



Beacon

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A series of key messages
from works by academics
useful for tackling
industrial animal agriculture
in developing countries

A project of Burning Questions Initiative

Issue 1 | October 2023

Eight studies are featured. They cover:

1. Government policies shaping aquaculture.
2. Intensive and extensive livestock production in China.
3. Large investors' interest in animal welfare.
4. Environmental pressures from different foods.
5. Implementing international animal welfare standards.
6. Cage-free egg production in China.
7. Game meat production in South Africa.
8. Meat consumption reduction in Brazil.

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1

Naylor, Rosamond, Safari Fang, and Jessica Fanzo. "A global view of aquaculture policy." *Food Policy* 116 (2023): 102422. [link](#).

Government policies in LMICs have been instrumental in shaping their aquaculture sectors

LMIC governments have encouraged rapid expansion of their countries' aquaculture sectors for the purpose of food security and economic development, paying less attention to problems such as pollution and overuse of antimicrobial drugs.

- A 2023 study by researchers at Stanford and Johns Hopkins Universities gives an overview of policies related to aquaculture globally, with a deeper investigation of *Bangladesh, Chile, China, and Zambia*.
- The authors analyze how policy has influenced aquaculture's growth, benefits and drawbacks in different countries.
- They find that LMICs in general have adopted policies that favor industry growth for the purpose of development and food security.
- Some countries have also taken steps to ensure that the economic benefits of aquaculture are distributed widely, including to the very poor.
- However, few policies have been implemented to guarantee protection of the environment and natural resources, and to maintain animal health and prevent misuse of antimicrobials.



Why is this academic study particularly useful for addressing "burning questions"?

- The study sheds light on "Burning Question" GOV 2; in particular, "Are government policies and value chain activities significant and influential drivers [of industrial animal agriculture in LMICs]?".
- Information in this study can be used as evidence that government forces are indeed driving aquatic animal production in LMICs, and as pointers to help with formulating realistic policy interventions.
- For example, given that policies encouraging aquaculture often aim at improving livelihoods and food security, efforts to reduce the industry's social and environmental harms may need to include alternative solutions that also promote nutrition and economic well-being.

Deeper dive

1. The objectives and outcomes of aquaculture policies in LMICs have differed from country to country.

Bangladesh

- In Bangladesh, the government partnered with international organizations in the 1980s and 1990s to invest in infrastructure, technology, and feed production.
- In the 2000s, the government made a series of policy decisions, such as allowing the introduction of lower-value species, and integrating aquaculture into nutrition planning, that made fish cheaper and more widely available.
- Fish now makes up 60% of the animal protein consumed in Bangladesh, and poor households now have increased access to aquaculture products.
- However, industry development has been prioritized over environmental protection. Saltwater intrusion has affected agriculture, pollution has impacted inland fisheries, and the destruction of mangrove forests has compromised the protection of coastal communities from storms and floods.
- The experience of Bangladesh illustrates that government policies can shape the growth of aquaculture, but also highlights the risk of neglecting environmental considerations.

Chile

- The gap between industry growth and government regulation has been particularly pronounced in Chile.
- Starting in the early 2000s, Chile's government encouraged the salmon aquaculture industry to grow at a very fast rate, aiming to double production by 2012.
- Raising salmon for export was intended to (and did) provide jobs in remote, low-income communities.
- The rapid growth was accompanied by very little regulation, allowing high concentrations of poorly-managed facilities to emerge.
- In 2007-8, a massive disease outbreak caused the virtual collapse of the industry. Routine overuse of antimicrobials has made it difficult to recover from subsequent disease outbreaks, as well as posing a human health risk.
- The country is now attempting to implement a more balanced set of policies, but factors including a lack of scientific knowledge, uneven enforcement, and pushback from the salmon industry and its financial backers have complicated the situation.

2. Why do governments in the Global South promote and regulate aquaculture?

Governments do that for a variety of reasons:

- In the Global South, aquaculture is often viewed as a tool to improve food security, livelihoods, and general economic growth.
- At the same time, raising aquatic animals can have negative effects such as pollution, disease outbreaks, and competition for water. In principle these outcomes can be prevented or mitigated by appropriate regulations.
- As the examples of Bangladesh and Chile make clear, aquaculture has effects in many domains. Policymakers need to consider the sector from the perspectives of nutrition and food security, equity, environment, public health, and more. The policy choices they make help to shape the trajectory of the sector and how it impacts their citizens.

