest that the World Bank financing comprises approximately just below 1% of global agricultural funding. If World Bank loans at a 5% (guess) lower concessional rate and 40% directed to animal agriculture, this could represent about ~$0.2 billion in subsidies financing for agriculture. As such, welfare conditions on World Bank loans would affect vast numbers of animals globally but are unlikely to be transformative.

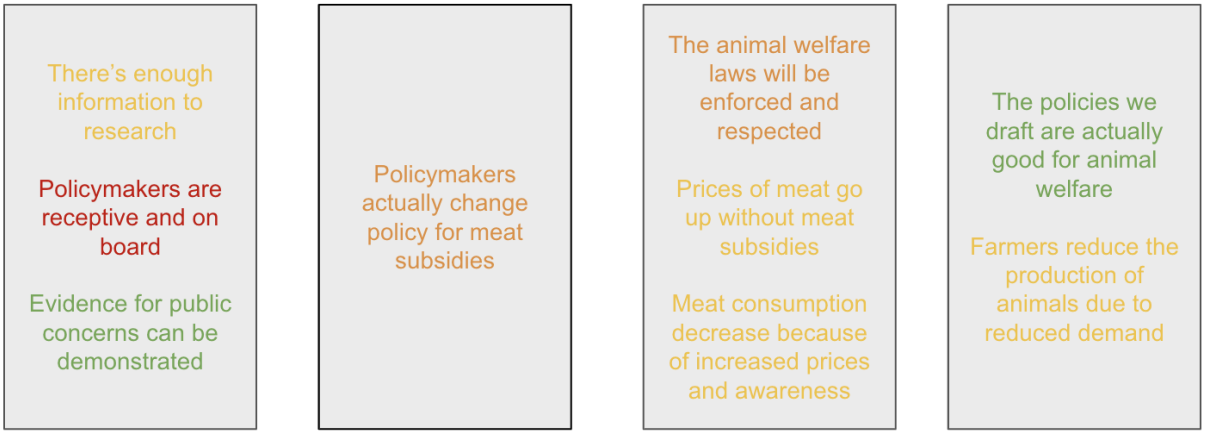
Due to time constraints, we have deprioritized further research on this approach. The World Bank is supposed to reevaluate its performance standards, which set the ethical policies for its loans, in the coming decade (uncertain on specific timing) - and this may be a much better policy window to start a new organization. We may revisit this idea in the future.

3.2 Policy advocacy

Here is the theory of change for political advocacy:



These are the key uncertainties and assumptions regarding each stage of the theory of change:



Scale: key uncertainty, high uncertainty, some uncertainty, low uncertainty, unconcerning

We brainstormed different arguments that a charity could use to argue for policy changes, the complete analysis can be found in the Annex. However, there are potentially exciting angles for leverage:

- As Western Countries ban sales of low-welfare animal products (California and EU). A charity could leverage this for a broader upgrade in standards.

Possible policy asks:

Next we prioritized what policy asks would be most appropriate in an LMIC context.

Policy asks	Description	Target locations	Clear TOC	Can progress within 2yrs	Evidence	Expected impact	Tractability	Neglectedness
A. Cage free	Introduce animal welfare laws, e.g., ban the use of cages for egg-laying hens	Bangladesh Ghana	Cage free policy work in countries that are heavy exporters to the EU may be successful as many farms will be transitioning anyway	Yes	Evidence from HICs One example (with limited success): Bhutan cage-free commitment	Hundreds of millions of egg-laying hens for Bangladesh Tens of millions for Ghana	Medium	Low
B. Environ-mental regulation	Require industry to cover externalized costs. E.g., require waste management, AMR prevention through disease monitoring, etc.	Bangladesh Ethiopia Nepal	Increasing the costs of large farms by regulation would increase meat prices and slow intensification. Unregulated environmental costs are a form of indirect subsidy.	Yes	Expert opinion supported this approach Chile where a Fisheries Act mainly targets environmental pollution - though it could be stricter.	E.g., in the US, if factory farms were required to treat their waste, it would cost the industry $80-200B/year, roughly the US meat industry's total annual sales. However, we are concerned about the small animal replacement problem (CE, 2018). In the Annex, we did a cursory analysis of the per-animal waste management costs.	Medium	Medium-Low
C. Basic animal welfare laws,	Introduce basic animal welfare protections that legally apply to all animals. In farms	Sub-Saharan Africa, e.g., Benin, Ghana, Niger, and	Basic animal rights laws being in place can help drive later change on farms – especially in	Yes	One example of impact: India's cage-free legal work (though still in cages in practice)	Depends on Enforcement. But it could have a preventative effect in the future; when enforcement improves	Medium-low (Medium-high to get basic laws in place but low to get them to	Medium-low

	and not in farms. For example, this could focus on the "Five Freedoms".	Ethiopia	jurisdictions with solid legal oversight of gov.		Many LMICs with laws that include five freedoms: (India, Tanzania, etc.)		impact farms due to enforcement eventually)	
D. Prevent meat subsidies	Prevent/ or roll back meat subsidies	Preventative: Indonesia, and maybe Bangladesh and Ethiopia Rollback: South Africa Mexico Ghana India	Without meat subsidies, the growth of intensification would slow, prices of meat would be higher and consumption would be less.	Probably no, or at least it will be hard to measure the prevention of subsidies	One example: Slovakia (1990 - 2014)	Subsidies India= $15.9 billion and Indonesia= $127 million Cutting or preventing this could have some effect	Low	Medium
E. Protectio-nism	Ban contract farming or otherwise protect local, small farmers and discourage centralization of multinationals	India Benin Ghana	By banning contract farming, small farmers should have less access to capital and infrastructure to intensify their operations.	Yes	Evidence contract farming is not preferred by farmers (Ruml and Qaim, 2020). Two examples: • 2020 India protests against the Farm Bill that deregulates contract farming. • Failure of contract farming initiated in the 2000s in Punjab.	It would hinder vertical integration of the industry; the impact is less certain as small farmers may still intensify without this.	Medium	Medium

Note 1: Some of these boxes are paraphrased. More elaboration can be found in the Quality of Evidence section below.

Note 2: Color key:

Low	Medium-low	Medium	Medium-high	High

Note 3: The "five freedoms" are: freedom from 1. Thirst, hunger, and malnutrition; 2. Discomfort due to the environment; 3. Pain, injury & diseases; 4. Fear & distress; 5. Freedom to express normal behavior for the species

The best strategy for policy change

Our best guess is that the best policy asks would be:

1. Advocating for cage-free laws and policy in countries with a high rate of exports to the EU. Such a charity could argue that LMICs must establish standards to keep up with Western standards to export to Western markets. This could be expanded to other areas beyond cage-free campaigns in the future.

However, we recognize that there is very high uncertainty here. We imagine a CE charity reviewing this decision in the early days of getting started. After cage-free policy, our subsequent best suggestions are:

2. A charity that pushes basic animal welfare laws that apply to all animals, such as the “five freedoms”
3. A charity that focuses on environmental arguments and gets the governments to regulate the environmental externalities of meat production.
4. A charity that lobbies against meat subsidies.
5. A charity that advocates for regulation against contract farming for farmer welfare reasons.

Alternatively, as a charity grows and demonstrates impact in the space, it could be a combination of different arguments/tactics and a combination of these other asks.

4 Quality of evidence

4.1 Evidence from expert interviews

Interviews conducted with African animal advocates have underscored the growing recognition of animal welfare as a critical concern for the public and policymakers, despite competing priorities such as food security. Key points of consensus among these experts include:

- A stark lack of laws and regulations regarding animal welfare.
- Convincing arguments relating to "One Health," a principle emphasizing the interdependencies among environmental health, human health, animal welfare, and economic stability.
- Rising awareness about the importance of animal welfare, genetic diversity, and the need to decrease stocking densities due to concerns such as avian flu outbreaks.
- A newfound understanding among farmers about the intimate link between animal welfare and farm productivity.
- Despite the importance of food security, experts suggest that animal agriculture may not be as crucial due to its inefficiencies in food conversion.
- A challenge where multinational companies outcompete local farmers, primarily exporting products to wealthier countries; thereby, most profits and economic growth don't accrue to local farmers.
- Contract farming is common and harmful to local farmers.

Overall view: This is weak evidence against the idea that we can drive policy change on LMICs on animal welfare grounds. However, this is also weak evidence in favor of being able to change policy in LMICs on health and environmental grounds

4.2 Evidence from analogy to HICs

A. Cage-free

In general cage-free policy has been most successful in countries where some significant proportion of farmers are running cage-free systems anyway, either due to corporate commitments or due to the need to export to cage-free markets. We give one case study below:

Taiwan

On December 31, 2021, Taiwan became the first country to ban battery cages for laying ducks, which follows undercover investigations and campaigns by the Environment & Animal Society of Taiwan (EAST) and We Animals Media. Duck eggs are a crucial part of Asian food, and Taiwan's duck egg industry is worth over $60 million. Taiwan's Council of Agriculture reports that the country has over 400 duck farms and around 2.16 million ducks used for laying eggs. Combined, these ducks lay more than 500 million eggs each year.

Two reasons attributed to the success:

- Most ducks are not yet housed in battery cages; of the 400 farms, around 60 use battery cages. However, duck egg producers have started transitioning their practices to incorporate battery cages.
- California's Prop 12 cage ban: Taiwan exports more than half of its duck eggs to the US—more than any other. From 2016 to 2020, 81.4 percent of Taiwan's duck egg exports to the U.S. were shipped to California.

Overall view: This is weak evidence in favor of being able to change cage-free policy in LMICs who export to HICs on economic grounds

B. Environmental regulation

CASE STUDY: US EPA regulations

This USDA economic research paper analyzed the implications of the EPA regulation established in 2003 (Ribaudo et al., 2003). Here are some relevant passages from the report:

- "The EPA regulations affect only those largest farms designated "concentrated animal feeding operations," or CAFOs. While making up only about 5 percent of animal feeding operations, they contain 50 percent of all animals and produce over 65 percent of excess nutrients."
- "At the time of writing in 2003, Only 18 percent of large hog farms and 23 percent of large dairies are currently applying manure on enough cropland to meet a nitrogen standard. Further, even if they spread manure over their entire land base, only 20-50 percent of all large hog farms operate enough land to meet land application standards, depending on whether a nitrogen or phosphorus standard is to be met. The new regulations will require even more large dairies to move their manure off farm; at best, just slightly more than one-quarter of all large dairies manage an adequate land base to spread their

manure on, and fewer than 2 percent have an adequate land base to meet a strict phosphorus-based standard. Similar results would be expected for beef and poultry."

- **"Livestock and poultry farms' annual net income could decline by more than $1 billion** (around 3 percent) - if 40 percent or more of all US cropland is available for spreading manure. On the other hand, if cropland farmers accept manure on only 20 percent of cropland, the per-animal cost to CAFOs for disposing of their manure would increase such that they would likely reduce their production."
- **"Phosphorus-based standards are more costly than nitrogen-based standards."**

Overall view: This is moderate evidence suggesting that environmental regulation will have a small impact on meat prices.

4.3 Evidence from case studies in LMICs

A. Cage-free

Bhutan

In 2013, Bhutan declared itself a cage–free country . The Minister of Agriculture and Forests, Royal Government of Bhutan, proclaimed that any female domesticated chicken, turkey, duck, goose, or guinea fowl kept for egg production, including pullets, shall never be continually confined in restrictive cages that prevent them from fully stretching their limbs or expressing important natural behaviors. The order also mandates that birds have sufficient space to perch or sit quietly without repeated disturbance.

Overall view: This is weak evidence in favor of being able to change cage-free policy in LMICs

B. Environmental regulation

This paper looked at manure regulation across Asian and African countries. (Machete and Chabo, 2020)

- Out of 34 surveyed countries, 30 already have national policies related to manure management
    - The regulation in Malawi, Senegal, and Malaysia are only overseen by the Ministry of Agriculture. Other countries' regulations are often

overseen by both Ministries of Agriculture and the Environment. In some countries, Energy and public health were also involved.

- Enforcement of manure policies was regarded as “weak”
- broader environmental goals such as achieving methane emissions reductions and meeting renewable energy targets or lowering energy costs at the farm level were found to be critical drivers of manure (or manure-related) policies (Teenstra et al. 2014)
- It is not common for the policies to promote holistic approaches to manure management or emphasize the value of manure as a fertilizer and supplier of organic matter.
- Some countries had incoherent or contradicting policies due to the involvement of multiple ministries.
- Some countries that don’t have policies still have good practices, i.e., El Salvador, which uses manure for coffee fields despite having no policy.
- China, Vietnam, Malaysia, Panama, Ecuador, and Chile indicated well-coordinated law enforcement.

