



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

Issue 6 | August 2025

Seven studies are featured. They cover:

1. Context is key to changing global livestock systems.
2. BRICS government support of big meat "national champion" firms.
3. New database of fishmeal and fish oil factories in 63 countries.
4. Structural developments supported industrial animal agriculture in China.
5. All parts of industrial poultry system contribute to avian flu epidemics.
6. Public development banks' role in Vietnam's animal farming.
7. Resisting beekeeping industrialization with insights from Mexico.

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Table of Contents:

1. Kazanski, Clare E., et al. **"Context is key to understand and improve livestock production systems."** • [Page 3](#)

KEY TAKEAWAY: To change livestock systems and practices one needs to factor in their economic, environmental and social contexts as well as priorities that motivate how livestock are managed.

2. Sievert, Katherine, et al. **"'National champions' in global meat supply chains: Implications for governance and corporate power in food systems."** • [Page 5](#)

KEY TAKEAWAY: National governments in BRICS countries support big meat processing firms, but shareholders benefit while consumers and the global food system suffer grave consequences.

3. Shea, Lauren A., et al. **"Spatial distribution of fishmeal and fish oil factories around the globe."** • [Page 8](#)

KEY TAKEAWAY: A new database identifies 506 fishmeal and fish oil factories in 63 countries. The factories are owned/operated by 413 companies, and Peru has the largest number.

4. Su, Tiantian, and Cuixia Li. **"Spatial-temporal characteristics and influence factors of high-quality development of animal husbandry industry in China."** • [Page 9](#)

KEY TAKEAWAY: Structural factors, not just GDP growth, account for China's shift toward industrial animal agriculture in recent years.

5. Aguilar-Støen, Mariel, et al. **"Dangerous liaisons: Unveiling the co-constitution of emerging infectious diseases and industrial meat production."** • [Page 10](#)

KEY TAKEAWAY: By narrowly focusing on the geographic locations of avian flu cases, we miss how the whole industrial poultry system shapes disease outbreaks.

6. Cook, Brian. **"Finance and farming: Understanding development finance and industrial animal agriculture in Vietnam."** • [Page 11](#)

KEY TAKEAWAY: Public development banks play a serious role in financing industrial animal agriculture in Vietnam, but can also be a force for good.

7. Shanahan, Maggie. **"Building resilient beekeeping systems: Actionable insights from Chiapas, Mexico."** • [Page 12](#)

KEY TAKEAWAY: Resisting industrialization of beekeeping requires both resilient practices and system-wide strategies as illustrated in Chiapas, Mexico.

Brief mention (non-academic reports)

1. FAO. **"FAO Investment Centre - Annual review."** • [Page 13](#)
2. OECD / FAO. **"OECD-FAO Agricultural Outlook 2025-2034."** • [Page 13](#)

1

Kazanski, Clare E et al. **"Context is key to understand and improve livestock production systems."** *Global Food Security* 45 (2025): 100840. [link](#).

To change livestock systems and practices one needs to factor in their economic, environmental and social contexts as well as priorities that motivate how livestock are managed.

Livestock systems and practices are shaped by producers' motivations along with economic, environmental, and social constraints. Understanding these desired outcomes and surrounding context is important for designing acceptable, feasible, and scalable interventions.

- Depending on how they are managed, ruminant production systems (e.g. cattle, sheep, goats) can lead to a variety of desirable and undesirable outcomes. They may support livelihoods and cultural identity, enhance or conflict with biodiversity, and contribute to rising GHG emissions, among numerous other effects.
- Diverse groups of stakeholders – producers, advocates, policymakers, and others – are therefore interested in improving ruminant production systems to obtain outcomes that they consider to be desirable.
- However, their efforts may not be successful if they conflict with priorities that motivate how livestock are currently managed. Moreover, stakeholders often have varying views about which outcomes are most important, and there may be trade-offs between different goals.
- In addition to desired *outcomes*, ruminant systems are also shaped by *contextual factors*. These factors are: economic (connectedness with local, regional, and global economies and markets); environmental (land condition, rainfall, and whether grazing animals are native to the land); and social (land tenure and the cultural embeddedness of ruminant livestock).
- Contextual factors influence both current practices and the type and scope of change that is possible.
- Efforts at improvement that worked in one case may not produce good results in another, if differences in stakeholders' motivations and contextual factors are not taken into account.



