Why future of food security depends on reducing antibiotic dependence in livestock

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Long-term resistance costs are set to dwarf the short-term gains from routine antibiotic use, says Alejandro Acosta



In an exclusive interview with AgroSpectrum, **Alejandro Acosta, Livestock Economist and Policy Officer, FAO**, cautioned that the projected rise in livestock antimicrobial use by 2040 could accelerate antimicrobial resistance (AMR), undermining animal health, farm profitability, food security and public health. Acosta emphasized that while reducing antimicrobial use delivers significant long-term economic benefits, the transition carries short-term costs that require targeted policy support, incentives and investment. He argued that preserving antimicrobial effectiveness should be treated as a global public good, given that the benefits extend far beyond individual farms and national borders. The FAOâ??s latest analysis suggests that improving productivity through better veterinary services, vaccination, biosecurity and husbandry practices offers the most effective pathway to reducing antimicrobial dependence without compromising livestock production.

How does FAOâ??s latest assessment change the economic argument around antimicrobial use in livestock, particularly for policymakers balancing productivity and sustainability?

Previous studies often presented antimicrobial use (AMU) reduction as a win-win proposition, assuming that lower use would automatically translate into economic gains. Our assessment suggests the reality is more nuanced. While reducing AMU delivers substantial economic, animal health and public health benefits in the long run, the transition is not costless, and the short-term economics can be challenging.

In the early years, producers may face adjustment costs as they invest in improved biosecurity, vaccination, veterinary services and alternative disease prevention strategies. As a result, the immediate cost of action can be higher than the cost of maintaining existing practices. However, over time, the economic consequences of rising antimicrobial resistance (AMR) become significantly greater. The key policy challenge is therefore not whether to act, but how to support farmers through the transition so productivity, profitability and sustainability can advance together.

With antimicrobial use in livestock projected to rise significantly by 2040, what are the biggest risks to food security, farm profitability and public health if current trends continue?

Under the business-as-usual scenario, the projected increase in antimicrobial use (AMU) is not driven by higher use intensity, but by the expansion of livestock biomass required to meet growing global demand for animal-source foods. In other words, if AMU intensity remains broadly unchanged and productivity gains are insufficient to offset demand growth, total antimicrobial use will rise mechanically as livestock production expands.

The main concern is that this trend could accelerate antimicrobial resistance (AMR). As resistance increases, treatments become less effective, animal diseases become harder to control, and producers face higher mortality rates, rising production costs and lower profitability. What may initially appear as a manageable production strategy can gradually undermine the economic efficiency of livestock systems.

The implications extend beyond individual farms. In the long term, higher AMR could reduce global livestock production compared with scenarios where resistance is better controlled, affecting the availability and affordability of animal-source foods. This has direct consequences for food security, particularly as global demand for meat, milk and eggs continues to grow.

From a public health perspective, the risks are equally significant. AMR is a One Health challenge that affects animals, humans and the environment simultaneously. If current trends continue, the long-term economic and societal costs of resistance could far outweigh the short-term benefits associated with continued reliance on antimicrobials, making preventive action increasingly important.

The report suggests that the long-term costs of antimicrobial resistance far outweigh the short-term productivity gains from antimicrobial growth promoters. What evidence supports this conclusion?

We first quantify the short-term productivity value of antimicrobial growth promoters (AGPs), and then compare it with the long-term economic losses associated with rising antimicrobial resistance (AMR). AGPs can provide measurable gains in growth performance and feed efficiency, which explains why they continue to be used in many livestock systems, particularly where disease pressure is high and access to alternatives remains limited.

However, our analysis shows that these short-term benefits are significantly outweighed by the long-term economic consequences of increasing resistance. By 2040, cumulative livestock production losses under a high-AMR scenario are projected to reach approximately $**Â 318 billion**, compared with about $Â **53 billion** under a severe AGP phase-out scenario.

The key point is that while AGPs may deliver immediate productivity gains, AMR gradually erodes the effectiveness of antimicrobial treatments, making animal diseases harder and more expensive to control. Over time, this can lead to higher mortality, reduced productivity, increased production costs and lower farm profitability. The report therefore demonstrates that the economic risks of inaction are substantially greater than the costs associated with reducing reliance on growth-promoting antimicrobials and investing in preventive animal health measures.

Why does FAO believe antimicrobial effectiveness should be treated as a global public good, and what would that mean in practical policy terms?