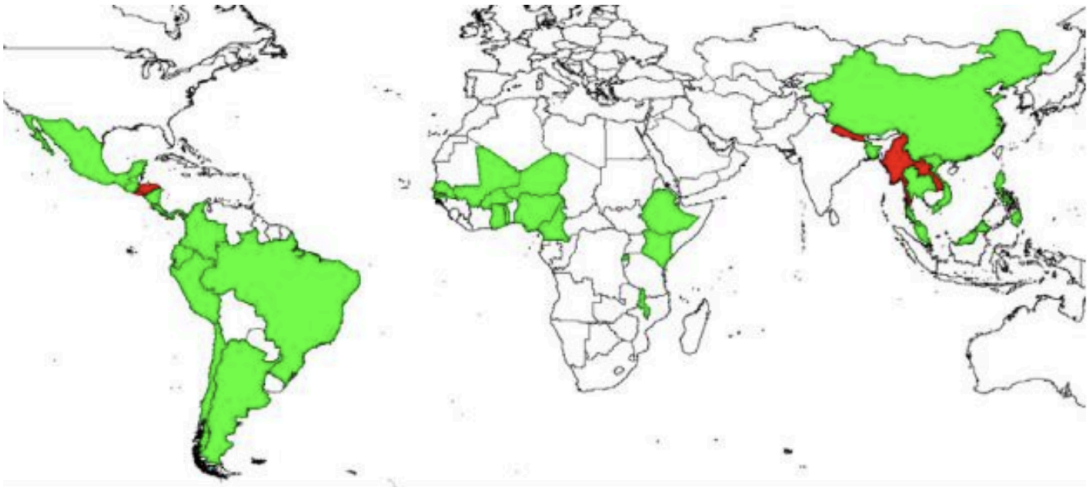


Figure 6: Countries with (green) and without (red) manure management-related policies (Machete and Chabo, 2020)

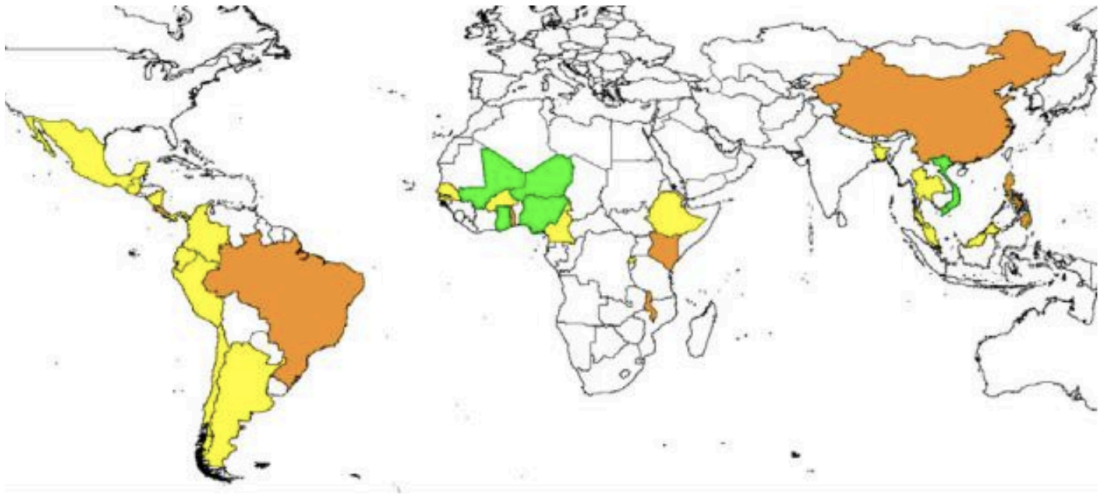


Figure 7: Level of coherence in the manure legislation (Source: Teenstra et al. 2014).
Green = very good: very complementary; holistically approached national policy in which relevant ministries have adapted their departmental policies to each other's responsibilities resulting in an integral manure management policy (taking into account i.e., human health, different pollutions, use of natural resources etc.)
Yellow = moderate: some contradicts, i.e., environmental policy in line with proper manure management, but no connection with human health policies; or overall no conflicting policies but may be still some policy gaps remain to be solved.
Orange = bad/none: contradictive; no holistically approached national policy, policy often based on single issues by responsible ministries, with as a result conflicting legislation. (Machete and Chabo, 2020)

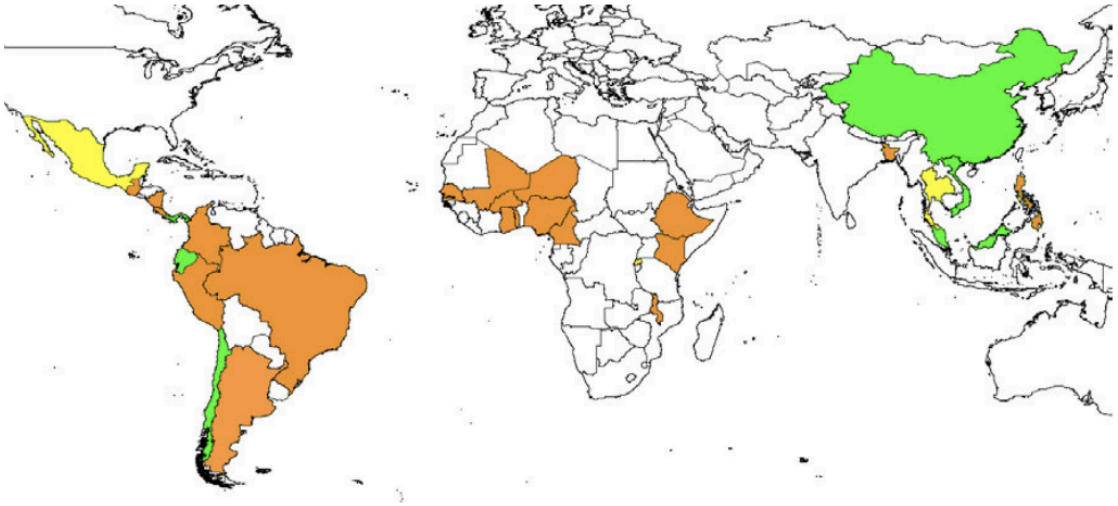


Figure 8: Level of enforcement. (Teenstra et al., 2014)
Green = Very strict; non-compliance immediately leads to penalties;
Yellow = moderate; strict but first a warning and a time frame within which improvements have to be made;
Orange = weak/none: rules are note enforced or just on selected farmers (based on size, location etc.)

Table 1: Overview of the Manure Policy frameworks of 34 countries (Teenstra et al., 2014)

Country	Manure Policy	Components addressed by the policy							Ministries involved			
		stocking rate	excretion	storage	treatment	digestion	application	discharge	Agriculture	Environment	Energy	Public Health
Latin America												
Argentina	Yes	x	x	x	x				x	x		
Brazil	Yes	x	x	x			x		x	x		
Chile	Yes	x		x	x	x	x	x	x	x	x	x
Colombia	Yes			x	x		x	x	nd[a]	nd	nd	nd
Costa Rica	Yes	x	x	x	x	x	x	x	x	x	x	x
Ecuador	Yes	x			x	x	x		x	x		x
El Salvador	No	n	n	n	n	n	n	n	na	na	na	na
Guatemala	Yes			x				x	x	x		x
Honduras	No	n	n	n	n	n	n	n	na	na	na	na
Mexico	Yes	x			x	x		x	x	x	x	
Nicaragua	Yes	x	x		x	x			x	x	x	
Panama	Yes	x	x	x	x	x	x		x	x	x	x
Peru	Yes	x	x		x		x		x	x	x	x
Sub-Saharan Africa												
Burkina Faso	Yes	x	x	x	x	x	x		x	x		
Cameroon	Yes	x	x		x	x	x		x	x	x	x
Ethiopia	Yes	x					x	x	x	x	x	
Ghana	Yes		x	x	x	x	x	x	x		x	
Kenya	Yes	x	x	x	x	x			x	x	x	x
Malawi	Yes			x	x				x			
Mali	Yes	x	x	x			x		x	x		x
Niger	Yes	x	x	x	x	x	x		x	x		x
Nigeria	Yes		x	x		x	x	x	x	x		x
Rwanda	Yes	x	x	x	x				x	x		x
Senegal	Yes	x	x	x	x		x		x			
Togo	Yes						x	x	nd	nd	nd	nd
South & East Asia												
Bangladesh	Yes	x	x	x	x	x	x	x	x	x	x	x
China	Yes	x	x	x	x	x	x	x	x	x	x	x
Lao PDR	No	n	n	n	n	n	n	n	na	na	na	na
Malaysia	Yes	x	x	x	x	x	x	x	x			
Myanmar	No	n	n	n	n	n	n	n	na	na	na	na
Nepal	No	n	n	n	n	n	n	n	na	na	na	na
Philippines	Yes	x	x	x	x	x	x	x	x	x		
Thailand	Yes	x	x	x	x	x	x	x	x	x	x	
Viet Nam	Yes	x	x	x	x	x	x	x	x	x	x	x

[a] no data reported

[b] not applicable

Case study: China

China did a series of environmental reviews for livestock farms in 2018 (Stanway, 2018).

- Heilongjiang, Guangdong, and Yunnan were also accused of failing to handle pollution from animal husbandry properly.
- the poultry and livestock industry produces nearly 4 billion tonnes of waste yearly, but less than half of it is safely treated.
- Just 47 percent of Heilongjian's large-scale poultry and livestock farms had installed proper waste treatment facilities, and many weren't running those facilities correctly, the Ministry of Ecology and Environment report said.
- A proposal was put before China's parliament in March 2018 on improving the rural environment.
- New regulations have forced thousands of facilities to relocate or close near densely populated or environmentally sensitive regions.
- The Zhengbang Group was fined 2 million yuan ($288,000) for turning off sewage treatment facilities to one of its largest pig farms in the city of Zhaodong - dumping concentrated wastewater into nearby grassland. It said this amounted to 0.4 percent of its listed unit's net profit in 2017.

Overall views: This is mixed evidence for manure regulation. On the one hand, this adds to the evidence that introducing manure policies are tractable for the countries that don't have them, i.e., Nepal, LAO, El Salvador, Honduras, and Myanmar. However, it does show that enforcement in these countries is a challenge.

C. Basic animal welfare laws

Precedence of animal welfare legislation

Summary

- There are many examples of animal welfare laws in LMICs, with varying degrees of stringency
- Enforcement is a concern, even if laws are passed, i.e., Tanzania.
- However, previously established laws provide cover for activists to push for meaningful re-interpretations, i.e., India.
- Prevention before take-off has precedence, i.e., Taiwan duck cages
- The strengthening of animal welfare standards in high-income countries provides renewed incentives to adjust LMIC policy if they want to export to those countries.
- Environmental and health arguments have stronger precedence of legislative success.

- Impactful campaigns in high-welfare countries have historically started when those countries were still middle-income countries in terms of their purchasing power.

Tanzania

An Animal Welfare Act was brought on to the Statute Book in 2008: its provisions are based on similar rules in advanced international locations and, collectively with ancillary criminal instruments, lays the inspiration for farm (and companion) animal welfare.

However, it has been reported that the Tanzanian Government makes minimal attempts to enforce the Act's provisions. At least in 2014, there has not been any prosecution for breaches of the law. Producers, transporters, butchers, and purchasers have little expertise or interest in the welfare of animals, partly through ignorance and lack of education but also because their welfare standards are waning.

Currently, none of the countries importing from Tanzania require high animal welfare standards. However, some of these countries might start demanding improved welfare standards in the foreseeable future. It is also true that at the time of writing, only two NGOs existed to promote animal welfare, both of which focused on companion animals at the beginning - The Tanzania Animal Welfare Society (TAWESO) and Tanzania Animals Protection Organization (TAPO). Only recently did TAWESO and the newly formed Education for African Animals Welfare and Meru Animal Welfare Organization begin advocating for farmed animal welfare.

Interestingly, Tanzania is identified by Animal Ask as one out of 22 countries with falling rates of meat consumption, despite increasing economic growth. In their report, they could not find convincing explanations for this phenomenon.

India

The first animal rights legislation was passed in 1860. The law banned specific kinds of cruelty to animals, citing "unnecessary pain or suffering on animals." Around the same time, the first Society for the Prevention of Cruelty to Animals in India was founded in 1861.

Following its decolonization, India's Parliament enacted its premier animal rights legislation in 1962, establishing the Animal Welfare Board of India. This board was responsible for formulating laws and regulations concerning animal welfare. Over the subsequent five decades, numerous animal protection laws were passed by both the Board and the Parliament. These laws govern various aspects including

slaughterhouses, animal performances, transportation of animals, and animal experimentation.

Humane Society International India, in 2012, managed to convince the majority of Indian states, including those with the highest egg production, to acknowledge that the confinement of hens in battery cages contravenes the Prevention of Cruelty to Animals Act of 1960. As a result, any cages introduced to farms post-2012 were mandated to have a minimum size of 750 square centimeters, reflecting a 50% increment from the previous standard (Lam et al., 2019). However, Animal Equality reported that battery cages were still used in 2017. In a 2022 blog post, Mercy for Animals mentioned that battery cages still exist in India.

In the same year, in a major overhaul, the central government revised the Prevention of Cruelty to Animals Act (PCA), 1960, by introducing 61 amendments to the law. The amendments include stricter punishments for breaking the law, a new section that talks about the duty of every person having charge of an animal to ensure that the animal in his care or under his control has freedom from:

1. Thirst, hunger, and malnutrition;
2. Discomfort due to the environment;
3. Pain, injury, and diseases;
4. Fear and distress, and
5. Freedom to express normal behavior for the species

It is unclear whether this bill has been passed.

Bangladesh

This is the case even though the 1920 Bangladesh Cruelty to Animals Act was revised and updated to the Animal Welfare Act in 2019. The new Act aims to "ensure the proper treatment and responsible rearing of animals and prevent cruel treatment" (Kamal et al., 2023).

- The law does focus on farm animals (Kamal et al., 2023).
- As far as we can tell, it doesn't mention five freedoms, but only wording against "cruelty"
- Disallowed feeding or injection of unnecessary medication in healthy animals, like antibiotics.
- Does have stringent punishments such as imprisonment of up to 2 years.

Other case studies

- Thailand 2014 introduced the Prevention of Animal Cruelty and Provision of Animal Welfare Act

- Bangladesh recently updated its Animal Welfare Act in 2019, replacing the century-old Cruelty to Animals Act of 1920.
- Indonesia's Criminal Code Law 18 of 2009 also applies to farm animals, providing that animals' needs for feed and health be met and that killing be made according to specific health, safety, and welfare guidelines
- Chile has a General Fisheries and Aquaculture Law since 1991, that is mainly focused on environmental regulation, rather than animal welfare. However, it shows that regulating the environmental externalities of the farming industry is tractable.
- OWA has successfully gotten at least 86 corporate commitments in Africa, though this includes some global corporations and is a much smaller percentage of total commitments. Considering the smaller proportion of resources put into African campaigns, this is evidence that campaigning in Africa is not completely intractable.
- There is evidence that when surveyed, stakeholders in middle-income countries understand that animal health is interconnected with environmental and human health (Radeski et al., 2018). Just recently, Colombia introduced a One Health Bill in Congress, through which the guidelines are established. This was a success for One Health Colombia and One Health Latin-America, Iberic, and Caribbean Network.

Overall view: This is weak evidence in favor of being able to introduce basic animal welfare laws in LMICs, and additionally, in the case of India weak evidence in favor of the idea that if such laws were introduced, they could then be used to drive impact on factory farms

D. Prevent meat subsidies

Case study: Slovakia

We looked at a case study of when removing meat subsidies had an effect on meat production in Slovakia.

As detailed by the Animal Ask report:

- There is a steady decline in consumption of animal products between 1993 and 2014, followed by a sudden uptick beginning in 2015.
- This is despite their per capita GDP growing at around 5% annually during this period, mirroring that of its close neighbor Czechia which had increased meat consumption since 1995.
- Prokeinova and Hanova point out that, in the early 1990s, Slovakia abolished subsidies for the production and consumption of meat.