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

- This study is relevant to relevant to 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), global supply chains, and government regulations?"
- Animal production in LMICs (low- and middle-income countries) is often placed into simple categories such as "intensive" and "extensive". But the impacts and implications of each of these categories, as well as strategies for changing them, may differ from place to place.
- This paper divides ruminant production into *three new categories*: "LMIC multi-purpose", "LMIC commercial", and "HIC commercial". For each one, it explains the outcomes the animals are managed for, integration with markets, predominant environmental problems, drivers and barriers to change, etc.

- The new categories are still very broad, but they provide a more realistic and nuanced framework for thinking about ruminant production, based on a wider range of factors. So, while this paper doesn't give, say, statistics about industrial production, it offers a useful way of approaching problems and solutions related to livestock in LMICs.

Deeper Dive

1. Simplistic narratives and a slow pace of change

- The study argues that narratives around ruminant livestock in media, policy, and academic debates tend to be driven by a *single* concern (GHGs, livelihoods, conservation, etc.).
- In reality, ruminant production can deliver multiple harms and benefits at the same time, and different combinations of these are relevant in different situations.
- For example, land degradation is a major issue on the Tibetan Plateau, deforestation is important in the Amazon, and GHG emissions are a global problem. In some situations, the main purpose of raising ruminant animals is profit; in others, the animals also provide services such as draught power, insurance, and wealth storage.
- Failing to recognize this diversity of desirable and undesirable outcomes can lead to narratives that are simplistic and polarizing (animals and their managers are simply “good” or “bad”).
- Then, even when multiple outcomes are acknowledged, economic, environmental, and social contexts influence which interventions will be successful. Planting trees to increase carbon storage may be appropriate on deforested land but counterproductive in native grasslands. Smallholder farmers may not have the funds or credit needed to implement better practices.
- To speed up progress in making ruminant systems more sustainable, it will be necessary to grapple with both the *multiple intended and unintended outcomes of ruminant management*, and the *system-shaping contextual factors*.

2. A better way of thinking about ruminant production systems

- If very simple narratives have not been helpful, how can we think about the complexity and diversity of ruminant production systems without becoming overwhelmed?
- This study used a set of 10 case studies to examine what motivates producers, what shapes systems and practices, what favors change, and what gets in the way of change in a variety of ruminant production systems around the world.
- This led them to organize the systems into three classes. Each class contains systems from around the world which are nevertheless broadly similar in terms of objectives, shaping factors and barriers and opportunities for change.
- In *LMIC multipurpose systems*: Producers' decisions are guided by local economic objectives such as using animals for food, collateral, and gifts. Animals tend to be deeply embedded in local cultures. Land degradation means that many producers want to improve their practices, but lack of information, technology, and financial resources can stand in the way.
- In *LMIC commercial systems*: Ruminant farming is often a relatively recent introduction. Regulations and market demands for traceability encourage change, but enforcement tends to be poor.
- In *HIC commercial systems*: Consumer demand for sustainability, well-researched practices, and intergenerational turnover drive improvements. However, low profit margins, consolidation of land ownership, and an individualistic culture create barriers.
- Of course, interventions that target particular regions or communities will benefit from delving deeply into the characteristics of that location. They will also be strengthened by including local producers and communities. Nonetheless, this study provides a guiding framework for understanding the issue of improving ruminant production systems on a broad scale.

2

Sievert, Katherine, et al. **“National champions’ in global meat supply chains: Implications for governance and corporate power in food systems.”** *The Journal of Peasant Studies* (2025): 1-27. [link](#).

National governments in BRICS countries support big meat processing firms, but shareholders benefit while consumers and the global food system suffer grave consequences.