3. There is yet more about government involvement to unpack

In addition to juggling all the considerations already mentioned, LMIC governments face extra challenges:

- Creating a balanced set of policies requires coordination between numerous government bodies. However, governments, especially in LMICs, often lack the capacity to do this.
- Different agencies may have inconsistent priorities, and may compete for leadership, information, and financial resources.

- A lack of knowledge, data, and analytical skills among agency personnel can also contribute to these problems.

2

Cheng, Mingjin, Jiawei Quan, Jiaheng Yin, Xuewei Liu, Zengwei Yuan, and Lin Ma. **"High-resolution maps of intensive and extensive livestock production in China."** *Resources, Environment and Sustainability* 12 (2023): 100104. [link](#).

Industrial livestock production systems are spreading but not yet dominant in China

New maps of livestock production in China suggest that industrial production systems are widespread but not yet dominant. 'High-rises for pigs' reported in Western media are rare anomalies so far, and strategies for dealing with industrial animal production in China should recognize that it is spreading but not yet fully entrenched.

- Researchers have created maps of "extensive" (low-density) and "intensive" (landless, high-density) production across China.
- The definition of "intensive" in this study covers large, Western-style, confined animal feeding operations (CAFOs), and more significantly for Western readers, *also smaller farms* with as few as 50 cattle, 500 pigs, or 10,000 birds.
- In contrast to countries like the USA, where almost all pigs and poultry are raised in CAFOs, in China *only around half* of these animals are currently in intensive systems.
- Strategies to tackle the negative impacts of industrial animal production in China should be tailored to a situation in which CAFOs are in the process of being built and normalized, but are not yet completely dominant.



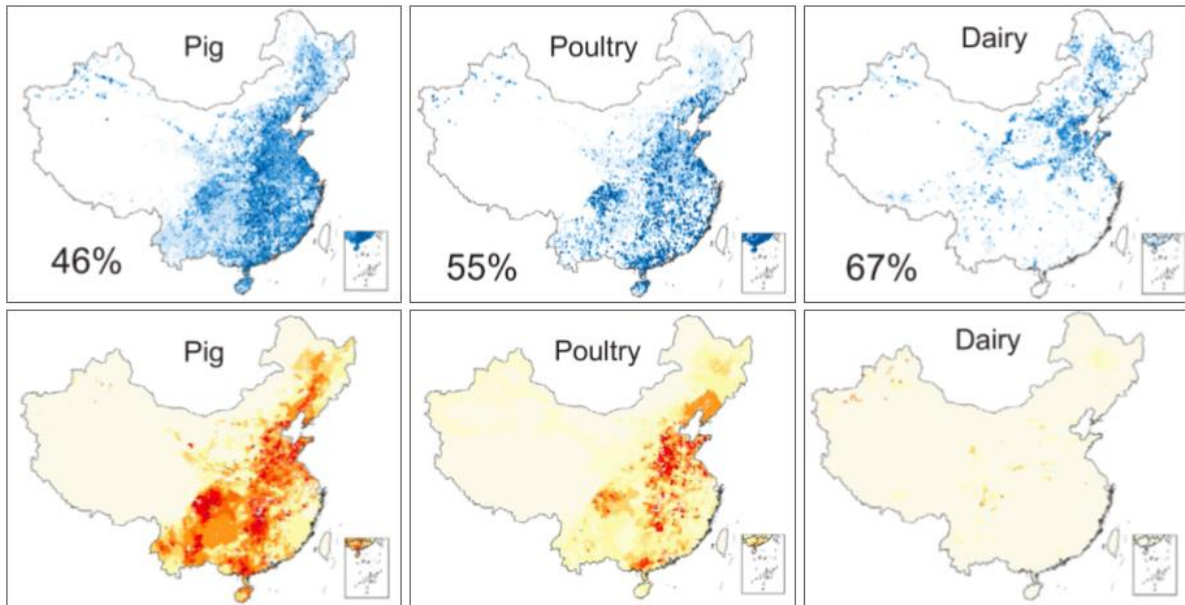
Why is this academic study particularly useful for addressing "burning questions"?