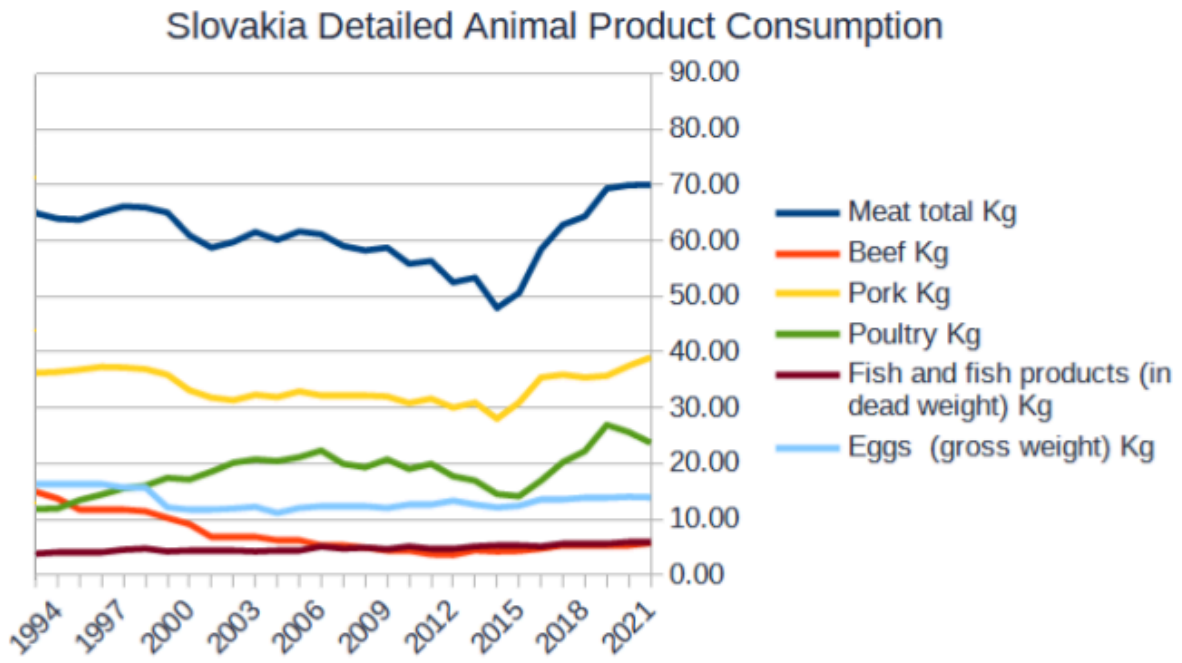


Figure 9: Slovakia's per-capita consumption of meat and animal products over time. The first year in the data is 1993. Data source: FAO Food Balances data.

The Slovakian government's website states:

- "Slovak agriculture passed through a difficult development after 1990 when it had to adapt to market economy conditions and public support restrictions."
- "Subsidies, which act as a stabilizing component of agricultural enterprises' incomes and without which most agricultural enterprises would be loss-making, played a key role in the economy for agricultural enterprises."

This suggests that the government attributes the decreased production to a lack of subsidies and its recovery to subsidies.

Cases study: Arid countries

In the Animal Ask report, they discovered:

- There is a trend of lower meat consumption in arid countries, which is associated with higher meat prices.
- Djibouti, Iraq, Algeria, and Iran are outliers in low baseline meat consumption; they are all arid countries with unusually high meat prices.
- This supports the impact of prices on lowering meat consumption.

E. Contract farming

- Most contract farmers in Ghana regret participating in the contract scheme and would prefer to exit if possible (Ruml and Qaim, 2021).

- Its benefits to farmer income are also questioned (Meemken and Bellemare, 2020), but the literature generally agrees that it increases farmer incomes and productivity (Arouna et al., 2021).
- There were large farmer protests in India against the farm bills that deregulated contract farming.
- Failure of contract farming initiated in the 2000s in Punjab.

Overall view: This is weak evidence that regulating contract farming is tractable.

4.4 Evidence from global trends

Do animal legislation wins correlate with economic development?

And according to the animal rights index, at least 59 countries have laws against animal cruelty.

- Examples of LMICs with animal cruelty laws include: Mexico, Brazil, Indonesia, Peru, Venezuela, Zambia, Zimbabwe, Kenya, Myanmar, Uruguay, Niger, Ethiopia, Mali, and more.

According to the Global Animal Law Association database, many African countries have animal legislation, but many are outdated.

- Botswana has a Cruelty to Animals law adopted in 1936, last revised in 1966
- Egypt has animal laws at the national level - PENAL CODE, ART. 355-357, adopted in 1937
- Ghana has CRIMINAL CODE 1960
- Kenya has Prevention Of Cruelty To Animals Act from 1960, last updated in 2012.
- Malawi has an animal welfare act - adopted in 1944, consolidated in 1970
- 10 more countries, including Mauritius, Namibia, Nigeria, Seychelles, South Africa, Tanzania, Uganda, Zambia, and Zimbabwe.

To answer whether economic development increases animal welfare laws, we took a holistic view of all animal welfare regulations from the Global Animal Law Association database. We analyzed their respective economic development and time of passing. We see a large number of legislation passing despite differences in economic development. Over recent history, there have been as many movements in the LMICs as in the HICs (~49% of animal welfare legislation milestones recorded in Global Animal Law happened in the LMIC countries). This suggests that it is tractable to pass legislation in LMICs, and enforcement is the more significant bottleneck.

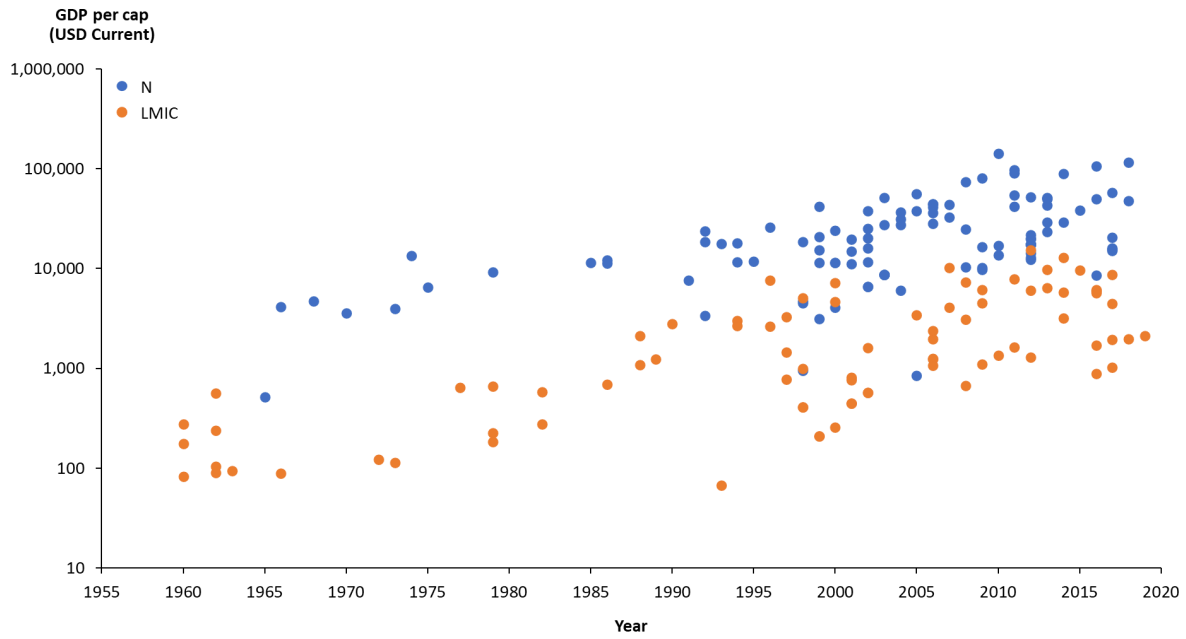


Figure 10: Animal welfare legislation mapped to their year of passing and GDP per capita if the country at the time (Source: Global Animal Law Association Database and World Bank)

Analyzing the histogram of animal welfare laws that occur within different GDP per capita, most welfare laws were made when per capita GDP was comparable to LMICs (up to $18k).

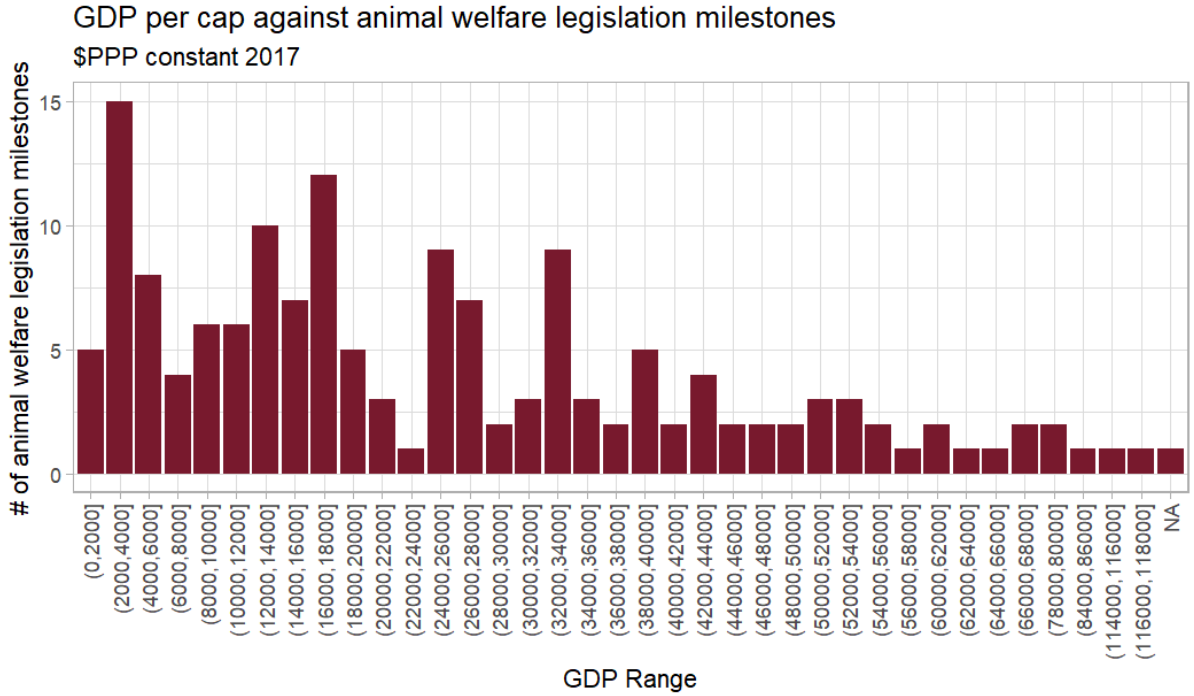


Figure 11: The range of economic development for animal welfare laws being created. (Source: Global Animal Law Association Database and World Bank)

Beyond the pure quantity of legislation, there is still a strong correlation between the quality of animal welfare legislation and the per capita GDP. This is shown when we map the 2022 USD GDP per capita against the 2021 Animal Rights Index, which, in addition to cruelty laws, considers fur bans, wildlife protection, recognition of sentience, etc.

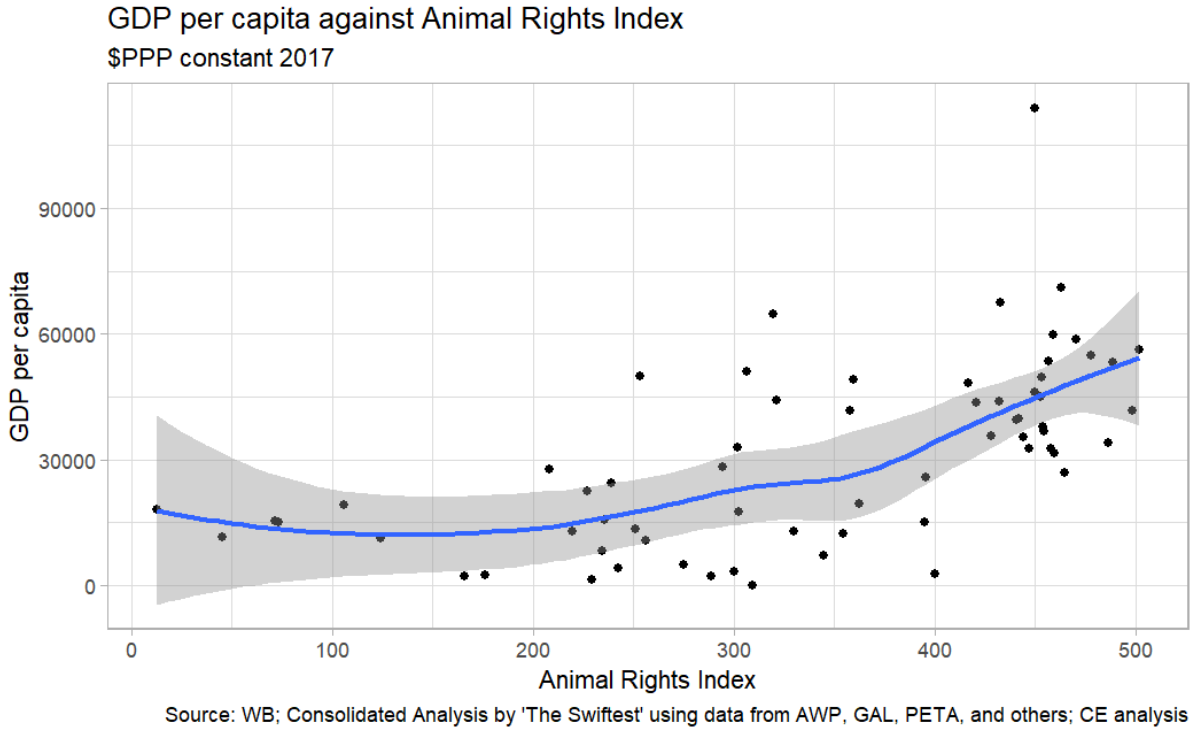


Figure 12: Quality of animal welfare legislation correlates with the economic development of a country. (Source: World Bank and Animal rights index)

However, as we have seen in the case study of India, animal advocates could use laws passed decades ago to argue for stronger enforcement and reinterpretation.

Overall view: This is medium-weak evidence against the idea that we can drive policy change on LMICs on animal welfare grounds.

4.5 Other data

Does removing meat subsidies increase the cost of meat and reduce production?

Most of the literature agrees that governmental support is important for industry. From a review of the trajectory of intensification in ten LMICs, such as Brazil, China, and

India, governmental policy is a crucial driver for the intensification of animal farming (Lam et al., 2019). Policies that they identified include:

- facilitating access to production inputs and services
- providing technical assistance
- subsidized credit
- low-interest loans
- tax breaks
- and other forms of financial assistance
- reducing trade barriers
- strengthening private property rights
- land leases
- land reform.