State support of “national champion” meat processing firms enables them to rapidly grow and dominate markets. Their vast size and wealth then enables these companies to shape society and the global food system to further their own interests.

- In some LMICs, notably Brazil and China, governments have intentionally boosted the growth of certain meat companies via subsidies, low-cost loans, tax breaks, preferential access to resources, and generally removing obstacles to growth.
- These state-supported companies, which include giants such as JBS (Brazil), Marfrig (Brazil), and WH Group (China), are known as “national champions”.
- The national champion companies have grown so large, powerful, and intertwined that they can influence regulations and society, making them increasingly favorable to industrial meat production and the companies involved in it.
- Meanwhile citizens face the negative environmental and social consequences of the companies’ business models.
- Anti-trust regulation (the rules governing when companies can merge with and acquire each other) offers a way of fighting back, but it needs to adapt to the reality of powerful, state-backed, transnational actors.



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

- This study is relevant to GOV 2: “What are the key supply-side drivers of the introduction and growth of industrial animal agriculture in LMICs? Are government policies and value chain activities significant and influential drivers (e.g., government subsidies to industry, free trade agreements, corporate marketing and partnerships with governments)?”
- This study focuses on a particular type of government policy that drives the introduction and growth of industrial animal agriculture in LMICs.
- This type of policy is not widely appreciated, and the paper explains how it works and why it is so consequential.
- The study therefore provides a deeper understanding of a driver of industrialization that is somewhat obscure but can nonetheless have far-reaching effects.
- It shows that changing the trajectory of the food system will require working on issues that may at first sight seem unrelated, such as anti-trust regulation.

Deeper Dive

- Countries such as Brazil, China, and Russia have supported national champions in the agribusiness sector in order to promote economic growth, create jobs, ensure food security, maintain economic stability via exports, and other goals that should benefit their citizens.
- These companies include meat processing firms as well as companies involved in other parts of the supply chain such as soybean production.
- State backing gives these firms an edge because it allows them to grow rapidly by buying and merging with other companies rather than slowly building up their business. It also increases the companies' ability to absorb losses and take advantage of market opportunities.
- Unfortunately, national champions have become so large and powerful that they are able to capture the rewards for themselves and their shareholders, leaving citizens to face the economic, environmental, and public health consequences of industrial meat production.

1. Benefits flow to companies and shareholders, not citizens

- Profits from industrial meat production have flowed to shareholders rather than to nations and their citizens in general. For example, the amount that Brazilian state-supported companies saved by operating from tax havens could have funded the country's payments to low-income families for 18 months.
- Although JBS and Marfrig have grown into multi-billion dollar companies, food insecurity continues to be widespread in Brazil. JBS executives have been embroiled in corruption and bribery scandals, and the company has been caught selling expired meat to consumers.
- Numerous lawsuits have accused companies including JBS and Smithfield (a subsidiary of China's WH Group) of practices such as restricting production, fixing prices, and driving down pay for workers in meat processing plants.
- JBS has also been accused of misleading consumers about its environmental impacts, including its enormous GHG emissions.

2. A pernicious feedback loop

- More than companies without state backing, the national champions have grown by acquiring and merging with other companies. This reduces competition and allows them to operate in locations (e.g. new countries) and parts of the supply chain that were previously out of bounds.
- As the champions' market share, wealth, and power grow, the total number of companies continues to decline, and new firms find it increasingly difficult to enter the market.
- These large companies are able to pay multiple lobbyists to work for regulations that will protect their interests. Brazilian giant JBS has 15 lobbyists in the United States, engaged in issues such as immigration policy (to maintain its workforce), and anti-trust law.
- In addition to exercising their own, individual power, the handful of largest firms coordinate with each other regarding regulations and pricing strategy, behaving "less like distinct, competing organisations, and more like a single operation".
- Overall, the champions continually increase their power, industrial meat production gets more entrenched, and shifting to alternative modes of protein production and consumption becomes ever more difficult.

