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Research Report

Antimicrobial resistance: Optimizing antimicrobial use in food-producing animals

Research Paper, No. 201

Provided in Cooperation with:

South Centre, Geneva

Suggested Citation: Munoz Tellez, Viviana (2024) : Antimicrobial resistance: Optimizing antimicrobial use in food-producing animals, Research Paper, No. 201, South Centre, Geneva

This Version is available at:

<https://hdl.handle.net/10419/301177>

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Research
Paper

27 June 2024

Antimicrobial Resistance: Optimizing Antimicrobial Use in Food- Producing Animals

Viviana Munoz Tellez



 **SOUTH
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RESEARCH PAPER

201

ANTIMICROBIAL RESISTANCE: OPTIMIZING ANTIMICROBIAL USE IN FOOD- PRODUCING ANIMALS

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SOUTH CENTRE

27 JUNE 2024

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ABSTRACT

The increasing resistance of microorganisms to antimicrobials that help to treat and control spread of infections is a major public health problem around the world. Antimicrobial resistance is aggravated by inappropriate use of antimicrobials in human and animal health and in plant and animal agriculture. This paper tackles the question of how to shift animal food production to implement adequate antimicrobial stewardship practices.

La résistance croissante des micro-organismes aux antimicrobiens qui aident à traiter et à contrôler la propagation des infections est un problème majeur de santé publique dans le monde entier. La résistance aux antimicrobiens est aggravée par l'utilisation inappropriée des antimicrobiens dans la santé humaine et animale, ainsi que dans l'agriculture et l'élevage. Ce document aborde la question de savoir comment réorienter la production alimentaire animale pour mettre en œuvre des pratiques adéquates de gestion des antimicrobiens.

La creciente resistencia de los microorganismos a los antimicrobianos que ayudan a tratar y controlar la propagación de infecciones es un grave problema de salud pública en todo el mundo. La resistencia a los antimicrobianos se ve agravada por su uso inadecuado en la salud humana y animal y en la agricultura vegetal y animal. Este documento aborda la cuestión de cómo cambiar la producción de alimentos de origen animal para aplicar prácticas adecuadas de administración de antimicrobianos.

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I. THE INTERFACE OF ANTIMICROBIAL USE IN HUMAN AND ANIMAL HEALTH

Sustainable development requires linking economic growth and optimized production with sustainable and just management of natural resources and ecosystems, food systems and consumption. It is imperative to tackle the combined crises of climate change, biodiversity loss, pollution, and waste, while advancing sustainable development, food security and a just and inclusive ecological transition. This high task requires understanding of the complex interlinkages and interdependence between the health of humans, animals, plants and the environment. The problem of rising antimicrobial resistance (AMR) is rendering antibiotics and other antimicrobial tools ineffective to combat infectious diseases. Resistance to antimicrobials² may spread and circulate among humans, animals, plants and the environment including in water from farms, sewage and human and animal waste. The development of resistance is accelerated by the inappropriate and overuse of antimicrobials in human and animal health and in food production - animal and plant.

It is estimated that globally bacterial resistant infections caused 1.27 million deaths and were a contributing factor in another 3.68 million deaths, bringing the total deaths associated with antimicrobial resistance to 4.95 million in 2019 (Murray *et al.*, 2022). Antimicrobial use in food-producing animals can lead to selection and dissemination of antimicrobial-resistant bacteria in food-producing animals, which can then be transmitted to humans via food and other transmission routes. Antimicrobial resistance is aggravated due to excessive and inappropriate use of antimicrobials in human and animal health and in plant and animal (terrestrial and aquatic) agriculture. Antimicrobials serve to prevent illness in animals and to treat them when sick, thus contributing to animal health, livelihoods and food security. However, antimicrobials are also routinely misused through massive administration to herds or troupes to help food animals grow faster and to protect them from getting ill in crowded and/or unhygienic conditions. Climate change is also making livestock more susceptible to disease and its spread, increasing demand for antibiotics to treat disease in animals, in the absence of alternatives. Global antimicrobial use in animal food production is projected to increase by 8% by 2023 as compared to 2020 with 5 countries, Australia, Brazil, China, India and the United States, making up about 58% of use (Mulchandani *et al.*, 2023).