The costs of reducing antimicrobial use (AMU) are often local and immediate, while the benefits of preserving antimicrobial effectiveness are global and long-term. This creates a misalignment of incentives, where farmers and countries bear the transition costs today, while the benefits are shared widely and materialize over time.

For example, producers may need to invest in biosecurity, vaccination, improved husbandry, veterinary services and other preventive measures to reduce antimicrobial dependence. These investments require resources upfront, while the benefits of slowing antimicrobial resistance extend far beyond individual farms or national borders.

This is why FAO considers antimicrobial effectiveness a global public good. Preserving it benefits animal health, food security, public health and the sustainability of agrifood systems worldwide. In practical policy terms, this means stewardship cannot rely solely on regulations or restrictions. It requires coordinated investments, economic incentives and transition support that help farmers adopt better practices without compromising productivity or profitability.

The report highlights the need for stronger veterinary services, improved surveillance and diagnostics, wider access to alternatives, sustainable financing mechanisms and market incentives that reward responsible antimicrobial use. Ultimately, preserving antimicrobial effectiveness requires collective action because the benefits are shared globally, while the costs of transition are often borne locally.

What kinds of investments and incentives are needed to help farmers transition away from routine antimicrobial use without compromising productivity?

The transition should be built around **FAOâ??s RENOFARM approach**, which focuses on reducing the *need* for antimicrobials rather than simply restricting their use. The objective is not to take tools away from farmers, but to create production systems where animals are healthier, disease risks are lower, and reliance on routine antimicrobial use becomes unnecessary. To achieve this, FAO promotes the **Farm 5Gs framework**: **Good Health Services, Good Production Practices, Good Alternatives, Good Incentives and Good Connections**.

This starts with investments in the fundamentals of animal health. Strengthening veterinary services, disease surveillance, diagnostics, vaccination programmes, biosecurity measures and improved husbandry practices can significantly reduce disease pressure on farms. These preventive measures help producers maintain productivity while reducing their dependence on antimicrobials as a routine management tool. Access to effective alternatives, including vaccines and other non-antibiotic interventions, is also critical, particularly in regions where disease risks remain high.

However, technical solutions alone are not enough. One of the key findings of our report is that the transition carries real costs, especially in the early years. Farmers may need to invest in infrastructure upgrades, improved farm management systems, staff training or preventive animal health measures before the benefits become fully visible. Without support, these upfront costs can discourage adoption.

This is why incentives are equally important. Farmers need access to finance, technical assistance and extension services that help them implement better practices. Market-based incentives can also play a significant role. Certification schemes, price premiums, sustainability-linked procurement programmes and other value-chain rewards can help compensate producers for the investments they make in responsible antimicrobial stewardship.

The report also highlights the importance of stronger connections across the value chain. Producers, veterinarians, processors, retailers, financial institutions and policymakers all have a role to play in supporting the transition. When farmers are provided with the right combination of knowledge, financing, market access and technical support, it becomes possible to reduce antimicrobial use without sacrificing productivity or profitability.

Ultimately, successful antimicrobial stewardship is not about imposing restrictions. It is about creating an enabling environment where farmers can adopt healthier, more productive and more resilient production systems while remaining economically competitive.

Â How can veterinary services, biosecurity measures, vaccination programmes and improved husbandry practices reduce dependence on antimicrobials in livestock systems?

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These interventions reduce dependence on antimicrobials by addressing the root causes of disease rather than relying on treatment after disease occurs. Each plays a distinct but complementary role in strengthening animal health and improving the resilience of livestock production systems.

For example, **biosecurity measures** help prevent the introduction and spread of pathogens by improving farm hygiene, controlling animal movements, managing visitor access and strengthening sanitation practices. By reducing disease exposure, farms face fewer outbreaks and consequently require fewer antimicrobial treatments.

Vaccination programmes reduce the incidence and severity of infectious diseases by building immunity within animal populations. When animals are better protected against common diseases, the need for therapeutic or preventive antimicrobial use declines significantly, while productivity and animal welfare are maintained.

Similarly, **strong veterinary services and diagnostics** enable earlier disease detection, more accurate treatment decisions and better herd health management. This helps ensure that antimicrobials are used only when genuinely needed and in an appropriate manner, rather than as a routine precautionary measure.

Improved husbandry practices, including better nutrition, housing, animal welfare, stocking densities and overall farm management, reduce stress and disease pressure in livestock systems. Healthier animals are naturally more resilient and less susceptible to infections, which lowers the need for antimicrobial interventions.