3. What can be done

- Anti-trust actions are intended to prevent companies like the national champions gaining excessive power.
- However, anti-trust regulation was not designed for a situation in which mergers and acquisitions (and their impacts) cross national borders, and in which concentration may occur through a series of relatively small acquisitions.
- In addition, anti-trust law in many countries considers only the effect of corporate consolidation on consumer prices, rather than a broader spectrum of issues that are relevant to the public.

- The authors point to South Africa's anti-trust laws as providing a partial model. They also suggest that deals involving national champions should have special scrutiny, and recommend national treaties on competition to allow scrutiny of cross-border mergers and acquisitions.
- Raising awareness of national champion policy, corporate consolidation and power in general, and tying these issues to the harms caused by industrial meat production will be necessary to build the political will to act.

3

Shea, Lauren A., et al. **"Spatial distribution of fishmeal and fish oil factories around the globe."** *Science Advances* 11.17 (2025): eadr6921. [link](#).

A new database identifies 506 fishmeal and fish oil factories in 63 countries. The factories are owned/operated by 413 companies, and Peru has the largest number.

The database contains locations of fishmeal and fish oil factories, along with their owners/operators and raw materials, which can help stakeholders to better understand and mitigate the factories' negative impacts. However, information about these factories is not systematically collected by industry and governments, so significant data gaps remain.

- Many fish species farmed by the global aquaculture industry are given feed that includes fishmeal (FM) and fish oil (FO).
- 66% of the raw materials for FM and 47% for FO come from wild-caught fish. This raises concerns about overfishing and the diversion of fish from local, human consumption to fish farms producing for luxury markets. Factories producing FM & FO can also emit harmful gases and particulates and have been known to dump untreated wastewater.
- This new database of FM & FO factories covers the 63 countries that account for >99% of annual, global FM & FO production. The countries with the most factories are Peru (125), Mauritania (42), and Chile (33).
- A large number of factories does not necessarily indicate high production levels. For example, Mauritania's 42 factories produce less FM & FO than Norway's 17.
- 37% of the factories use whole fish as their raw materials, while 49% use by-products from capture fisheries and aquaculture (the remainder use both).
- However, while more factories rely on by-products, more of the total production volume may be based on whole fish.
- The database is primarily based on information from industry-related bodies. Compiling the data was difficult and major gaps still exist. For example, the data for China, the second largest producer of FM & FO, is incomplete.

4

Su, Tiantian, and Cuixia Li. "Spatial-temporal characteristics and influence factors of high-quality development of animal husbandry industry in China." *PloS one* 20.2 (2025): e0313906. [link](#).

Structural factors, not just GDP growth, account for China's shift toward industrial animal agriculture in recent years.

Structural aspects of society such as improvements in infrastructure, innovation, and agricultural finance are needed to explain the rise of industrial animal production in China. Examining these factors gives useful clues about the likely mechanisms behind this development.

- This study investigates how animal agriculture in China changed between 2010 and 2022 in five key respects, and the factors associated with these changes.
- The article explains that the Chinese government wants to encourage "high quality development" in animal agriculture.
 - The authors define high-quality animal agriculture as having high levels of *five characteristics*: "output efficiency, product safety, resource conservation, environmental friendliness, and...scientific and technological management".
 - They identify it with "*large-scale, standardized and industrial*" production.
- Over the study period, environmental friendliness and scientific and technological management developed to higher levels than the other characteristics. There were differences in both levels and trends from province to province.
- *The factors associated with industrialization in animal agriculture were*: urbanization, transportation infrastructure, population density, scientific innovation, agriculture as a share of total industry, animal agriculture as a share of total agriculture, and a sophisticated agricultural financing system.
- Perhaps surprisingly, GDP per capita was *negatively* associated with industrialization in *some* provinces.
- Interestingly, provinces whose neighbors had a highly-developed animal agriculture industry were more likely to develop their own sector.
- The study illuminates some of the possible mechanisms behind industrialization. For example, better transportation infrastructure improves the supply of inputs like feed as well as the circulation of products, while potentially also enabling cold chains and expanding market reach.
- Based on these insights, the authors make several recommendations for how the Chinese government can *increase* industrialization there.