The misuse of antibiotics has increased with the industrial intensification of animal production for food in the context of rising demand for animal protein in human diets. The strong lobbying from industry has slowed government action to adequately regulate antimicrobial use in animal food production.

This paper tackles the question of how to shift animal food production to implement adequate antimicrobial stewardship practices.

² Antimicrobials are agents used to prevent, control and treat infectious diseases in humans, animals and plants. They include antibiotics, fungicides, antiviral agents and parasiticides.

II. POLICIES AND LEGISLATIVE MEASURES TO DRIVE CHANGE TOWARDS REDUCTION OF USE OF ANTIBIOTICS IN FOOD ANIMAL PRODUCTION

II.1 Regulations and international guidelines

To preserve effectiveness of antimicrobials for human health, the antimicrobial classes of most concern are those that are used only in human health, and those used in both humans and animals (shared class).

Regulation is one of the main ways in which governments drive policy. Government regulators can take various measures to advance appropriate antimicrobial use. These include restrictions on use of medically important antimicrobials other than for human health, for example by defining the medically important antimicrobials that should only be authorised and used in human health, setting national lists that are guided by the international list of the World Health Organization (WHO), and not allowing their use in animal health (i.e. registration for use only for human health, ban on use for animal health). Other measures include regulating how antimicrobials are sold (i.e. limiting sales over the counter and requiring prescriptions from physicians and veterinarians, other than in settings where such regulation may be unfeasible and may unduly limit access to antimicrobials) and marketed, regulating appropriate use including proper dosage and promoting diagnostic of the pathogen causing an infection of dosage before prescription.

In the case of shared class antibiotics approved for both human and animal use, government regulators can restrict the use in animals to veterinary use (for prevention and treatment of disease) and under supervision of a veterinarian, following guidelines for appropriate prescription. Restricting use of shared class antimicrobials to veterinary use serves the purpose of tackling improper use for growth promotion and other routine use of antimicrobials such as to substitute for hygiene measures. Some countries have opted to further restrict use of shared class antimicrobials to use in an individual animal only or a restricted number of animals for preventing disease (prophylaxis) when the risk of infection is very high, and the consequences are likely to be severe.

This approach to limit antimicrobial use in animal food production via regulations is supported by the international agencies such as the WHO, World Organisation for Animal Health (WOAH) and Food and Agriculture Organization (FAO). The WOAH has recommended the phasing out of the use of antibiotics for growth promotion as of 2016. There are various international guidelines and regulations that should inform government policies and measures to reduce use of antimicrobials in food animal production, particularly antibiotics that are medically important for human health. These include the WHO Guidelines on the Use of Medically Important Antimicrobials in Food-Producing Animals, the WHO List of Medically Important Antimicrobials, the WOAH list of antimicrobials of veterinary importance, and the FAO/WHO Codex Alimentarius Code of Practice to minimize and contain AMR, the Codex Alimentarius guidelines for risk analysis of foodborne AMR, the Codex Guidelines on integrated monitoring and surveillance of foodborne antimicrobial resistance, and the WOAH Terrestrial Animal Health Code, Chapters 6.9-6.11.

As the global standards and guidelines are voluntary, the regional and national guidelines may differ from this guidance. Thus, the extent to which countries are implementing these is unclear. There is significant divergence among countries on how to regulate use of antimicrobials both in humans and animals, and the guidance and approaches used to assess the level of risk to public health resulting from use of antimicrobials in animals. There are also significant gaps in data collection - which data is collected and from what sources (i.e. sale, importation, prescription, use), research to inform policy and consider costs and benefits of

different interventions, and insufficient reporting. For example, the WOAHA collects information from countries on antimicrobial agents intended for use in animals, though data is not provided at individual country level as countries can provide data anonymously. The WOAHA 7th annual report on antimicrobial agents intended for use in animals notes that of 157 country reports received, only 35 make national reports public.