- This paper is relevant to "Burning Question" PROD 2; "What do we know about the current status and growth of industrial animal agriculture in LMICs, including the prevalence of industrial practices (versus other systems), the number of animals involved (by species..... "
- The new study presents high-resolution (1 km), continuous maps of extensive livestock production. It also pinpoints intensive facilities at specific locations.
- The paper gives the relative percentages of animals in intensive and extensive systems, for different species and types of animal.
- It also briefly discusses the reasons why intensive farms tend to be located in particular areas.

Deeper dive

1. Intensive pig, poultry, and dairy farms are concentrated around human population centers

- The researchers find that 67% of dairy cattle, 55% of poultry, 46% of pigs, 26% of beef cattle, and 15% of sheep and goats were farmed intensively as of 2017.



Blue = intensive; Red = extensive

Excerpted from:

High-resolution maps of intensive and extensive livestock production in China

Author: Mingjin Cheng, Jiawei Quan, Jiaheng Yin, Xuwei Liu, Zengwei Yuan, Lin Ma

Publication: *Resources, Environment and Sustainability*

Publisher: Elsevier

Date: June 2023

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- The high fraction of dairy cattle in intensive systems is probably because China does not have a tradition of extensive milk production.
- There are many intensive farms in locations with rapid human population growth, particularly around dense population centers in eastern China. This places them close to markets and reduces transportation costs.
- Unlike extensive farms, high-density, landless systems can exist in peri-urban locations where land prices are high.

2. It is *not yet too late* to prevent industrial animal agriculture becoming fully dominant in China

- Non-industrial systems are still prevalent in China. It is important to learn about these systems and the challenges they face if one does not want to see them eclipsed by the industrial model.
- Advocates and researchers could partner on projects that use maps like these to better demonstrate industrial livestock's negative impacts in China and other LMICs.

- Such projects could include modeling the spread of infectious animal diseases or monitoring air and water pollution from intensive farms, as well as looking more closely at the factors driving the expansion of industrial food animal production.

3. Tracking the status and growth of industrial food animal production is surprisingly difficult

- In any country, information about food animal production facilities may be outdated, inaccessible to the public, or may not distinguish between industrial and non-industrial production. Researchers must therefore devise methods of obtaining useful information from imperfect data.
- Here, the authors collected public statistics about the number of animals in Chinese provinces, cities, and counties. They then used a machine learning model to distribute the animals into 1 km pixels. This allowed them to create maps of extensive livestock production for different species, with finer spatial resolution than the original data.
- To locate intensive farms the researchers started from government farm registration records. By combining farm locations and livestock population records, they were able to identify farms that were likely to use the intensive model.

4. There are still uncertainties, open questions, and complexities

- This research is a significant step forward in understanding the status of industrial food animal production (IFAP) in LMICs. However, it is based on models, approximations, and assumptions that cannot perfectly represent reality. The results should be taken as useful guidance rather than final answers.
- The paper is a snapshot in time for 2017; it doesn't reveal how quickly IFAP has been spreading before or since.
- There is no official, global definition of IFAP (or other systems). This means that different researchers are likely to define farming systems in different ways, and apples-to-apples comparisons between studies are not straightforward.

3

Brice, Jeremy, George Cusworth, Jamie Lorimer, and Tara Garnett. **“Immaterial animals and financialized forests: Asset manager capitalism, ESG integration and the politics of livestock.”** *Environment and Planning A: Economy and Space* 54, no. 8 (2022): 1551–68. [link](#).

Pension funds and other large, multi-sector investors may have little incentive to urge companies to improve animal welfare

Large investors have pressured companies to reduce deforestation, but they have been less inclined to improve farm animal welfare. Why? Deforestation poses systematic risks across multiple industries, and large, multi-sector investors have an incentive to reduce portfolio-wide risks. They have less interest in specific ESG (environmental, social, governance) issues affecting single industries such as agribusinesses.