5

Aguilar-Støen, Mariel, et al. **“Dangerous liaisons: Unveiling the co-constitution of emerging infectious diseases and industrial meat production.”** *Antipode* 57.4 (2025): 1320-1341. [link](#).

By narrowly focusing on the geographic locations of avian flu cases, we miss how the whole industrial poultry system shapes disease outbreaks.

The epicenter of an avian flu outbreak should be understood not just as a physical location but as a set of links within the industrial poultry system. Certain features of this system likely increase the risk of disease, so they need to be researched and acknowledged.

- The dominant way of understanding animal disease epidemics in recent decades has been through “epicenter thinking”: locating where cases of a disease occurred, and tracing the spread of the outbreak.
- This has frequently placed blame for outbreaks on small-scale farmers and wildlife in the Global South.
- Based on this understanding of the problem, intergovernmental pandemic preparedness programs have responded by encouraging the consolidation of the poultry industry into fewer, larger facilities, sometimes in dedicated poultry production zones, with characteristics such as indoor housing for all birds.
- One problem with this response is that large-scale, consolidated poultry production brings its own disease risks. These include lack of genetic diversity, movement of animals, people, and equipment between farms, and the ecological disruption involved in producing animal feed crops.
- This paper argues that we need to move beyond thinking of the epicenter as a specific, geographic place, and instead begin understanding it as a set of links and causal relationships in an integrated system.
- This means asking many new questions about *the entire poultry supply chain*: how each actor in the chain affects the others’ vulnerability to disease and how they respond to it, and how farming practices, trade, and ecology are all connected.

6

Cook, Brian. “**Finance and farming: Understanding development finance and industrial animal agriculture in Vietnam.**” Tiny Beam Fund, March 2025. [link](#).

Public development banks play a serious role in financing industrial animal agriculture in Vietnam, but can also be a force for good.

Industrial animal farming is not yet the dominant model in Vietnam, but it is growing steadily. Development banks offer significant financial backing to support large industrial farms while also assisting eco-friendly farming, navigating in a landscape with a complex interplay between economic development goals, food security, and environmental sustainability.

- Public development banks are a range of development financial institutions that are government-backed or nonprofits, providing funding for projects that may not qualify for commercial loans. Most notably, the World Bank supports government-led development and food security. The Asian Development Bank promotes regional cooperation and economic growth. In 2023, development banks spent \$3.3B on 62 industrial animal agriculture projects worldwide.
- Development finance has supported industrial animal agriculture in Vietnam. For example: In 2022, IFC (the private sector arm of the World Bank) invested \$52 million in the Mavin Group for expanding the country's industrial pig production.
- Moving development finance away from industrial animal farming in Vietnam is hard because government policies support industrial growth, big farms are preferred by funders, data is limited, and global trade pushes for open markets.
- However, development banks have also helped smallholder farmers and projects in Vietnam that align with climate and global sustainability goals.
- Animal agriculture in Vietnam is at a crossroad. It is *not inevitable* that it will become fully industrialized. Development banks can help steer Vietnam toward an equitable and sustainable food system.
- Campaigners in Vietnam can also promote the shift away from industrialization by strategies such as:
 - Share real-world examples of successful transitions to inspire funders and policymakers.
 - Center advocacy on lived experiences and insights of communities affected by projects.
 - Help smallholder farmers build cross-regional alliances and develop proposals for bankable alternatives.
 - Demand public access to real-time project data and impact assessments before funding is approved.
 - Use development banks' internal grievance and ESG mechanisms to challenge harmful funding.

7

Shanahan, Maggie. **"Building resilient beekeeping systems: Actionable insights from Chiapas, Mexico."** Tiny Beam Fund, April 2025. [link](#).

Resisting industrialization of beekeeping requires both resilient practices and system-wide strategies as illustrated in Chiapas, Mexico.