All around the world countries are progressing in instituting regulations to tackle misuse of antibiotics in animal food production and antimicrobial resistance, though there are still gaps and need for increased enforcement of regulations, for example in the case of countries in Latin America (Da Silva *et al.*, 2023), South East Asia (Malik *et al.*, 2023), India (Khurana *et al.*, 2021) and the United States (Wallinga *et al.*, 2022).

II.2 Trade measures

Some countries have used trade measures as an extension of their national or regional regulations. The European Commission established two regulations on medicated animal feed (Regulation (EU) 2019/4) and veterinary medicinal products (Regulation (EU) 2019/6) to provide measures to reduce excess use of antimicrobials in food animals. The regulations came into effect on 28 January 2022. The regulations ban the routine use of antimicrobials via medicated feed for growth promotion and for preventative treatment of individual animals or groups of animals except in exceptional cases - for the administration to an individual animal or a restricted number of animals when the risk of infection or of an infectious disease is very high and the consequences are likely to be severe. In such cases, the use of antibiotic medicinal products for prophylaxis should be limited to the administration to an individual animal only. The regulations also make it illegal to give antibiotics to farm animals to compensate for inadequate husbandry practices, lack of care or poor hygiene.

The regulations also address imports of animal derived products. Implementation of the regulations requires the European Commission to establish a ban on imports of animal derived products that use antimicrobials for growth promotion and a ban on imports of animal derived products that use antimicrobials that are on the European Union's list of designated antibiotics for use in human medicine. The standards for EU imports of animal food products will have an important impact on producers from around the world (Munoz Tellez, 2022). The EU regulation Article 118 will enter into effect in September 2026 with a 24 month transition period, then only products derived from animals that have not been treated with antimicrobials on the restricted list or with antimicrobials to promote growth during their lifetime can be exported to the EU. While the EU regulation for the moment is more permissive for imports than for the internal market, exporting firms will have to soon introduce changes in practices to overcome the market barriers or face market exclusion. Firms that begin earlier to adopt the same practice required for products for domestic EU consumption may potentially gain from premium price, granted appropriate market conditions in the EU.

III. MEASURES ON AMR LINKED TO PROMOTING SUSTAINABLE ANIMAL FOOD PRODUCTION SYSTEMS

To date the regulations on AMR are generally focused on the specific aim of containment of AMR, for human health and linked to animal health and food safety, as noted above. Another approach is to embed efforts to address AMR as part of broader policies and regulations towards transitioning away from unsustainable agricultural practices towards promoting more sustainable, just and resilient food production systems. This includes lowering carbon emissions, reducing land use of crops for animal feed, better use of resources including waste that can be turned into feed, improved animal nutrition and husbandry conditions to prevent disease.

In designing policies for sustainability, the pathways to change must be context specific. For example, for most developing countries, in addition to sustainability, key concerns are food security, improving nutrition and resilience to climate change. Transition also requires careful consideration of costs and benefits for different stakeholders and must include measures to protect the livelihoods of the more vulnerable. In the global South, there are extensive and semi-extensive livestock production systems which still generate the largest share of animal source foods while highly intensive, industrial systems dominate in the North (FAO, 2023a). It follows that the latter should lead the way in the transition of food production systems.

Moreover, while livestock production in some contexts will increase to meet demand, small-scale producers are failing to participate fully in sector growth and are increasingly facing difficulties to stay in business (FAO, 2023a). Hence, there is need to support pathways to open new business opportunities for small scale animal food producers that can produce more sustainably.

III.1 Growth, trade-offs and value assessments

The traditional approach to the measurement of wealth and well-being is through indicators such as the monetary value of finished goods and services made by a country's residents and national companies, during a specific period (gross domestic product - GDP, gross national product - GNP). Likewise, productivity growth has been a focus in measuring the health of an economy. These approaches are now increasingly in question. The United Nations created the Human Development Index (HDI) to provide alternative indicators for development beyond only measuring economic growth. Other indexes include social and environmental conditions (Boarini *et al.*, 2006) such as the Better Life Index established by the Organisation for Economic and Co-operation Development (OECD), and the Genuine Progress Indicator (GPI), developed to focus on cost and benefit trade-offs of economic growth.