- “Universal owners” are large investors (such as pension funds) that invest in companies across many different sectors and industries. Because they own such a wide variety of companies, they are concerned that the negative environmental or social effects of one type of company in their portfolio may reduce the value of the *entire* portfolio.
- Tropical deforestation contributes to climate change, and climate change involves multiple issues and poses risks to a range of industries. Universal owners have therefore pressured companies to avoid deforestation in their supply chains, including in meat and animal feed supply chains.
- In contrast, farm animal welfare is a single issue confined to agribusinesses, and this *specificity* does not pose systematic, portfolio-wide risks. So, universal owners have done much less to improve farm animal welfare in the companies they own.
- This paper also argues that universal owners have helped to “financialize” livestock-related ESG matters, packaging matters to do with livestock chiefly as financial problems that will affect the future value of assets, and filtering out other considerations. Animals themselves, and ethical issues involving them, are not given any place within this financialized framework.
- Those concerned with farm animal welfare should be aware of this tendency towards financialization when deciding whether and how to engage with universal owners.

4

Halpern, Benjamin S., Melanie Frazier, Juliette Verstaen, Paul-Eric Rayner, Gage Clawson, Julia L. Blanchard, Richard S. Cottrell, et al. **“The environmental footprint of global food production.”** *Nature Sustainability* 5, no. 12 (October 24, 2022): 1027–39. [link](#).

Environmental pressures generated by food production vary greatly according to the type of food and where it is produced

A recent paper presents global maps of greenhouse gas (GHG) emissions, freshwater use, excess nitrogen plus phosphorus, and habitat disturbance generated by food production. The maps reveal large variations in these four environmental pressures across the world and for different food types, implying that a variety of solutions will be needed to suit different places and contexts.

- In addition to individual and total environmental pressures, the authors also calculate “environmental (in)efficiencies” for numerous foods. These represent the sum of the four pressures divided by tonnes of food produced, protein content, or energy content.
- Globally, *pigs, beef, rice, and wheat* exert the highest total pressure. *Aquatic foods* also have a large environmental footprint compared to their small share of global food production.
- However, different food types generate different individual pressures, and “food rankings” can differ from place to place. For example, cattle meat is less efficient than pig meat on average, but several times *more* efficient in *Indonesia*.
- Strategies to reduce the environmental impacts of food production will therefore need to be tailored to local problems and circumstances.
- Advocates should take care when interpreting this study. There are many nuances and subtleties in the paper. To name a few: efficiencies vary depending on whether they refer to protein, energy, or weight of food; environmental *pressure* is not the same as environmental *impact*; most countries import food, so could be considered “responsible” for impacts elsewhere; and deforestation was not considered in calculating GHG emissions.

5

Vilas-Boas, Jean, Laurens Klerkx, and Rico Lie. **“Facilitating international animal welfare standards implementation in national contexts: The role of intermediaries in Brazilian pig production.”** *Journal of Rural Studies* 90 (2022): 53–64. [link](#).

Implementing international animal welfare standards in a country requires concerted efforts by an ecosystem of people and organizations

Once international animal welfare standards have been adopted by a country, successfully implementing them involves a host of strategies and actions that are suited to local circumstances. It is important to foster the ecology of organizations and individuals that makes this happen.

- In 2015, leading Brazilian pork producers voluntarily adopted EU animal welfare standards, agreeing to comply by 2026. For those standards to be put into practice, a complex web of activities needed to occur.
- These activities included translating EU standards into Brazilian national regulations, reconfiguring facilities, and training personnel. In the process, various questions about applying the standards in Brazil had to be addressed. For instance, what should group housing for sows look like in the context of Brazil’s human resources, feed availability, and climate?
- The work was carried out by a loose alliance of “*intermediaries*”. These were individuals and organizations such as industry groups, independent technical consultants, Brazilian research institutions, and international animal welfare NGOs, some of whom were organized into government-mandated working groups and committees.
- Specific actions taken by the intermediaries included raising funds, developing policies, arranging conferences, and creating courses and handbooks. More generally, intermediaries acted as knowledge brokers and network builders, and were able to connect across levels (e.g. national and international) that would normally remain separate.
- Efforts to bring international welfare standards to other countries would benefit from planning for, and funding, this ecology of intermediaries that is required to go from adoption to implementation.