These are all forms of direct or indirect subsidies to the meat industry. If we can limit the subsidies from the government, we should be able to 1) impede the growth of the industry and 2) reduce the extent of intensification.

In an Open Philanthropy newsletter, they seem to be a bit more skeptical on the effects of subsidies, arguing that:

- "Most rich nations have untethered farm subsidies from production levels in response to WTO rules, and most economic analyses suggest newer crop insurance and direct payment subsidies only slightly lower grain costs" - though I can't verify this claim from linked sources.
- "Nations that have eliminated farm subsidies, like New Zealand, haven't seen rising meat prices or declines in meat consumption."

Overall view: This is mixed evidence on whether reducing will lead to lower meat consumption.

Does the price of meat affect the consumption of meat?

To understand if increased prices, either from environmental regulation or reduced meat subsidies, will impact consumption and production, we need to understand the price elasticity of meat. This is how much consumers change their consumption behavior when the price of meat changes.

According to this systematic review of 160 studies on the price elasticity of demand for major food categories to assess mean elasticities by food category (Andreyeva et al. 2010):

- Price elasticities for foods and nonalcoholic beverages ranged from 0.27 to 0.81 (absolute values)

- Consumers are most responsive to price changes in food away from home, soft drinks, juice, and meats (0.7–0.8).
- As an example, a 10% increase in soft drink prices should reduce consumption by 8% to 10%.
- The price elasticity for meat is 0.68–0.75
- However, eggs are amongst the most inelastic at 0.27.

Although most studies were in high-income contexts, we expect the price sensitivity to be higher in LMICs. However, at least in the few studies with comparisons between low-income groups and the average consumer, there are no significant differences:

- One study focusing on milk demand showed that demand was more price elastic in low-income populations (1.2 versus 0.66)
- A study on fast food depicted a large difference as well (2.09 versus 0.51).
- However, three studies, including estimates for a broader group of foods, reported essentially no difference, with average elasticities of 0.62 for low-income populations and 0.64 for consumers as a whole.

Overall view: This is strong positive evidence that increases in the price of meat will lead to lower meat consumption.

Does farming animals not in cages improve their welfare?

There is overwhelming evidence that cages are bad for animal welfare. However, we note that any laws prohibiting the use of cages would need to be enforced in order for it to have this expected impact.

Summary of quality of evidence

Options (in priority order)	Quality of evidence for:	Expert view	Analogy to HICs	LMIC case studies	Global trends and other data
A. Cage free	**Tractability**	Weakly against	Weakly in favor	Weakly in favor	Mid-weak against
	Impact				Strong in favor
B. Environmental regulation	Tractability	Weakly in favor		Weakly in favor	
	Impact		Weakly in favor	Weakly against	Medium in favor
C. Basic animal welfare laws	Tractability	Weakly against		Medium in favor	Strong in favor
	Impact			Weakly in favor	
D. Prevent meat subsidies	Tractability			Weakly in favor	

	Impact			Weakly in favor	Mixed
E. Protectionism	Tractability				
	Impact				Medium in favor

5 Expert views

High-level summary

We interviewed twelve experts, ranging from local and international animal advocates, grantmakers to academics who study the economics of factory farming in LMICs. All experts agreed that animal welfare work in LMICs is heavily neglected.

Most experts identified the lack of awareness, education, and welfare standards and regulation as critical challenges to animal welfare improvements in LMICs, particularly in Africa.

There is contention about the main drivers of intensification, with some experts saying it is consumer demand. In contrast, others say demand is partly driven by the industry's increased supply and “meatification.”

Experts have no clear consensus regarding the best approaches to preventing the intensification of factory farming in LMICs. Most experts are excited about various approaches, including local political advocacy, lobbying development banks and international institutions, and meta-level research. Part of this is due to the lack of proven approaches to address the problem due to neglectedness. And many of them indicated the system is complex. Experts seem divided about whether policymakers in LMICs are receptive to animal welfare ideas; many think that animal welfare issues will come second to food security and economic concerns. Having said this, several experts believe that animal welfare and food security need not be traded off. A few experts even remark that heavy industrialization produces lower yields due to sickness -caveated by the need for more research and evidence, particularly in the African context.

Interestingly, some experts suggested that it would be easier to prevent the intensification of factory farming than to scale it back once it has already happened. This is due to the path-dependent nature of development and industrialization. Once industrialized, there are entrenched interests, jobs needing protection, and political inertia.

There is consensus amongst experts that the World Bank and other development banks play a huge role in the intensification of animal agriculture in LMICs, through their loans, investments, and development programs. A few experts stated that access to capital is one of the main limiting factors preventing intensification from speeding up further and that farmers would choose to intensify if they had access to investment capital. With government subsidies, usually selectively advantaging large corporations

over small farmers, some experts say these programs directly contribute to the concentration of power and players in the global food system, driving inequities. Some experts expressed skepticism about the tractability of lobbying such banks. One of the experts who focuses on lobbying the World Bank has said the success rate is less than 10%, and the loans are almost certainly replaced.

Lastly, many experts have remarked that meat consumption is tied closely with wealth and status in LMICs. This attitude will provide headwinds to shifting consumer behavior.

Individual takeaways

Here, we've distilled the key takeaways from each expert. However, you can find more extended summaries of the conversations in the annex.

Table 2: Summaries of individual expert takeaways.

Expert	Key insights and takeaways
Local Advocates	
Paul Ssuna - Animal Welfare Competence Center For Africa	• Political advocacy and outreach are most promising but require skilled navigation of stakeholders • Demand is growing rapidly with the middle class, but he doesn't think it will be as strong as the West. • Existing animal welfare standards are non-existent or outdated • The process of policy review and implementation is similar across Africa, so it's scalable • Most African farms are still small-scale despite the majority of animals coming from intensive farms (difference in animals per farm)
Solomon Onyango - The Donkey Sanctuary Kenya	• Factory farming is still early in Africa. Still at a stage where the path can be shaped. • Lack of awareness and education around the topic; law of regulation • Consumer demand is the primary driver of factory farming • Politicians and people primarily concerned about food security • Capital is a significant limiting factor to increased intensification currently. Most farmers would intensify if given the investment capital because they think it's profitable
Jean Claude Masengesho - Rwanda Animal Welfare	• Lack of awareness and education around the topic; lack of regulation • Policymakers are generally receptive • Intensification in Africa is not necessarily good for yield

Organisation	due to diseases, different environment. ● More research needed to prove this
Ayubu Nnko - Education for African Animals Welfare	● When a Western corporation goes cage-free, a lot of the cages end up in Africa ● Mostly working to educate farmers ● Most infrastructure and cages are sold by multinationals, quite a lot from China. ● The local food markets mainly sell animals farmed by small-scale farmers
South American Animal Advocate	● LMICs are heavily neglected ● Norwegian fish farms are running intensive fishing operations in Chile and exporting all the fish back to Norway while causing environmental and health damage to local people and profits don't accrue to the local economy. ● Many different approaches are needed to stop this.
International advocates	
Lynn Tan - Animal Advocacy Africa	● Animal advocacy work in Africa is nascent, with many resources devoted to companion animals. ● Existing animal welfare standards are non-existent or outdated ● Lack of awareness and education around the topic ● Meat eating is associated with wealth and status ● Important to find local founders, but the capacity building is lacking
Kikiope Oluwarore - WHO and OneHealth	● Most African farms are still small scale, despite the majority of animals coming from intensive farms (difference in animals per farm) ● There's a lack of awareness and understanding for animal welfare in Africa, and lack of localized research ● Improving animal welfare can improve productivity and yield ● Multinational companies use farming methods that are banned in their headquartered countries. ● Farmers would still take loans from development banks even if welfare conditions were attached
Lucia Gomes Periera - Sinergia Animal International	● There's room for more bad-cop work in LMICs ● It's crucial to diversify approaches since each approach bolsters the other ● Sinergia is mainly focused on Latin America and Asia, may in the future expand to Africa, but not yet. ● They have run one campaign (unsuccessfully) against a World Bank loan.
Merel van der Mark - Sinergia,	● Most financing comes from commercial banks rather than development banks. Still, work on development

BankforAnimals	banks can be more ambitious due to SDG commitments, and there are precedence-setting effects. • Quite a few organizations in a coalition, totaling around 10 FTE, lobbying the development banks. Around 10-15 campaigns have been launched so far. Only one big success, blocking a loan to Marfrig, Brazil's second-largest slaughterhouse. I.e., overall <10% success rate. • Funding is difficult for this work due to a more indirect theory of change and difficulty in measuring impact • There may be an upcoming reassessment of the World Bank performance standards, which guides all of their work, including ethical policies - this could be a great policy window, but it's unclear when this will take place.
Academics	
Philip Howard - International Panel of Experts on Sustainable Food Systems and Michigan State University	• Subsidies to industrial farming have a massive effect. • Additional to animal welfare issues, concentration of power within the food system is a massive problem • Large multinational firms spend a lot of money lobbying the government • Most profits flow to multinationals without benefiting local economy • No clear winning strategy to prevent this, suggests diversifying approaches
Matthew Hayek - New York University	• There's path dependency in the industry - easier to prevent industrialization than to deindustrialize once it has already happened • Increase in meat consumption is hard to explain by pure increase in demand. Supply-side overproduction from factory farming is partly to blame. • There are ways to feed people without sacrificing too much animal welfare. Policy needs to focus on high-yield methods of agriculture.
Mehroosh Tak - Royal Veterinary College London	• Importance of systems change thinking • There is a massive concentration of players in the food industry • The World Bank has a significant role in forcing policies that concentrate power.
Grantmaker	
Carmen Lee - Tiny Beam Foundation	• Global food system is hugely complex • Need for more research to understand the drivers and levers • In favor of a think tank approach to monitoring the situation, provide regional-level context

6 Geographic assessment

6.1 Where existing organizations work

The Open Wing Alliance (OWA) has several organizations working across Africa:

- Liberia Animal Welfare and Conservation Society - Liberia and Guinea
- Animal Advocates International - Zimbabwe
- Africa Network for Animal Welfare - Kenya
- Animal Law Reform South Africa - South Africa
- Animal Protection Organization of Nigeria - Nigeria
- Animal Welfare League - Ghana
- ARAF-PLATEAU DOGON - Mali
- Arusha Society for the Protection of Animals - Tanzania
- Coalition of African Animal Welfare Organisations - Kenya and South Africa
- Education for African Animals Welfare - Tanzania
- Humane Africa - Zimbabwe
- Meru Animal Welfare Organization - Tanzania
- National Youth Network on Climate Change - Malawi
- Nurture Imvelo Trust - Zimbabwe
- OIPA Cameroon - Cameroon
- One Health Development Initiative - Nigeria
- Rwanda Animal Welfare Organization - Rwanda
- Sibanye Animal Welfare and Conservancy Trust - Zimbabwe
- Southern African Faith Communities Environment Institute - South Africa
- Tanzania Animal Welfare Society - Tanzania
- Uganda Vegan Society - Uganda
- Utunzi Animal Welfare Organization - Kenya

Open Wing Alliance in Asia:

- Currently do not operate in Bangladesh
- 3 Organisations working in Indonesia
- 5 Organisations working in India

However, there is still reason to suggest there is more space for a new organization to do advocacy work. These organizations are focused on a few major African countries and plenty more countries that don't have well-established animal advocacy organizations. Furthermore, many of these organizations have multiple focuses on less cost-effective programs, including companion animals. Also, most of these existing organizations focus on cage-free campaigning rather than preventing intensification holistically.

6.2 Geographic assessment

To identify the most promising countries for political advocacy by a new charity, we employed a weighted factor model approach, combining several key metrics, to produce a geographic assessment.

The scale of the Problem: We considered the issue's magnitude in each country using

- The number of poultry birds as a proxy(Our World in Data).
- The change in poultry birds over the past decade (2011-2021) in each country.
- Additionally, current and projected future population, meat consumption per capita
- Annual GDP per capita growth rates from 2021 projected to 2028

Neglectedness: The inverse Gross National Income (GNI) per capita was used to indicate a country's available resources to address this issue.

Intensification Metrics: We employed various productivity metrics (yield per animal) as an approximate measure for intensification, considering that broiler chickens under intensive conditions generally exhibit higher productivity than those under extensive conditions. However, it's important to note that the breed of chicken (fast-growing vs. slow-growing) can be a stronger predictor of productivity than the production system, making productivity an imperfect proxy for a country's level of intensification (Bogosavljević-Bošković et al., 2012; Blyth and Springlea, 2023).

Tractability: We measured tractability using a combination of the following indexes:

- The Fragile States Index,
- Corruption Perceptions Index,
- Rule of Law Index
- Freedom in the World Index.

Based on this assessment, we identified **the top 10 priority countries**:

1. Benin
2. Bangladesh
3. Ghana
4. Niger
5. Ethiopia
6. Indonesia
7. Senegal
8. Pakistan

9. India
10. Nepal

These countries exhibit high scores on the evaluated metrics, suggesting they could be targets for the charity's advocacy efforts.

Using OEC data, we checked which countries in this list export a large amount of animal products to continental Europe to see if new EU sale regulations can be used as leverage.

- 27% of exported animal product from Ghana goes to European countries.
- 64% of exported animal product from Bangladesh goes to European countries.

7 Cost-effectiveness analysis

We conducted a cost-effectiveness analysis on advocating for a cage ban for the ten most promising countries identified via our geographic assessment. Here are the headline numbers:

Table 3: Cost-effectiveness per country, 35-year model of top 10 target countries

Country	Discounted costs (USD)	Discounted WPs gained	WPs/$ over 60 years	WPs/$ starting benefits at 30+ years
Benin	$425,585.31	17,239,032	40.51	28.87
Bangladesh	$432,152.83	76,089,458	176.07	76.84
Ghana	$420,965.70	6,909,337	16.41	10.31
Niger	$406,075.68	9,682,630	23.84	20.79
Ethiopia	$421,426.29	18,397,656	43.66	27.30
Senegal	$427,139.43	26,837,011	62.83	43.07
Indonesia	$479,792.23	75,385,785	157.12	60.53
India	$434,867.03	155,602,137	357.82	137.97
Nepal	$431,373.23	16,673,483	38.65	21.29
Pakistan	$420,051.93	83,340,341	198.40	148.35
AVG	**$429,942.97**	**48,615,687**	**111.53**	**57.53**

7.1 Costs

Our model assumes that the charity will operate for five years, focusing on lobbying efforts before any policy success. We project that the policy would take approximately two years to come into effect. The budget estimates are as follows:

- Year 1: $100,000
- Years 2-5: $300,000 per year
- Post-policy implementation (Years 6-7): $150,000 per year in the UK

These estimates account for staffing (around four members) and other miscellaneous expenses. They are held constant across CEAs. We then have also added in an adjustment of the costs based on GDP per capita such that working in poorer countries has slightly lower costs.