Together, these measures shift livestock production from a treatment-based approach to a prevention-based approach. They make antimicrobials less necessary as a routine risk-management tool while protecting productivity, farm profitability and long-term sustainability. This is the core principle behind FAOâ??s RENOFARM approach: reducing the need for antimicrobials through stronger animal health systems rather than relying solely on restrictions on antimicrobial use.

The report highlights major regional differences in antimicrobial use, particularly across Asia-Pacific, South America and Africa. How should policy responses be tailored to these varying realities?

While antimicrobial use patterns vary considerably across regions, the fundamental policy objective should remain the same everywhere: **reduce antimicrobial use (AMU) intensity while increasing animal productivity**. The report shows that changes in livestock biomass alone have relatively limited influence on total AMU. The main leverage comes from lowering the amount of antimicrobials used per unit of production through better productivity, greater efficiency and stronger preventive animal health management.

That said, the pathways to achieving this objective will differ depending on regional realities. In some regions, particularly where livestock systems are rapidly expanding, the priority may be strengthening veterinary services, disease surveillance, vaccination coverage and biosecurity measures to ensure productivity growth does not translate into proportionally higher antimicrobial use. In others, the focus may be on improving farm management practices, promoting technology adoption and increasing access to alternatives that reduce dependence on routine antimicrobial use.

The report projects that **Asia and the Pacific will continue to account for the largest share of global livestock antimicrobial use by 2040**, reflecting both the scale of livestock production and growing demand for animal-source foods. South America is also expected to remain a significant contributor, while Africa, despite a smaller overall share, is projected to experience some of the fastest growth rates in livestock production and antimicrobial demand. These differences underline the need for context-specific implementation strategies.

However, regardless of geography, the most effective long-term approach is to improve animal health and production efficiency. Investments in biosecurity, vaccination, diagnostics, veterinary services and improved husbandry practices can simultaneously enhance productivity and reduce AMU intensity. This creates a pathway where producers can meet growing demand for animal-source foods while limiting the risk of accelerating antimicrobial resistance.

Ultimately, the report suggests that successful antimicrobial stewardship is not about reducing production; it is about producing more efficiently and sustainably. The policy tools may vary across regions, but the strategic goal remains consistent: healthier animals, higher productivity and lower reliance on antimicrobials.

What role can market-based mechanisms, trade policies and supply-chain standards play in accelerating responsible antimicrobial stewardship across the global livestock sector?

Market-based mechanisms can play a critical role in accelerating responsible antimicrobial stewardship by helping to offset the transition costs associated with reducing routine antimicrobial use (AMU). One of the key challenges highlighted in our report is that while the benefits of preserving antimicrobial effectiveness are long-term and broadly shared, the costs of changing production practices are often immediate and borne by farmers. Economic incentives can help bridge this gap.

Certification schemes, product labels and price premiums can function much like a **â??green premium,â?•** rewarding producers who adopt responsible antimicrobial-use practices. When consumers, retailers and food companies recognize and value these practices, producers receive a direct economic signal that supports investment in improved animal health management, biosecurity, vaccination and other preventive measures.

Supply-chain standards can further accelerate change by establishing clear expectations for responsible antimicrobial use across production systems. Food processors, retailers and exporters increasingly require suppliers to meet sustainability and animal health standards, creating incentives for producers to align with best practices. These standards can also improve transparency, traceability and accountability throughout the livestock value chain.

Trade policies can complement these efforts by encouraging greater convergence around internationally recognized antimicrobial stewardship principles. As global markets place increasing emphasis on food safety, sustainability and responsible production, compliance with antimicrobial-use standards may become an important factor in maintaining market access and competitiveness. This is particularly relevant for export-oriented livestock sectors seeking to meet evolving consumer and regulatory expectations.

However, market incentives should not be viewed as a substitute for public investment. They work best when combined with supportive policies, veterinary services, technical assistance and access to alternatives that enable farmers to make the transition successfully. The objective is to create an environment where responsible antimicrobial stewardship is not only a regulatory requirement but also an economically attractive business decision.

Ultimately, aligning market signals with animal health and sustainability goals can help accelerate the adoption of responsible practices across the global livestock sector while supporting productivity, profitability and long-term food security.

-- Suchetana Choudhury (suchetana.choudhuri@agrospectrumindia.com)

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