To support honey bee health, stop escalating honey bee colony loss worsened by industrialization, and find alternatives to industrial beekeeping, one must work collectively to build resilient practices as well as systems. Chiapas provides an example of beekeepers opting out of inputs-intensive practices which lead to industrialization.

- Industrial beekeeping harms honey bee health and resilience. It also spreads pathogens that jeopardize wild bees and native ecosystems. Industrialization of beekeeping and agriculture is a key contributor to recent rapid escalation of bee colony loss.
- Beekeeping industrialization takes place when *inputs-intensive practices are applied at scale*. Gargantuan beekeeping operations are not the only ones responsible for industrial beekeeping. Small-scale beekeepers can also play a role in industrialization when they focus on input-intensive practices.
- It is important to understand that a beekeeping system is comprised of a huge and extensive network of bees and beekeepers who are highly connected to – and deeply impact – each other. Honey bee colonies are closely linked together. That is why it is not enough to only improve practices of individual beekeepers. A systems approach is required in order to build true resilience and make a real difference.
- When a beekeeping system is resilient, bee colonies do not have to always rely on interventions from beekeepers in order to survive.
- Building resilient beekeeping systems in Mexico is critical now. Bee colonies in some parts of Mexico are beginning to see colony losses similar to the alarming rates in the U.S., and input-intensive practices are becoming more common.
- But there are also many beekeepers in Chiapas that *opt-out of inputs-intensive practices* and resist pressures to industrialize. They can offer valuable insights. And they are not alone. "Alternatives to industrial beekeeping have always existed and continue to prosper in many parts of the world."

Brief mention (non-academic reports):

1

Food and Agriculture Organization. *FAO Investment Centre - Annual review*. Rome: FAO, 2025. [link](#).

- “FAO, through its Investment Centre, collaborates with countries and a growing network of financing and knowledge partners to provide investment and finance solutions tailored to meet today’s challenges. This edition of the FAO Investment Centre Annual Review looks at the Centre’s achievements in 2024 – including marking 60 years of investment support – and priorities for the coming years.”
- “In 2024, the Centre helped design 51 projects in 36 countries approved by financing partners for USD 7.3 billion in new public investment. It contributed to 48 agricultural strategies, 33 sector studies, 21 policy studies and 5 policy dialogues in 92 countries. And it supported ongoing investment projects, totalling over USD 49.5 billion in investment, to ensure end-to-end quality and lasting results.”
- “Among the new publications released in 2024 was a joint study with the World Bank on the challenges smallholder coffee producers in Guatemala and Honduras face in preparing for the European Union’s new regulation on deforestation-free agrifood products. Another study with Innovations for Poverty Action looks at how access to finance can empower farmers and agribusinesses in lower-middle-income countries to invest in the agrifood sector.”

2

OECD / FAO. *OECD-FAO Agricultural Outlook 2025-2034*. Paris: OECD Publishing, Rome: FAO, 2025. [link](#).

- “The OECD-FAO Agricultural Outlook 2025-2034 provides a comprehensive assessment of the ten-year prospects for agricultural commodity and fish markets at national, regional, and global levels.”
- “Key trends include rising consumption of animal-source foods, mainly by a growing, more affluent and urbanised population in middle-income countries. Global agricultural and fish production is expected to increase by 14% over the next decade, mainly enabled by productivity growth, particularly in middle-income countries. Productivity gains will contribute to reducing emission intensity and limit the expected increase of direct agricultural greenhouse gas emissions to 6%.”
- “Scenario simulations indicate that the elimination of undernourishment globally by 2034 can go hand in hand with a reduction of greenhouse gas emissions by 7% if combined investments are made in emission-reduction technologies and in a 15% productivity increase in agriculture.”
- “A rules-based trade system remains essential for global food security and rural livelihoods. Real international reference prices are expected to maintain a slightly declining trend, pressuring smallholders to improve productivity in order to stay competitive.”



About Beacon

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 our curated series of key messages – 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 the research undertaken 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 contains 6-8 main items. These are works by academic researchers in peer-reviewed 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.

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