7.2 Effects

To estimate the potential benefits of this intervention, we modeled the anticipated growth in animal populations and the projected intensification of the industry in each target country. This involved two main methods to predict new production growth:

1. Historical meat production data extrapolation
2. A log-linear regression model, using predicted economic growth data from the IMF database and per capita meat consumption and GDP from OWID, which identifies the relationship between economic growth and meat consumption growth. We also factored in projected population growth using data from OWID.

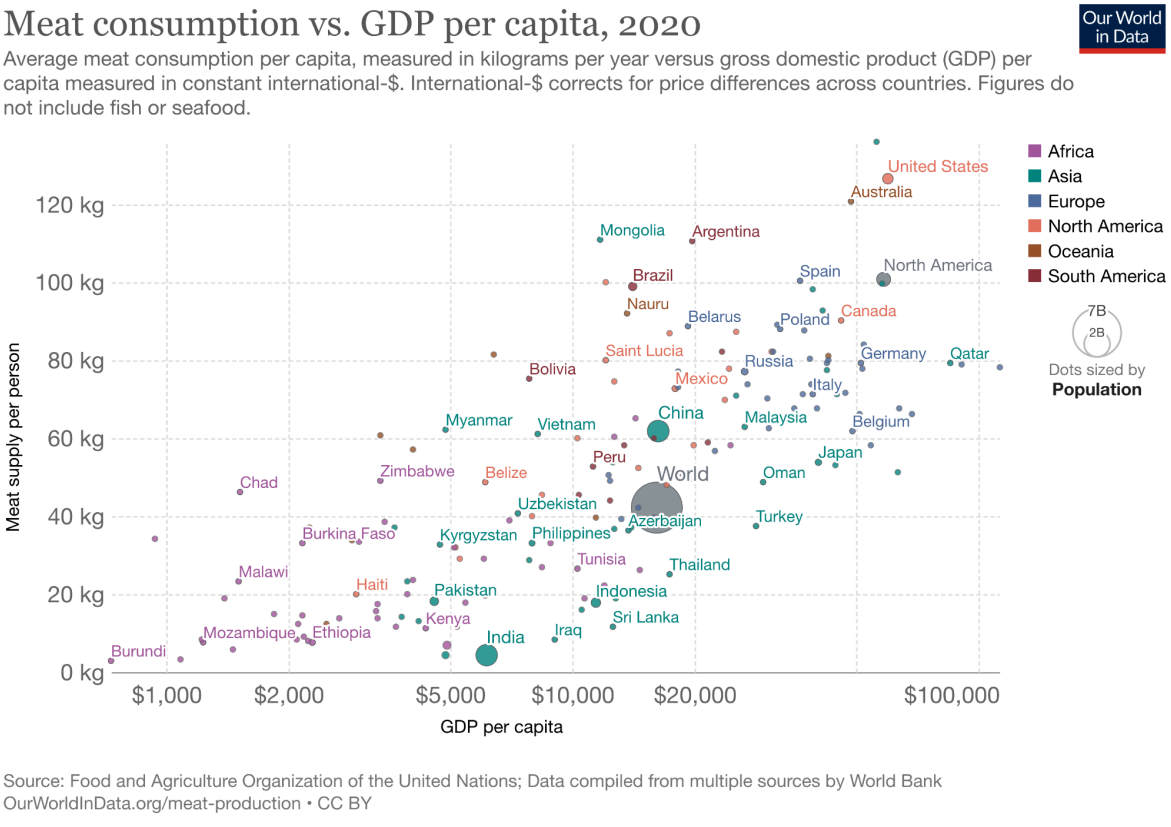


Figure 13: Meat consumption per capita increases as the per capita GDP increases (Source: Our World In Data)

Intensification Modeling

For changes in intensification, we utilized a simplified version of a model from Gilbert et al. that delineates the relationship between economic growth and the percentage of chickens in intensive farming practices. Our model assumes that a charity could influence the percentage of caged chickens such that intensification aligns with the lower bound of countries relative to their GDP.

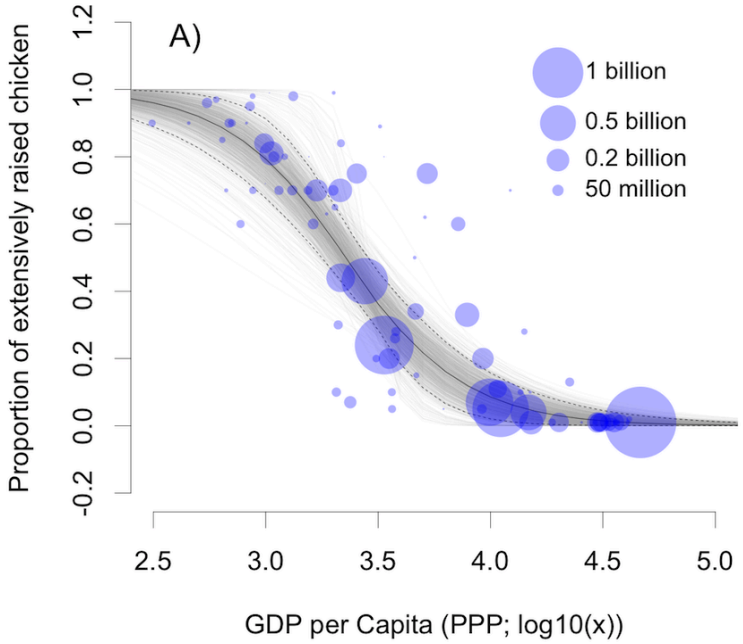


Figure 14: intensification of poultry farming follows an S-curve of adoption as per capita GDP increases (Gilbert et al.,2015)

Welfare Points

We modeled the difference between the welfare points of a battery-caged hen and a hen in enriched cages to estimate the potential welfare gains.

Probability of Success

The estimated probability of success is 8% for countries with less than 50% intensification and decreases to 2% for those with over 50% intensification. This is due to the increased influence of entrenched lobbying and interest groups, making change less likely.

Enforcement Rate

To start, we assumed an enforcement rate of 51%, which is based on the lowest average enforcement rates of EU-level legislation, expecting the compliance in LMICs to be lower. Then we applied a discount based on the World Justice Project's Rule of Law Regulatory enforcement score.

Limitations

This analysis may underestimate the charity's impact as it only models benefits for laying chickens. The welfare points gained per chicken may also be understated as the model assumes a transition from battery cages to enriched cages, while the charity is presumed to advocate for cage-free.

On the other hand, the cost-effectiveness might be overestimated due to uncertainty in effect sizes and probability of success. The charity might also need to operate for extended periods to facilitate policy enforcement. We have not factored in the governmental costs of the policies.

There is also a major challenge in extrapolating economic growth and how meat consumption and intensification would respond accordingly.

8 Implementation

This section summarizes our concerns (or lack thereof) about different aspects of a new charity putting this idea into practice.

Factor	How concerning is this?
Talent	High Concern
Access to information	Moderate Concern
Access to relevant stakeholders	Moderate Concern
Feedback loops	Moderate Concern
Funding	High Concern
Scale of the problem	Low Concern
Neglectedness	Low Concern
Execution difficulty/Tractability	Moderate Concern
Negative externalities	Low Concern
Positive externalities	Low Concern

8.1 Talent

High concern: For political advocacy, we think it would be crucial to have founders or at the very least programs managers from local countries and, anecdotally, talented animal advocates from Africa are hard to find.

8.2 Access

Information

Less information is available on scale and practices in LMICs and corporations are less transparent. However, given current information, I don't expect this to be debilitating, and charity could still do "good enough" prioritization.

Stakeholders

LMIC policymakers are generally happier to listen to international NGOs.

8.3 Feedback loops

We could quickly gauge interest from different countries, but generally, feedback loops for policy are long. Especially if we are particularly concerned about the enforcement of policies.

8.4 Funding

Funding for prevention and LMIC work is limited, especially in Africa. Many funders want to see an impact immediately and therefore deprioritize preventive work.

8.5 Scale of the problem

There are Many countries to target and many animals implicated. It does depend on your time horizon. In the near term, animal production will continue to be dominated by MICs like China. For LICs, it will still take many decades before their animal production is comparable to Western countries.

8.6 Neglectedness

Work in LMICs is highly neglected, particularly in Africa. Different organizations work in the space, but few are strictly effectiveness minded or well-resourced.

8.7 Tractability

Difficult to get a sense of tractability. On the one hand, it should be easier to prevent intensification as there's less established interest and lobbying. On the other hand, we might expect governments in LMICs to be more concerned about food security and less about animal welfare. There is also generally less animal welfare awareness in LMICs which may make policy change more difficult.

8.8 Externalities

Positive externalities

This could be precedent-setting for other LMICs. Reduction in intensification could also be positive for the environment and human health, with less animal waste pollution and antibiotic use.

Negative externalities

Could keep the prices of animal products higher than some people can afford. although this shouldn't be detrimental to food security as it should free up more plant crops to be fed to humans, it is unclear how much social dissatisfaction it could create.

9 Conclusion

Growth in animal agriculture in LMICs is almost guaranteed and is highly concerning. There are solid reasons to think that we should address this problem early and prevent the worst forms of factory farming from happening. In this report, we brainstormed many different approaches to prevent the intensification of factory farming in LMICs, and we prioritized researching evidence for political advocacy. Amongst the many policy-asks a charity could push for, we were most excited by a Charity that leverages upcoming import bans in high-welfare countries to argue for higher animal welfare standards such as cage bans. However, we were uncertain about this, and believe that depending on the context, other asks such as environmental regulation, and basic animal welfare laws.

One main concern highlighted from case studies

We were highly uncertain and unconvinced by the tractability of influencing policymakers in LMICs on animal welfare issues—the limited evidence of past successes and adequate enforcement of legislation. Although the overall problem is

pressing, we did not identify a convincing theory of change/ approach as robust as other interventions we looked at.

We may revisit this idea if and when more evidence presents itself, especially in the tractability of LMIC political advocacy.

References

Alonso, W. J. & Schuck-Paim, C. (2020). Pandemics global health and consumer choices. Google Docs. https://docs.google.com/document/d/1dmWc4AlqztHohOGxqLP7T5ISuyoy58a76KX5WL_qq_c/edit?usp=sharing

Andreyeva, T., Long, M. W. & Brownell, K. D. (2010). The impact of food prices on consumption: a systematic review of research on the price elasticity of demand for food. American Journal of Public Health, 100(2), 216–222. https://doi.org/10.2105/AJPH.2008.151415

Arouna, A., Michler, J. D. & Lokossou, J. C. (2021). Contract farming and rural transformation: Evidence from a field experiment in Benin. Journal of Development Economics, 151, 102626. https://doi.org/10.1016/j.jdeveco.2021.102626

Blyth, M. & Springlea, R. (2023). Can the trajectory of meat consumption and production in developing countries be influenced by policy? https://docs.google.com/document/d/18cHcrY_CxYHvwdBbi_QfzP9RSHwZDVXWlyDoUEkugds/edit#heading=h.jz84ja6brikp

Bogosavljević-Bošković, S., Rakonjac, S., Dosković, V. & Petrović, M. D. (2012). Broiler rearing systems: a review of major fattening results and meat quality traits. World's Poultry Science Journal, 68(2), 217–228. https://doi.org/10.1017/S004393391200027X

Bolt, S. L. & George, A. J. (2019). The use of environmental enrichment on farms benefits animal welfare and productivity. Livestock, 24(4), 183–188. https://doi.org/10.12968/live.2019.24.4.183

Cassidy, E. S., West, P. C., Gerber, J. S. & Foley, J. A. (2013). Redefining agricultural yields: from tonnes to people nourished per hectare. Environmental Research Letters: ERL [Web Site], 8(3), 034015. https://doi.org/10.1088/1748-9326/8/3/034015

CE. (2018, 24. September). Small animal replacement problem. CE. https://www.charityentrepreneurship.com/post/small-animal-replacement-problem

David, P. A. (2007). Path dependence: a foundational concept for historical social science. Cliometrica, 1(2), 91–114. https://doi.org/10.1007/s11698-006-0005-x

Dwyer, C. (2020). Can Improving Animal Welfare Contribute to Sustainability and Productivity. https://www.semanticscholar.org/paper/2e7269c33cdda3b36ac7c28594d88f5b6d0d9f66

Evans, A. B. & Miele, M. (2019). Enacting public understandings: The case of farm animal welfare. Geoforum; Journal of Physical, Human, and Regional Geosciences, 99, 1–10. https://doi.org/10.1016/j.geoforum.2018.12.013

FAIRR. (2016). Factory farming: Assessing investment risks. https://www.fairr.org/resources/reports/factory-farming-assessing-investment-risks

Gilbert, M., Conchedda, G., Van Boeckel, T. P., Cinardi, G., Linard, C., Nicolas, G., Thanapongtharm, W., D'Aietti, L., Wint, W., Newman, S. H. & Robinson, T. P. (2015). Income Disparities and the Global Distribution of Intensively Farmed Chicken and Pigs. PloS One, 10(7), e0133381. https://doi.org/10.1371/journal.pone.0133381

How I learned to love shrimp (2023). Silvano Lieger on a nationwide ballot initiative to end factory farming. https://www.howilearnedtoloveshrimp.com/podcast/episode/7bb19f6a/silvano-lieger-on-a-nationwide-ballot-initiative-to-end-factory-farming

Kamal, A.-H. M., Dell, C. A. & Kang, T. (2023). Recognizing Zooeyia to Promote Companion Animal Welfare in Urban Bangladesh. Animals : An Open Access Journal from MDPI, 13(9). https://doi.org/10.3390/ani13091523

Lam, Y., Fry, J. P. & Nachman, K. E. (2019). Applying an environmental public health lens to the industrialization of food animal production in ten low- and middle-income countries. Globalization and Health, 15(1), 40. https://doi.org/10.1186/s12992-019-0479-5

Lefrançois, T., Malvy, D., Atlani-Duault, L., Benamouzig, D., Druais, P.-L., Yazdanpanah, Y., Delfraissy, J.-F. & Lina, B. (2023). After 2 years of the COVID-19 pandemic, translating One Health into action is urgent. The Lancet, 401(10378), 789–794. https://doi.org/10.1016/S0140-6736(22)01840-2