The United Nations Secretary-General (UNSG) has also recently advocated as part of the preparation for the Summit of the Future in 2024 for a paradigm shift in what is measured as progress of "value that counts", to capture data on the activities and outcomes that a society truly values and have data to better inform policy and financial decisions. A critique of the GDP is that it does not capture the human and environmental destruction of some economic activities, and the biased distributional dimensions of economic activity (UN, 2023). Value assessments are also being used to value nature and account for biodiversity loss with a justice and power perspective (IPBES, 2022). Value based assessments are important given that resources are finite and the way these are distributed demand trade-offs.

III.2 Impact and true cost accounting

This new way of thinking about the true value and trade-offs in choices for sustainable development is also relevant in the assessment of agrifood systems and different methods of agrifood production towards the transition to more sustainability.

The concepts of “impact” or “true cost” accounting aims to provide a means to account for benefits beyond prices and economic, environmental, and social costs / externalities, risks, and dependencies. These concepts have been employed mainly to inform and facilitate business and investor decisions based not only on monetized private gains or losses, but also on the broader impact a company has on society and the environment. It is now increasingly gaining ground as a concept to inform government policy and consumer choices, with a broader application. However, there are also open questions on the feasibility, given that many impacts lack an observed price, and potential manipulation (King & Pucker, 2021). There are various methodologies for impact and “true cost accounting” as applied to the agrifood sector, with different indicators and metrics that produce different outputs (de Adelhart Toorop *et al.*, 2021). Most methods will calculate negative externalities in terms of costs in a monetary way, for example the “true price” methodology will assess a “true price gap” that can be compared to the market price of the product, and the difference is the true price that refers to how much the product truly costs, to the buyer (market price) and to external stakeholders (true price gap), the latter which can be used to identify forms of remediation such as restoration, compensation, prevention or retribution costs (Galgani *et al.*, 2021).

A driver for “true cost” assessments for the agrifood system is that sustainable and healthy food is often less affordable to consumers and profitable for businesses than unsustainable and unhealthy food, for various reasons, that include externalities not reflected in market prices (Hendriks *et al.*, 2021). At the same time, it should be recognised that businesses set prices to optimize their business profit, which can also lead to inflated prices as signals of sustainable and healthy food, making it more expensive. Thus, the estimation of true costs and value for businesses should be to inform their decisions towards sustainable transition for the internalization of externalities, such as the negative environmental, social or health impacts, but not to just pass on added costs to the consumer. While consumers may be interested in sustainability, price is a key consideration in consumption choices. Moreover, a central aim of a just transition in the agrifood system must be to ensure that healthy and more sustainable food can reach people everywhere to help address hunger and malnutrition. More than 3.1 billion people in the world – or 42 percent – were unable to afford a healthy diet in 2021 with climbing food prices (FAO, IFAD, UNICEF, WFP and WHO, 2023). Another important consideration, which is not regularly embedded in “true cost” assessment, is the impact of corporate consolidation of supply chains and what this means for small livestock producers.

To date, true cost accounting has been used to lesser extent to drive policy levers and there is limited evidence that assessments have led to policy change (de Adelhart Toorop *et al.*, 2023). The FAO annual report *The State of Food and Agriculture 2023* advances true cost accounting as an approach to uncovering the hidden impacts of agrifood systems on the environment, health, and livelihoods, so that agrifood system actors are better informed and prepared before making decisions (FAO, 2023b). The report provides an assessment of total hidden costs in agrifood production at USD 12.7 trillion in 2020, with significant variation across the income levels of countries. Some of the hidden costs considered are social hidden costs associated with distributional failures, which result in poverty and undernourishment; environmental hidden costs from damages linked to externalities; and health hidden costs due to dietary patterns that lead to obesity and non-communicable diseases.