6

Bright, Ashleigh. "Egg producer and egg buyer disconnect: Exploring barriers and levers to increase cage-free egg production in China." Tiny Beam Fund, December 13, 2022. [link](#).

Serious China-led efforts to align interests of egg producers and buyers are needed to speed up cage-free egg production in China

Consumers' poor understanding of animal welfare and the meaning of "cage free", high cost and risks for egg producers, weak trust and confidence between producers and buyers, are important factors delinking producers and buyers, contributing to sluggish cage-free egg production in China.

Cage-free eggs in China:

- There is interest in cage-free eggs from producers and buyers. Over 70 international and national food businesses have committed to sourcing 100% cage-free eggs in China.
- But eggs from specialized cage-free farms comprise *less than 1%* of China's total egg production. The quantities of eggs currently being produced in specialized cage-free systems is estimated at *less than 20%* of the egg supply needed to fulfill 2025 commitments.

Key reasons for the slow transition can be traced to three significant barriers and fundamental disconnect between egg producers and buyers (retailers and end consumers):

1. Global cage-free egg campaigns have focused on the singular issue of animal welfare. But the concept of animal welfare is not well understood in China and there is confusion about "cage-free" in China's egg marketplace.
2. Transitioning to cage-free is expensive and comes with considerable financial risk for Chinese producers. And domestic egg buyers are generally unwilling to pay the resulting price increase.
3. Egg producers are not confident that food businesses will keep their commitments. In turn, egg buyers can't always trust claims of traceability and verifiability of their eggs.

Levers to align interests of egg producers and buyers:

- Support and fund initiatives for producers and buyers that are firmly China led and driven.
- Improve transparency and accountability of cage-free commitments specifically in China.
- Ensure the term "cage-free" is associated with trusted, premium products addressing multiple ethical and social concerns.
- Increase market demand by targeting receptive demographics.
- Focus engagement with multinational grocery retailers operating in China yet to make cage-free commitments.

7

Sommerville, Melanie, Lindokuhle Khumalo, Tariro Kamuti, and Shirley Brooks. **"Game on! Understanding the emerging game meat value chain in South Africa."** Tiny Beam Fund, August 9, 2021. [link](#).

Game meat production in South Africa on the cusp of expansion and intensification

South Africa game meat sector's efforts in 2010s and early 2020s to expand and intensify production reveal the complexities of why and how a sector develops an industrial value chain. To thwart developments such as this one in LMICs requires understanding and addressing multiple factors that may appear unconnected.

- The South African game sector viewed expansion and formalization of the game meat value chain to be a good way forward as it faced many challenges and found itself at a crossroad in 2020. Among the most significant challenges are the collapse in game prices and the economic shut-downs associated with COVID-19.
- This report explains the changes that lead to the challenges experienced by the sector and to an *increase in game populations* that needs to be dealt with. These reasons and changes are complex. They are related to and intersect with:
 - Game breeding practices, farm conversions and new investment patterns, hunting norms, ecotourism, biodiversity loss, processed game products, and the emergence of community game farms through land reform.
- An expanded game meat value chain raises serious concerns for socio-economic development and racial transformation, environmental sustainability, human health and animal welfare. And there are key gaps in the regulatory framework for game meat production. The report highlights these concerns and gaps.
- It also provides six recommendations for front-line persons and policy makers who want to ensure that expansions in game meat production occur in an inclusive, sustainable, safe, and ethical manner.

8

Cook, Brian. "Effective Behaviour Change Strategies to Promote Meat Reduction in Brazil." Tiny Beam Fund, September 6, 2023. [link](#).

Strategies to reduce meat consumption in Brazil need to satisfy multiple conditions and consider the country's diverse diet landscape

Any strategies to promote meat consumption reduction in Brazil will need to be region-specific and tailored to the specific audience. And instead of focusing narrowly on a single aspect or variable to inform the strategies, it is better to use evidence and theories of behavior change that are multifaceted (e.g., the COM-B model).