Loyon, L. (2018). Overview of animal manure management for beef, pig, and poultry farms in France. Frontiers in Sustainable Food Systems, 2. https://doi.org/10.3389/fsufs.2018.00036

Machete, J. B. & Chabo, R. G. (2020). A Review of piggery manure management: generally, across western, Asian and African countries. Botswana Journal of Agriculture and Applied Sciences, 14(1), 17–27. https://doi.org/10.37106/bojaas.2020.17

Mackenzie, J. S. & Jeggo, M. (2019). The One Health Approach-Why Is It So Important? Tropical Medicine and Infectious Disease, 4(2). https://doi.org/10.3390/tropicalmed4020088

Meemken, E.-M. & Bellemare, M. F. (2020). Smallholder farmers and contract farming in developing countries. Proceedings of the National Academy of Sciences of the United States of America, 117(1), 259–264. https://doi.org/10.1073/pnas.1909501116

Milford, A. B., Le Mouël, C., Bodirsky, B. L. & Rolinski, S. (2019). Drivers of meat consumption. Appetite, 141, 104313. https://doi.org/10.1016/j.appet.2019.06.005

Nuvey, F. S., Kreppel, K., Nortey, P. A., Addo-Lartey, A., Sarfo, B., Fokou, G., Ameme, D. K., Kenu, E., Sackey, S., Addo, K. K., Afari, E., Chibanda, D. & Bonfoh, B. (2020). Poor mental health of livestock farmers in Africa: a mixed methods case study from Ghana. BMC Public Health, 20(1), 825. https://doi.org/10.1186/s12889-020-08949-2

OECD/FAO (2021). OECD-FAO AGRICULTURAL OUTLOOK 2021-2030. https://www.fao.org/3/cb5332en/Meat.pdf

Peterson, C. A., Bell, L. W., Carvalho, P. C. de F. & Gaudin, A. C. M. (2020). Resilience of an Integrated Crop–Livestock System to Climate Change: A Simulation Analysis of Cover Crop Grazing in Southern Brazil. Frontiers in Sustainable Food Systems, 4. https://doi.org/10.3389/fsufs.2020.604099

Radeski, M., O'Shea, H., De Meneghi, D. & Ilieski, V. (2017). Positioning Animal Welfare in the One Health Concept through Evaluation of an Animal Welfare Center in Skopje, Macedonia. Frontiers in Veterinary Science, 4, 238. https://doi.org/10.3389/fvets.2017.00238

Ribaudo, M., Kaplan, J. D., Christensen, L. A., Gollehon, N., Johansson, R., Breneman, V. E., Aillery, M., Agapoff, J. & Peters, M. (2003). Manure Management for Water Quality Costs to Animal Feeding Operations of Applying Manure Nutrients to Land. https://doi.org/10.2139/ssrn.757884

Ruml, A. & Qaim, M. (2021). Smallholder Farmers' Dissatisfaction with Contract Schemes in Spite of Economic Benefits: Issues of Mistrust and Lack of Transparency. The Journal of Development Studies, 57(7), 1106–1119. https://doi.org/10.1080/00220388.2020.1850699

Stanway, D. (2018, 24. October). China's NE farming belt accused of livestock pollution failures. Reuters. https://www.reuters.com/article/us-china-pollution-farming-idUSKCN1MY0DV

Teenstra, E. D., Vellinga, T. V., Aktasaeng, N., Amatayaku, W., Ndambi, A., Pelster, D., Germer, L., Jenet, A., Opio, C. & Andeweg, K. (2014). Global asessment of manure management policies and practices (No. 844; p. -). Wageningen UR Livestock Research. https://library.wur.nl/WebQuery/wurpubs/livestock-reports/485932

Westenbarger, D. & Letson, D. (1995.). Livestock and Poultry Waste-Control Costs. Choices. The Magazine of Food, Farm, and Resources Issues. https://www.semanticscholar.org/paper/Livestock-and-Poultry-Waste-Control-Costs-Westenbarger-Letson/4a8ce82d1ff840956bd8a44d82ec80db290f0035/figure/1

Winders, B. & Ransom, E. (2019). Global Meat: Social and Environmental Consequences of the Expanding Meat Industry. MIT Press. https://play.google.com/store/books/details?id=g7i0DwAAQBAJ

Annex

Expert Summaries

Paul Ssuna - Animal Welfare Competence Center For Africa

Paul has just begun a project to prevent the intensification of factory farms in Uganda. They are currently securing funding and hope to start the project very soon. He believes that government outreach and policy review are the most effective approaches. However, the existing laws on animal welfare are outdated and not strictly enforced. To address these issues, Paul is conducting research to appraise the current situation in Uganda, involving various stakeholders such as academia, the Ministry of Agriculture, and local communities. The research will then be used to inform policy to limit intensification. Paul stressed the importance of finding someone who is local to do this work, who understands the political process and has networks locally. He also mentioned that the main concern of politicians are related to economic growth and politics.

The process of policy review and implementation is similar across Africa. After successfully implementing changes in Uganda, Paul plans to apply the learnings to other African countries. The growth of factory farming in Africa has been influenced by multinational companies entering the market, leading local farmers to adopt large-scale farming practices. However, unlike the West, the intensification of farming has not significantly reduced the cost of animal products in Africa.

Paul believes that the trajectory of factory farming in Africa will not follow the same path as in the West. Although there has been increased awareness of animal welfare in Africa over the past two decades, most farms still practice majorly small-scale farming with poor welfare conditions for animals. The growth of factory farming is likely to plateau soon due to the limited local demand and reliance on exporting to neighboring countries.

The rising middle class is increasing the demand for animal products, however, due to increasingly known health concerns, this demand could platuea soon. Despite the rising middle class, the demand for animal products may not increase significantly due to health concerns. The consumption of beans and vegetables is still prevalent, and alternative proteins, such as soy, have gained popularity. However, affordability and accessibility remains a challenge for alternative protein sources.

In terms of receptiveness to animal welfare initiatives, communities are more concerned about providing basic necessities like food and healthcare for animals. The majority of animal products sold in retail markets are not sourced from factory farms but from small-scale deep litter systems. however, the large intensive farms supply the supermarkets where the majority of the middle-class buy. Uganda has one supermarket chain that only buys meat sourced from free range and good welfare farms About Us - Carrefour & Majid Al Futtaim Retail | Carrefour Uganda, others have no concern for welfare. Meat consumption is considered a status symbol in Africa, but local cuisines have numerous delicious vegetable dishes.

Solomon Onyango - The Donkey Sanctuary Kenya

Solomon Onyango, a veteran veterinarian and a passionate animal advocate who currently serves as the Country Director for The Donkey Sanctuary in Kenya, shared critical insights into the state of factory farming in Kenya and other LMICs. His background in animal welfare advocacy and community development provides a unique lens through which to examine this pressing issue.

Onyango identifies human indifference towards animals' suffering, along with a lack of comprehensive laws and enforcement mechanisms, as the major challenges faced by animal welfare in Africa, particularly in Kenya. Factory farming, although currently at an introductory phase and predominantly linked to poultry farming in Kenya, is under pressure to expand. Despite the high initial costs posing a significant barrier to this expansion, Onyango believes the industry is ripe for change and there's room to influence its future course.

Driving the intensification of factory farming is the surging consumer demand and a desire to lower costs. Onyango warns that this intensification, while economically appealing, results in significant animal welfare problems and health risks from poor sanitation in larger farms. With the current absence of policies or regulations to mitigate these issues, he calls for strategic interventions.

According to Onyango, the most effective strategies to halt or reduce the intensification of factory farming involve policy changes and public awareness campaigns. He sees animal welfare organizations, policymakers, and consumers as key stakeholders who can help resist the transition to factory farming.

Despite a growing awareness about animal welfare in the region, there remains a disconnect when it comes to attitude change, especially among politicians. They often counter animal welfare arguments with the need for food security and job creation, making the advocacy work more challenging.

As for local communities, their support for initiatives to prevent factory farming intensification is uncertain. The allure of cheaper animal products and job prospects offered by factory farming may win their favor. To counter this, Onyango suggests highlighting the negative impact of factory farming on human and environmental health to shift perspectives.

Unfortunately, data on the proportion of factory farms owned by foreign companies, particularly from China, is unavailable, which Onyango identifies as an area ripe for research.

Onyango recommends reaching out to Dr. Bahati of Africa Network for Animals and Dr. Yamo of World Animal Protection, as they lead the fight against factory farming in the region. Their experiences may provide valuable lessons.

Jean Claude Masengesho - Rwanda Animal Welfare Organisation

Jean Claude Masengesho, a veterinarian and the founder and director of the Rwanda Animal Welfare Organisation (RAWO), was trained in Austria and worked at the biggest veterinary hospital in Rwanda before starting his organization. His focus is on farm animal welfare, particularly concerning the adoption of chicken battery cages, which he argues are harmful to animal welfare and sustainability.

Two main issues in animal welfare in Rwanda and Africa at large are identified: lack of knowledge or compassion among the people, and a lack of regulations or standards in farming. These issues, according to Jean Claude, lead to poor animal welfare conditions.

Jean Claude notes that in Rwanda, conservation is prioritized over animal welfare. Factory farming is semi-intensive, with a growing trend towards intensification, attributed to land shortage and increased interest in livestock farming. Chinese companies in Rwanda also promote battery cages, contributing to their adoption. However, Jean Claude believes that the failures of some farmers who have tried the intensive farming system and the unsustainable nature of battery cages could help halt the growth of factory farming in Rwanda.

Despite the lack of formal regulations, some farmers have started moving their chickens awat from battery cages, recognizing that the intensive farming system is not sustainable. He has seen this system fail in several large farms, leading to unhealthy and sick chickens. He thinks that the argument for animal welfare needs to be framed in terms of sustainability and profitability to convince business-minded people. Jean

Claude observes a need for more research to prove the case for lack of sustainability and poor economics of caged farming systems in Africa, particularly in Rwanda.

Jean Claude’s work involves extensive education and awareness creation among farmers. He also engages with policymakers, though this is in the early stages. The organization, currently employing eight people, also works with dogs and livestock farmers as part of projects and governmental programs. However, they face challenges such as a lack of human and financial resources.

Reasons for farming intensification include the appeal of profit-making, the influence of Western or European farming methods, and the promise of efficient land usage. Jean Claude also mentions that Chinese companies push for intensification through their advertisements, projects, and donations.

Despite challenges, Jean Claude finds farmers and government officials receptive to RAWO's work. Farmers understand the concept of sustainability and express concern about issues like antibiotic usage in farming. There's also a market preference for eggs from free-range chickens. Jean Claude believes there is potential for similar work in Rwanda and neighboring countries like Burundi, Congo, and South Sudan.

The Rwandan government is investing heavily in livestock and agriculture as part of its development plan, introducing tax deductions on certain agricultural products and subsidies for animal insurance. The local community and citizens generally support these efforts, appreciating the current state of animal agriculture and having avenues to raise concerns if they are not getting necessary services.

Ayubu Nnko - Education for African Animal Welfare (Tanzania)

During a meeting, Ayubu Nnko, the director of Education for African Animal Welfare in Tanzania, provided crucial insights into the transfer and use of farming infrastructure from Western corporations to Africa, particularly focusing on the issue of cage farming.

Ayubu pointed out a troubling trend: when Western corporations transition to cage-free farming, the cages they formerly used often find their way to Africa. This not only perpetuates animal confinement practices but also fosters an environment where factory farming can flourish.

Ayubu's organization focuses predominantly on education as a means to combat these issues. By informing farmers about the implications and alternatives to such practices, they aim to promote more humane and sustainable farming methods in Tanzania.

However, this task is made difficult by the influence of multinational corporations. Ayubu noted that a significant amount of farming infrastructure, including cages, is sold to African farmers by these corporations, many of which are based in China. This direct equipment supply further encourages the continuation of factory farming practices on the continent.

Despite this, Ayubu highlighted that local food markets in Tanzania are mostly supplied by small-scale farmers. This suggests that traditional farming methods still hold sway in the region, allowing these farmers to adopt more humane practices before they shift towards intensive farming methods.

South American animal advocate

They provided valuable insights into the current state of factory farming, specifically intensive fishing, in Low- and Middle-Income Countries (LMICs) like Chile. They emphasized that these regions are often heavily neglected, a fact that becomes more apparent as foreign companies exploit their natural resources.

They singled out Norwegian fish farms in Chile as an example of this exploitation. According to them, these businesses run intensive fishing operations, causing significant environmental and health damage to local communities. Even more concerning, the profits from these operations don't benefit the local economy. Instead, the harvested fish are exported back to Norway, leaving the local economy and environment to deal with the fallout.

Finding a solution to this issue is not straightforward, as they highlighted. While unsure of the best approach, they stressed the kikneed for various strategies to tackle this problem effectively. This might involve policy changes, public awareness campaigns, legal action, or developing economically viable alternatives that can provide similar employment opportunities without causing such extensive environmental harm.

Significantly, they expressed their willingness to offer assistance, which suggests that they could provide a wealth of information and resources on this matter. Given their leadership role in a vegetarian advocacy organization in Chile, they likely have a deep knowledge and extensive network that could prove invaluable in addressing this issue.

Lynn Tan - Animal Advocacy Africa

Lynn's interview highlights the current state of animal advocacy in Africa, emphasizing that while there is considerable focus on wild and companion animals, less attention is

given to farm animals. Existing welfare standards are outdated and enforcement is inconsistent. Factory farming has intensified in some countries like Kenya, but the majority still rely on small-scale farming.

The source of factory farm investors remains unclear, but Synergia, an NGO, is working to prevent international banks from financing factory farming in Africa. Political advocacy appears to be the consensus among experts as the most effective approach for preventing intensification.

There is room for more effective organizations in the field, as most existing ones do not focus primarily on farm animals. International organizations are generally well received, but the receptiveness of direct work remains uncertain. Local founders of charities are important, but talent acquisition remains a challenge in Africa. Communities are receptive to animal welfare advocacy, but government response varies.

Eating meat is culturally associated with wealth and status in Africa, a trend that seems to be growing. People who care about animals may still eat meat and lean more toward welfarist positions rather than abolition. Strategies for promoting change should be tailored to individual advocates and their baseline concerns. Funding and talent acquisition are notable challenges for animal welfare organizations in Africa, while the influence of Western animal welfare standards on African policy is uncertain.