There are challenges in quantifying hidden costs and in identifying who should these costs be attributed to in the food system in a just way considering the range of stakeholders in supply

chains. Nevertheless, the approach of cost/benefit assessments as in “true cost accounting” can be useful towards increasing transparency throughout supply chains and responsibility of businesses and farmers through context-specific assessments for hidden costs. It can also help bring systems thinking into the design of policy and interventions that consider assessments of trade-offs and benefits to shape stakeholder behaviours and models of agri-food production that are more conducive to sustainability and sustainable development.

III.3 Value analysis for AMR in animal food production

The FAO report 2023 did not include assessment of hidden costs in relation to antimicrobial resistance and illness due to unsafe food due to data gaps across the set of countries analysed. It does however point to one study including AMR as hidden costs in the agri-food system, estimating global annual GDP loss attributable to AMR at 1,377 billion and percentage of AMR related to food systems, estimated at 22% (FLUC, 2019). While the valuations can be questioned, there is a clear negative externality from modes of intensive animal-food production practices that misuse antibiotics.

From a policy perspective, the problem can be defined in a limited way to target misuse of antibiotics in animals to protect human health, or it can be part of a broader assessment of the costs (direct and hidden), benefits and trade-offs of different models of agri-food system production, towards increased sustainability. There may also be trade-offs between the sustainability dimensions in different production systems (Vesterlund *et al.*, 2023). Firms and farmers can benefit from a holistic assessment of the potential for transition towards increased sustainability, for their brand and potentially increased earnings. It can also be helpful for governments to better grasp what is the range of support measures that would be required to support transition, in addition to regulation. Some of the direct costs for producers that stop use of antibiotics for growth promotion and restrict use for prevention or treatment can be higher costs of production due to lower animal weight gain efficiency and higher disease costs. Consumer preferences for food safety and sustainability can compensate for the initial profit loss, as well as government targeted support measures for transition, which may be linked not only exclusively to appropriate antibiotic use, but also to improved practices for disease prevention (vaccination, segregation of herds or flocks by age) including good husbandry practices (i.e. nutrition, ventilation systems, low-stress). In addition, assessments could include potential economic losses resulting from the transmission in farms of resistant bacteria to food-producing animals. There are costs associated to change in practices, though these also have co-benefits in terms of prevention and control of diseases beyond antimicrobial resistance, and control of potential economic losses from AMR in animals.

IV. VOLUNTARY MEASURES – CONSUMER PREFERENCES

Consumer demand is a strong driver for shaping markets and influencing change in food production systems. Consumers are increasingly concerned with antibiotic use in animal agriculture for health and food safety reasons and animal welfare (Barrett *et al.*, 2021). These consumer preferences have driven some businesses to reduce antibiotic use, assuming they can gain a premium from a niche market. A general assumption is that consumers will be willing to pay a higher price to purchase products that meet the production standards they seek. However, price is also a key factor affecting consumer behaviour.

Voluntary measures and actions by veterinarians, businesses -including retailers-, farmers and consumers to address inappropriate antibiotic use, may have an important role, particularly in countries in which regulation of antibiotic use is not strong or enforcement is weak. It can also serve to set best practice among trans-national businesses and suppliers.

In the United States, there are several large businesses that have opted to establish voluntary labelling and marketing measures concerning antibiotic use in animal food. Producers may submit a one-time application to be reviewed by the US regulator (Food Safety and Inspection Service (US Department of Agriculture - USDA) inspectors). In the US, labelling of no use of antibiotics for growth promotion in poultry production has been used for a century by the fast-food chain McDonalds, and large broiler producer Perdue Foods and Tyson Foods. Some have gone further to commit to no use of antibiotics in poultry production, for example the fast-food chain Chick-fil-A as of 2019 with a label of “no use of antibiotics ever” and the supermarket Whole Foods that uses the slogan of “Our Meat: No Antibiotics, Ever”, and beef is labelled as “antibiotic free”, Organic and Animal Welfare Certified, for which consumers pay a premium price (around 1 USD more per pound). Their commitments exert pressure on the supply chain to also limit antibiotic use, which helps drive change in animal farming.