- Meat plays a crucial role in Brazil and is set against the backdrop of a complex social structure. Patterns of meat consumption vary significantly across the country, influenced by regional traditions, social disparities, and economic factors.
- The COM-B model (which brings together many theories of behavior change) can be adapted for use in Brazil. According to this model, for change to occur, one needs to meet *all* three conditions:
 - *Capability* to carry out the action – physical (being able to do it) and psychological (having the right knowledge and knowing how to do it).
 - *Opportunity* to perform it – physical (having the right chance to do it) and social (affected by what our peers think and say).
 - *Motivation* to do it – automatic (feeling like doing it) and reflective (deciding to do it).
- One should define the precise behavior and specific audience to be influenced. Do not go for "everyone in society". Before front-line workers take any action, they should identify:
 - *Who* (i.e., the specific population on whom they are going to focus).
 - *When* they want the reduction to occur (e.g., at home, away from home, only at dinner).
 - *How much* of a reduction they want to see.

Brief mention (non-academic reports):

1 FAO (Food and Agriculture Organization of the United Nations). *Contribution of terrestrial animal source food to healthy diets for improved nutrition and health outcomes – An evidence and policy overview on the state of knowledge and gaps*. Rome: FAO, 2023. [link](#).

- One of the key messages: “Terrestrial animal source food (TASF) within appropriate dietary patterns can make important contributions to reducing stunting and wasting in children under five years of age, low birthweight, anaemia in women of reproductive age (15–49 years), overweight in children under five years of age, and obesity and diet-related non-communicable diseases (NCDs) in adults.”

2 World Bank Group. *IFC Practices for sustainable investment in private sector livestock operations*. 2 Nov. 2022. [link](#).

- International Finance Corporation (IFC)'s website states: “IFC - a member of the World Bank Group - is the largest global development institution focused exclusively on the private sector in developing countries.”
- “This document lays out the seven fundamental practices that inform IFC investments in livestock and aquaculture projects. These practices must underpin a client’s operations, and IFC works with clients to help them transition to operations that follow these practices during the course of the investment. . . .
 1. Implement robust animal health management and biosecurity protocols
 2. Implement prudent and responsible use of veterinary antimicrobials and medicines
 3. Implement animal welfare management systems codified by credible standards
 4. Promote decarbonization pathways and enhance the climate resilience of operations
 5. Prevent the loss of biodiversity
 6. Provide safe food
 7. Respect relevant national laws and regulations”



About Beacon

A project of Burning Questions Initiative

Why?

- Tiny Beam Fund's flagship *Burning Questions Initiative* produces a list of "burning questions". These questions were contributed by over 25 organizations and funders critical of and working to tackle industrial animal agriculture, especially concerning low- and middle-income countries (LMICs). These questions focus on topics that they would most like academic researchers to address and answer. The current (2023) list is [here](#).
- Every "burning question" is complex and multifaceted. It would be foolish to believe that there is a single, simple, definitive answer to a question.
- Addressing these questions requires welding together many pieces of nuanced, contextualized information, research findings, and perspectives drawn from a broad knowledge base, a rich knowledge bank of studies by academic researchers. It also requires extracting key messages from these studies.
- This welding and extracting endeavor is arduous. But, "a journey of a thousand miles begins with a single step". We hope that this series – named *Beacon* – will serve as a beacon, guiding all those keen to take the first step.

Who's the audience?

- Those who have contributed to the "burning questions", those who are curious about these questions, those who are interested in using research done by academics to address the questions.
- Anyone can access *Beacon* on our website. It is easy to read and understand. No academic jargon!

What's in it?

- Each issue in the *Beacon* series contains 6-8 main items. These are papers in peer-reviewed academic journals from the past couple of years. Also included are reports written for Tiny Beam Fund by recipients of its *Burning Questions Initiative* fellowship awards (they are all PhD holders or PhD students close to obtaining their degrees). 1-2 "Brief mention" non-academic reports may also be included.
- Each main item is annotated with clear, useful key messages, and has only 300 or so words. Two items in each issue have additional "deep dive" sections to drill down a bit more.
- After the inaugural issue from October 2023, three issues of *Beacon* are offered in 2024.

[Read This Issue](#)