Kikiope Oluwarore - WHO and OneHealth

In the wide-ranging interview, Kiki offers insights into her work at the World Health Organization (WHO) and as the Founder of One Health and Development Initiative (OHDI). Her work involves implementing the One Health approach to improve preparedness and response to zoonotic diseases, antimicrobial resistance (AMR), and other One Health threats. With OHDI, she provides ad-hoc oversight on the One Health and Animal Welfare programs within and outside the country. In addition, she has previously consulted with organizations such as the Africa Network for Animal Welfare (ANAW) and the Africa Union – Inter-African Bureau for Animal Resources (AU-IBAR) on animal welfare research and interventions in Africa.

She identifies three core challenges facing animal welfare in Africa: poor knowledge and understanding of animal welfare, inadequate policy regulations, and a dearth of Afro-centric research. Misconceptions about animal welfare and its impact on One health, combined with a lack of localized research, exacerbate these challenges. Kiki has evidence that improving animal welfare improves long-term productivity, dispelling the largest myth for intensification. Interestingly, Kiki points out that while some

African countries have adopted animal welfare strategies, few have established legal frameworks to enforce these strategies, creating a gap between policy development and its actual implementation.

Kiki proposes adapting animal welfare principles to existing local systems and structures to address this. This approach necessitates a deep understanding of these systems through comprehensive research. She further emphasizes the role of animal agriculture in many African economies – with many still dependent on them for nutrition and socioeconomic livelihoods, highlighting the need to raise awareness about animal sentience and establish supportive policies.

On a more global scale, Kiki discusses the significant role that multinational companies play in funding intensive farming in Africa. These companies often implement practices that are banned in their own countries due to a lack of regulation in Africa. As a result, she underscores the need for policy advocacy alongside awareness campaigns to ensure long-term improvements in animal welfare.

Kiki also advocates for establishing a think tank focused on animal welfare in LMICs. This entity could provide an overview of current practices and conduct necessary research. She notes the importance of integrating animal welfare into the key messaging of organizations like the Food and Agriculture Organization and the World Bank, which provide substantial support to farmers but often overlook animal welfare. Believing that farmers are primarily interested in improving their work and lives, Kiki suggests that they would likely adhere to animal welfare standards if these were linked to technical and financial support often provided by these organizations.

Lucia Gomes Pereira - Sinergia Animal International

Sinergia primarily focuses on corporate campaigns and investigations related to animal welfare in Latin America and Asia. They employ both "good cop" and "bad cop" approaches in their campaigns, depending on the circumstances and partners involved. The organization recognizes the importance of research and contextual understanding before launching campaigns, particularly in regions with limited information on factory farming, such as Africa.

Sinergia has been reorganizing internally and experiencing rapid growth, with a focus on filling gaps and strengthening operations in Latin America. They collaborate with local organizations and provide training to individuals interested in starting their own organizations in the countries where they operate. The organization is part of a coalition pressuring development banks and private banks to change their policies regarding animal agriculture.

Their campaigns primarily focus on online awareness-raising, but they plan to expand to street demonstrations and more visual campaigns with sufficient funds. They launched a campaign against the World Bank to prevent a loan to a Brazilian company, which raised public awareness but did not succeed in stopping the loan approval. Sinergia acknowledges the challenges of obtaining information about the World Bank's decisions and believes someone needs to challenge their actions.

Sinergia employs a diversified approach to address factory farming, targeting both the political and investment bank sides. They work on raising awareness, changing laws, and engaging with companies. Challenges include working with large multinational corporations that own many farms in the regions they operate, as well as limited information on distribution patterns of farm products.

Starting a new charity to prevent the intensification of factory farming in LMICs should consider incorporating bad cop campaigns, raising awareness, pressuring institutions like the World Bank, and collaborating with existing organizations to enhance impact.

Measuring the impact of bad cop campaigns is challenging for Sinergia. They use indicators like website access, media mentions, and social media interactions but struggle to attribute specific outcomes. They engage in pre-campaign work by notifying targeted companies in advance and collecting survey data from employees within those companies to gauge the impact and obtain feedback. They aim to establish a direct correlation between campaign expenditures and the impact on animal welfare to demonstrate cost-effectiveness.

Merel van der Mark - Sinergia, BankforAnimals

Merel, an environmental activist, has a dual role at Sinergia Animal International. Her part-time role at Sinergia includes managing the BankForAnimals campaign, which lobbies commercial banks to adopt animal welfare policies. Additionally, within The Stop Financing Factory Farming Campaign, organised by a coalition of animal welfare organisations including World Animal Protection, she works to curb the financing of factory farming by development banks, like the World Bank/ IFC.

Despite severe resource limitations, with Sinergia itself dedicating only one FTE and the broader coalition comprising about 10 FTEs, they have managed to make strides. They use the Early Warning System to automate the process of identifying relevant loans linked to factory farming, which helped challenge around 10-15 loans made by banks over the last few years

Merel underscores the strategic importance of targeting development banks for their precedence-setting effects, even though they don't provide the majority of the financing to the industrial livestock sector. Their taxpayer-funded nature and commitment to Sustainable Development Goals make them susceptible to public pressure. Though the overall success rate remains below 10%, the cancellation of a loan to Marfrig, Brazil's second-largest slaughterhouse, was a notable victory. There may be an upcoming reevaluation of the performance standards at the World Bank, which guides all of their loans, including ethical policies; this may be an excellent policy window, but it is unclear when it will happen yet.

Simultaneously, commercial banks, particularly those with high reputational risks, are crucial targets, as they provide the majority of financing to the livestock industry. Banks in middle and low-income countries, due to their significant roles in financing sectors like agriculture and industrial livestock, and their interdependent influence on politics, is an important stakeholder to curb LMIC intensification.

Merel's strategy includes an argument against large-scale meat production, highlighting its redundancy in feeding the world, and proposing the more economical and environmentally friendly use of plant-based foods for direct human consumption. Despite its merits, this argument has met with resistance, with banks showing more receptivity to environmental over animal welfare concerns, making it more feasible to campaign against environmentally damaging projects like beef production due to its association with deforestation.

Data gathering involves using financial databases like Bloomberg or Refinitiv for larger companies, while traditional approaches like annual report analysis are used for smaller ones.

Merel is concerned by more investments being driven by chinese banks and engaging with Chinese banks has been challenging due to their lack of sensitivity to reputational risks and the lack of robust Chinese animal welfare organizational partners. However, she is excited by the focus on Sub-Saharan Africa as there is substantial development finance.

Merel emphasizes that there is ample room for a new organization to join the fight. The most significant need, however, is for funding. Fundraising for this kind of work has been challenging due to its indirect nature and the difficulties in measuring its impact.

Philip Howard - International Panel of Experts on Sustainable Food Systems and Michigan State University

Philip Howard's research primarily centers on the consolidation trends within food systems. During the interview, he describes the food system as resembling an hourglass—millions of farmers at the top, billions of consumers at the bottom, and a handful of firms exercising control over the distribution and processing of food in the middle. Over time, Howard has charted the global expansion and strategies of these dominant firms.

To counteract these consolidation trends, Howard proposes two overarching strategies: fostering alternatives that allow farmers to sell directly to consumers, thereby bypassing the 'hourglass,' and scrutinizing the role of governments in this consolidation process. According to Howard, government support and subsidies significantly contribute to these large firms' power. Removing these subsidies could theoretically hinder these corporations' expansion. However, when one subsidy is eliminated, these firms usually find an alternative subsidy or advantage. Howard cites a study that shows big firms net a $200 return for every dollar spent on lobbying, reflecting the entrenched power of these corporations.

Howard is also wary of the rapid proliferation of ultra-processed foods in middle-income countries. Big corporations such as Nestle displace diverse, independent food producers with their products by leveraging local government policies. This displacement creates negative economic and health impacts. Although the entrance of these corporations can offer some benefits, the majority of the profits typically flow back to the headquarters of these firms, leaving local economies in a worse position.

Small farmers, in Howard's perspective, often fall prey to the strategic maneuvers of big firms. These farmers lack organization and power, making them easy targets for big firms, which profess to benefit small producers while frequently exploiting them.

In terms of funding for industrial agriculture, Howard explains that corporations in lower-middle-income countries secure financing from various sources, including government-backed banks, major international banks like Barclays and Goldman Sachs, and large investment funds like Vanguard and Fidelity.

The centralization of food production brings a host of drawbacks, according to Howard. These include a decrease in food diversity, the externalization of environmental and farmer harms, and the concentration of decision-making power in a

few firms—a system he regards as inherently undemocratic. Trade agreements can often reinforce this power structure, with intellectual property protections and other corporate rights limiting competition.

While Howard acknowledges the potential influence of consumer behavior on the industry—particularly through supporting initiatives like Fairtrade—he warns against income inequality and the risk of corporate greenwashing undermining this approach. Regarding animal welfare, he emphasizes that the high-density conditions of industrial farming systems, coupled with practices like using growth hormones and antibiotics, create extreme stress for animals.

Lastly, Howard asserts that without multinational corporations, harmful farming practices might persist on a smaller scale but would likely be less common. The absence of these corporations could also open up opportunities for innovative and beneficial farming practices to flourish. However, he remains skeptical about policy advocacy's effectiveness given the entrenched power of large firms, underlining the importance of creating direct connections between farmers and consumers.

Matthew Hayek - New York University

Mathew stresses the trade-offs of factory farming: Factory farming offers efficiency in environmental terms, but this comes at a significant cost to animal welfare. Matthew thinks that the historic increase in animal product consumption is not only due to demand increase, but may be attributed to the supply-side efficiency increases of factory farming, leading to cheaper products and marketing leading to artificially increased demand. However, Matthew thinks that its positive environmental impacts (mainly in terms of land use and greenhouse gase reduction) might be overestimated by up to 40%.

Distinction between intensification and industrialization: The FAO differentiates between intensification (increasing production efficiency) and industrialization (confined, indoor factory farming methods). Semi-intensification could improve productivity without incurring the welfare costs linked to factory farming.

Challenges and policy implications: Matthew points out that there are path dependencies and subsidies causing major challenges in transitioning away from factory farming to pasture-based systems, once they are established. It is much easier to prevent the intensification from happening in the first place, since it doesn’t come with the political baggage of job losses and cultural inertia. As such, improving outdoor-based intensive systems might be a more pragmatic strategy. Some organizations, despite their good intentions, may inadvertently accelerate the

introduction of factory farming, underscoring the need for new and more diverse voices in policymaking.

High-yielding alternatives: The best way to mitigate factory farming's impact is by implementing high-yielding alternatives. The potential alternatives shouldn't have a drastic yield decrease compared to factory farming. Silver pasture and Integrated Crop-Livestock Systems are high-yield, non-industrial farming practices worth exploring. High welfare standards and food security can be maintained through such systems. Livestock isn't necessarily essential for food security; instead, a high-yielding food system should be promoted.

Domestic vs Exported Production: Remarking on meat production in factory farms in LMICs being exported on a large scale by multinational companies, Hayek also observes a divide between rural and city areas, where the latter tend to have more purchasing power and better nutritional intake.

Alternative proteins currently face marketing challenges, especially within sustainable development communities. Additionally, Matthew thinks that companies like Impossible Foods and Beyond Meat generate urban jobs, which perpetuate the aforementioned inequalities and concentration of food systems.

Mehroosh Tak - Royal Veterinary College London

One of the key themes that Mehroosh mentions is the centralization of power in global food systems. For example, Mehroosh reveals that three global firms predominantly control the poultry genetics market. This dominance not only impacts the type and price of poultry consumed worldwide but also has implications for the biodiversity of livestock, as the same few strains of chicken are produced globally. This lack of genetic diversity can contribute to biosecurity threats like avian flu, which is a significant concern for animal health and food security.

Furthermore, Mehroosh points to the significant role of international finance in shaping livestock production systems. Entities like the World Bank have been instrumental in supporting and promoting industrialized and intensified farming practices. These practices often lead to the consolidation of farming industries under a few large firms, resulting in structural inequalities. Smallholder farmers may find themselves tied to risky contracts and faced with poor labor conditions. A potential charity could

prioritize understanding these financial influences and lobbying such organizations to diversify their investments towards more sustainable and equitable farming practices.

Mehroosh mainly studied these livestock production systems in the context of India and Bangladesh but she suggests that the structures and systems could provide valuable lessons for Sub-Saharan Africa, even though each country will have unique characteristics.

A crucial aspect of Mehroosh's perspective is her advocacy for a systems-level approach. She emphasizes that the issues surrounding food security, animal welfare, and local economies are interconnected and cannot be viewed in isolation. Thus, the charity could adopt a systems-level approach in its problem-solving and advocacy efforts, aiming to break down the silos that often hinder effective policy development and implementation.

To break the cycle of power concentration and intensification, Mehroosh proposes diversifying ownership and production practices. This approach could involve promoting diversified strains of animals for farming and encouraging more players to participate in the food system. Moreover, the charity could play a significant role in amplifying the voices of those often unheard in policy discussions, thus ensuring more inclusive and representative policies.

The potential power of celebrity influence in driving policy changes also emerges in the interview. Celebrities can engage with and influence policymakers, and their involvement could bolster the charity's advocacy efforts.

The final segment of the interview delves into the necessity of decentralization and diversification in the food system, inequalities in meat production and consumption, the limitations of consumer choice, and the accessibility of affordable and quality food. Mehroosh argues that consumers' choices are often confined by what is cheap and available, creating a disparity between those who can afford "better" options and those who cannot. She also highlights significant disparities in meat production and consumption worldwide, leading to imbalances in the availability of meat in different regions and subsequent nutritional issues.

In essence, the charity should consider adopting a multi-faceted approach. This approach could involve advocating for diversified and decentralized farming practices, lobbying global financial institutions, facilitating inclusive policy discussions, leveraging celebrity influence for advocacy, and addressing systemic inequalities in food production and consumption. This approach aligns with Mehroosh's emphasis on

a systems-level perspective and her insights on the interconnectedness of factors impacting industrial farming, animal welfare, and food security.

Carmen Lee - Tiny Beam Foundation

Carmen Lee, founder of the Tiny Beam Fund, has been investigating the intensification of animal farming for over 40 years, with a focus on Asia and China. The foundation concentrates on three main areas: the study of animal farming in Low- and Middle-Income Countries (LMICs), industrial production analysis, and academic research promotion.

Carmen's insights point to a complex system of factors contributing to the intensification of factory farming in LMICs. Key drivers include government subsidies and support, large agribusiness corporations' desire for profit, demand manipulation, and policies favoring larger farms. She emphasizes that each LMIC is unique and requires a nuanced understanding of its specific drivers and reasons for industrialization.

Carmen highlights the importance of investment, particularly from organizations like the World Bank and corporations. Governments in Southeast Asia are pushing for the industrialization of farming for trade and export purposes, working closely with corporations. This collaboration involves subsidies, favorable loans, and other financial incentives.

To combat farm intensification, Carmen suggests potential strategies such as political advocacy - making a case for the downsides of industrial farming, supporting small farmers for sustainable farming. Advocating to financial organizations like the World Bank is potentially high impact, but she doesn’t think the world bank is very persuadable.She is most excited for a new think tanks in raising awareness, partnering with academics and other groups, and providing research and information necessary for advocacy work. Moreover, think tanks can provide a neutral platform for dialogue with powerful entities without being dismissed due to an advocacy stance. The think tank can engage with farmers, academics, advocacy organizations, and industry experts. She also emphasises the value of gaining a comprehensive understanding of the issues in a particular country or region, highlighting the need to read academic papers, trade publications, and talking to experts.

Carmen acknowledges that meat consumption is a factor in the intensification of factory farming, but she believes that government subsidies and support, along with agribusiness corporations' drive for profit, play a more significant role. She also

highlights how meat industry subsidies in many countries allow companies to produce and sell meat at a lower cost, making it difficult for smaller players and plant-based alternatives to compete.

Carmen suggests that Brazil and Southeast Asian countries may be promising focus areas due to their significant meat industries and being on the cusp of industrialization. However, she advises against focusing on China due to its complexity and Africa due to multiple barriers to industrialization, she doesn't think Africa would intensify that much.

Policy Case for Animal Welfare and Reduced Animal Agriculture

Here, we list some of the arguments the charity could leverage to convince a policymaker to adopt pro-animal welfare policy changes. This is roughly in the order of importance.

Counterarguments to policymaker concerns

1. Addressing Food Security
    - Policymakers often perceive industrializing animal agriculture as a solution to food security concerns in LMICs. However, increasing reliance on animal agriculture can actually decrease a country's food security since animal protein is an inefficient way to feed the population. (Winders and Ransom, 2019, Casssidy et al., 2013)
    - Alternatives such as Integrated Crop Livestock Systems (ICLSs) increase total agricultural yield (plants and animals) without sacrificing animal welfare and provide resilience to extreme weather events. (Peterson et al., 2020)
    - At lower levels of intensification, there is a positive correlation between good animal welfare practices and productivity. Well-managed animals complying with higher welfare regulations yield better meat or egg production (Bolt and George, 2019; Dwyer, 2020)
    - Good animal welfare results in less stressed animals, reducing injury rates, enhancing productivity, and improving the nutritional content and quality of animal by-products. Products of stressed animals produced under poor conditions are of inferior nutritional quality and spoil faster. (Evans and Miele 2007).
    - In South Africa, egg pricess rose 20 percent in 2017 after an outbreak of Avian flu, causing a decreasse in laying flock by nearly 15%. In 2021 there was also

another devastating outbreak, followed by the global outbreak in 2022 and 2023, causing egg prices to soar worldwide.

2. Socioeconomic Factors
    - Intensification of the industry can risk exports as many Western countries ban sales of caged products. LMICs exporting to EU markets must show good animal welfare practices to access these markets. This is particularly relevant as the EU looks set to ban all caged production in the EU following the End the Cage Age European Citizens' Initiative.
    - Multinational companies take advantage of the lack of animal welfare legislation and set up big, caged farms and outcompete local farmers, primarily exporting products to wealthier countries, thereby stunting the country's economic growth.
    - Most contract farmers in Ghana regret participating in the contract scheme and would prefer to exit if possible (Ruml and Qaim, 2020). Its benefits to farmer income are also questioned (Meemken and Bellemare, 2019), but the literature generally agrees that it increases farmer incomes and productivity (Arouna, 2021).
    - There were large farmer protests in India against the farm bills that deregulated contract farming.
    - Studies from Vietnam, China, and Turkey cite the adverse socioeconomic effects of agricultural industrialization, including increased unemployment, smallholders losing their livelihood, increased inequality, and a rise in rural-to-urban migration. (Lam et al., 2019)
    - Animal welfare aligns with growing consumer concerns, improving access to local and international trade, contributing to GDP, supporting sustainable livelihoods, and reducing the budgetary burden on animal health.

Positive arguments

3. One Health Approach
    - This integrated approach aims to balance the health of people, animals, and ecosystems, recognizing their close linkage and interdependence. This approach would argue that animal welfare is important due to its interdependencies with human health, economic stability, and environmental health. It is accepted and championed by WHO, CDC, FAO, OIE, UNICEF, World Bank, USDA, and more. (Mackenzie and Jeggo, 2019)
    - Experts said that African stakeholders are particularly persuaded by One Health arguments.
4. Environmental Considerations

- Improved animal welfare practices, as alternatives to factory farming, can reduce the contribution of animal waste to greenhouse gasses and minimize land degradation.
- Evidence from Vietnam, Brazil, Turkey, and China shows the negative environmental impacts of industrialized animal farming, such as odor increase, biodiversity reduction, atmospheric and water pollution, deforestation, overgrazing, greenhouse gas emission, and excessive use of pesticides. (Lam et al., 2019)

5. Health Risks

- After COVID-19, policymakers recognize the significant risks of zoonoses originating from animal reservoirs. Factory farms can be breeding grounds for highly pathogenic viruses, and their use of antibiotics can hasten a post-antibiotic era (Lefrançois et al., 2023, Alonso and Schuck-Paim, 2020).
- The many instances of avian influenza breakout over the last few years, with a mortality rate of around 53%, is an example of a serious health risk from animal farming. In 2023, Ecuador reported it's first case in January 9.
- Improved animal welfare reduces animal stress, enhances immunity, and reduces antibiotic use, decreasing antimicrobial resistance (AMR).
- It also supports human mental health and social well-being. Workers in farms with poor animal welfare report having worse mental health. (Nuvey et al., 2020)
- Examples from Vietnam, Mexico, and China illustrate the public health risks, such as increased zoonotic diseases, antibiotic resistance, respiratory health issues, and infectious diseases due to poor animal agriculture practices. (Lam et al., 2019)

Which animals produce the most waste - implications for SARP

Taken from information in Loyon (2018):

analysis of per animal waste

(tons)	Solid	Slurry	Droppings	Number	Solid per animal	Slurry per animal	Droppings per animal	Total per animal (tons)
Cow	68700000	18200000	0	19500000	3.523076923	0.9333333333	0	4.456410256
Pig	828000	25400000	0	13900000	0.05956834532	1.827338129	0	1.886906475

Chicken	2200000	2500000	600000	221600000	0.009927797834	0.01128158845	0.002707581227	0.02391696751

- Environmental regulation for waste management on a weight basis would have some SARP concerns in that it would cost the industry more per animal to treat cattle waste than chicken waste.
- However, the cost of management may still be different with different animals.

This is an older paper from 1995 of estimated costs to farms when the US introduced the farm bill to regulate pollutant disposal (Westenbarger & Letson, 1995).

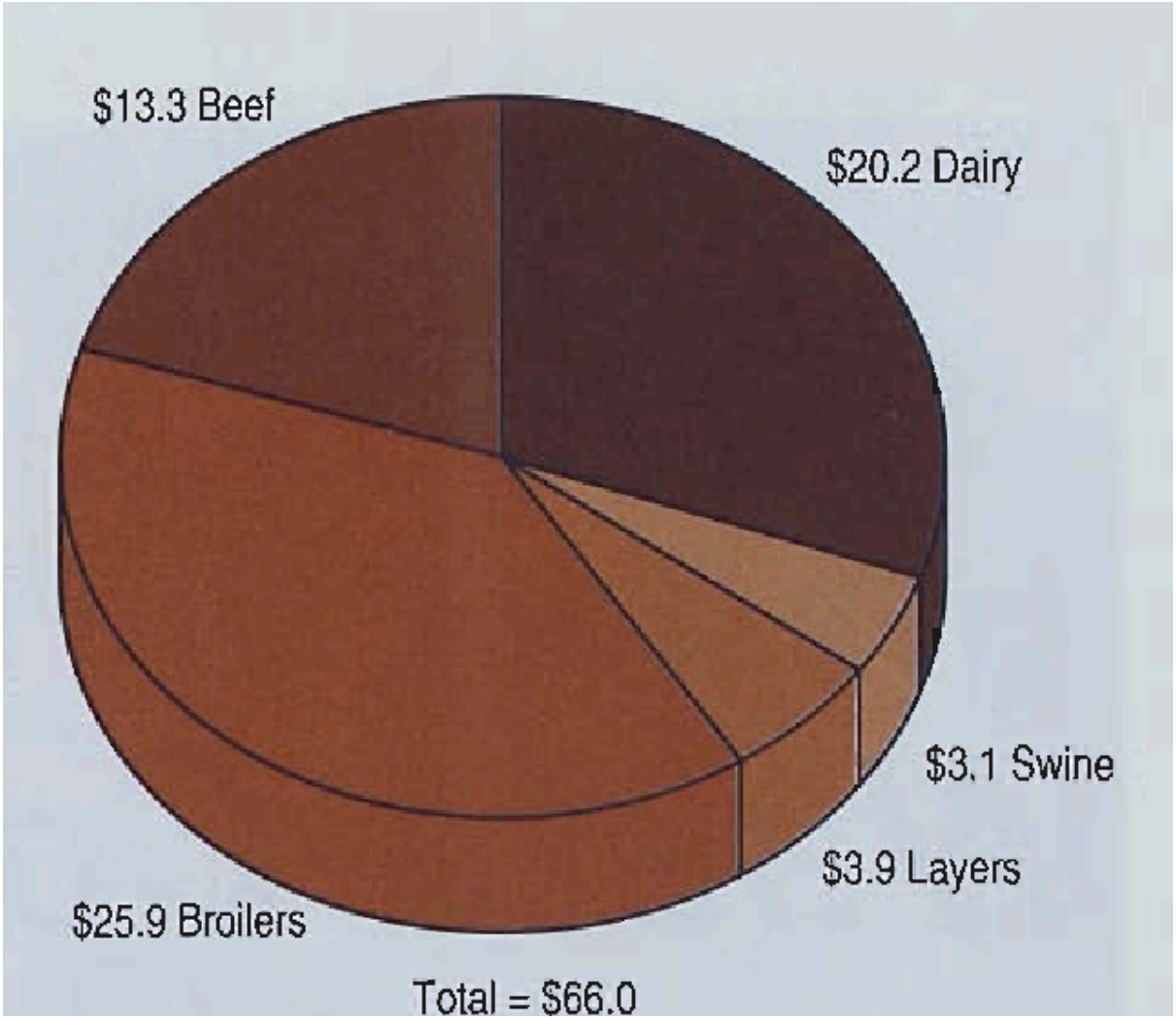
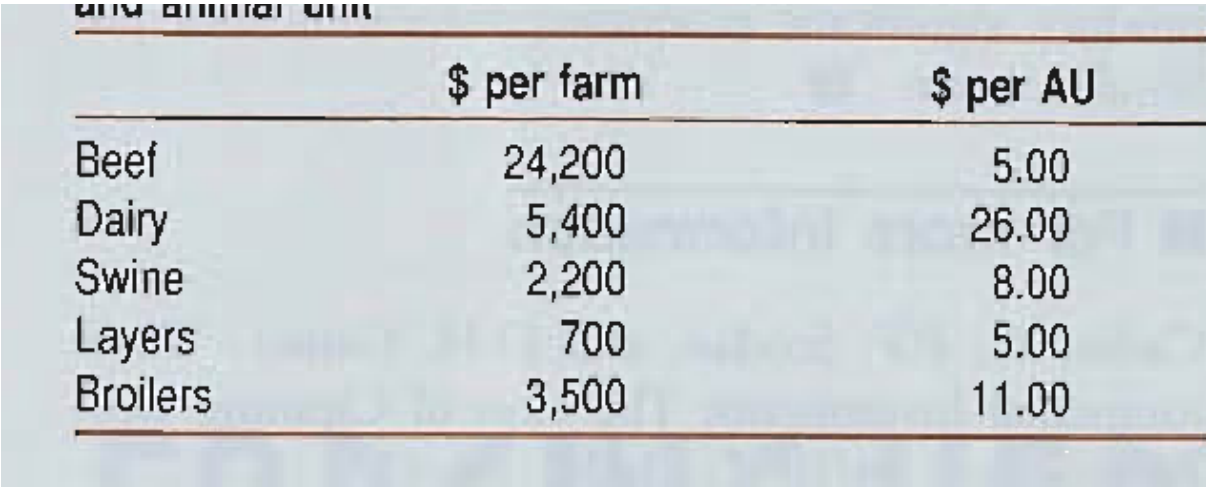


Figure 15. Estimated annual Clean Water Act compliance costs based on CZARA provisions, by animal type, 1990 (million $) (Westenbarger & Letson, 1995)



	$ per farm	$ per AU
Beef	24,200	5.00
Dairy	5,400	26.00
Swine	2,200	8.00
Layers	700	5.00
Broilers	3,500	11.00

Table 3. Estimated annualized compliance costs per farm and animal unit (Westenbarger & Letson, 1995)

Cases of industry path dependence

QWERTY Keyboards
Perhaps the classic example used to describe path dependency. It was initially designed to slow down typists and prevent jamming in early mechanical typewriters. Even though newer, more efficient keyboard layouts have been created since QWERTY remains dominant due to the costs of switching. (David, 2007)

Technological Path Dependence
VHS vs. Betamax is another classic case. Even though many considered Betamax technically superior, VHS won out due to marketing, pricing, and the network effects of having more VHS tapes available in video rental stores.

Social conventions
Social norms and conventions, such as driving on the left or right side of the road, are also examples of path dependence. Once established, they tend to persist because it's costly and challenging to coordinate a switch to an alternative.

“Leapfrogging”
"Leapfrogging" technology refers to the idea that areas with poorly-developed technology or infrastructure can move directly to modern technology without going through intermediary steps. This concept often applies to developing countries where new technologies can be adopted without the burden of transitioning from outdated systems.

Mobile and Landlines

In Africa, the costs and logistical challenges of establishing landline phone networks were prohibitive. This challenge meant that a large portion of the population didn't have access to reliable telecommunication. However, the advent of mobile technology allowed Africa to leapfrog the landline stage of development directly into the age of mobile telecommunication.

Renewable Energy
In the energy sector, an example of leapfrogging is the growing use of solar home systems and mini-grids in rural areas of India and Sub-Saharan Africa. By leapfrogging directly to renewable solutions, these communities can access electricity more quickly and cheaply without the significant investments needed to extend the power grid.

Overall view: This is weak evidence in favor of the idea that it is more tractable to prevent the intensification practices rather than reverse them.