However, it has also come into question whether these businesses are able to keep their promises and monitor the compliance by their suppliers. Studies have found that retail animal meat such as chicken even when labelled as antibiotic free or organic is commonly contaminated with pathogens associated with foodborne illness and bacteria harbouring genes conferring resistance to critically important antimicrobial drugs (Mollenkopf *et al.*, 2014) (Prince *et al.*, 2022). In 2007, Tyson Foods label claiming poultry was “raised without antibiotics” was found to be false and misleading, not providing consumers with the attributes expected (Bowman *et al.*, 2016). Whole Foods has been undergoing litigation as of 2022 over claims that traces of antibiotics were used for growth promotion in Whole Foods beef products. Recently, Chick-fil-A has changed its policy to provide poultry raised without use of antibiotics that are considered important to human health, as some suppliers such as Tyson Foods dropped the label “no use of antibiotics ever” citing higher costs of production (Silverman, 2024). These examples point to the need for continued monitoring and adequate testing techniques and transparency in sharing verifiable information to the public, and to use third-party certification to verify the claims. It also points to the continued need for regulation to work alongside voluntary initiatives. Recently, the USDA decided to revise the meat labelling guidelines for voluntary marketing claims, require more documentation to be submitted by businesses to back up the claims, and will undertake targeted sampling to assess antibiotic residues in cattle destined for the 'raised without antibiotics' market, to help inform whether it should require that laboratory testing results be submitted for that claim or start a new verification sampling program. For the time being, the USDA doesn't have the regulatory authority to check animal welfare claims on farms (Durbin, 2023). A new guidance from USDA will require that inspection program personnel in all cattle slaughter establishments submit information on establishment use of Raised Without Antibiotic (RWA) claims through a questionnaire, to direct future sampling related to these claims (FSIS, 2023).

Label claims in the US

No antibiotics used: <ul style="list-style-type: none"> ○ INAC Never Ever 3 ○ No Antibiotics Ever (NAE) ○ Raised With No Antibiotics Ever (RWNAE) ○ Raised Without Antibiotics (RWA or RWOA) 	No antibiotics important to human health/medicine used: <ul style="list-style-type: none"> ○ No Antibiotics Important to Human Health (NAIHH) ○ No Antibiotics Important to Human Medicine (NAIHM) ○ No Antibiotics Used Important to Human Medicine (as defined by WHO)
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Another concern is that transnational businesses maintain different standards of production according to the market destination. The policies may change by country, for example McDonalds has been criticized for not keeping the same policy in foreign markets such as India (Tewari & Khurana, 2017). There are new international markets for more sustainable, low-antibiotic animal protein, as more consumers become more aware of the impact of antibiotics in animal food production and residues in animal food products, and there is growing concern for animal welfare.

Campaigns by public interest advocacy groups have proven important towards increasing consumer information on label claims and the accountability for their use by producers and retailers. In the US, numerous groups including the Center for Food Safety, Natural Resources Defence Council, Consumer Reports, U.S. Public Interest Research Group (PIRG), Food Animal Concerns Trust, and Milken Institute School of Public Health, advance a campaign to urge companies involved in the production, marketing, and sales of meat and poultry (livestock producers, supermarkets, restaurants, etc.) to set and implement timebound policies that eliminate the routine use of medically important antibiotics in their supply chains, to utilize third-party auditors to ensure compliance with antibiotics policies, to report annually on their progress and share data on antibiotics use in their meat and poultry supplies (Antibiotics Off the Menu coalition). Labels “No Antibiotics Administered” or “No Antibiotics Added” or “Raised Without Antibiotics” are not third party verified, in contrast with other labels such as USDA Certified Organic, USDA Process Verified Never Ever 3, Global Animal Partnership (GAP), American Grassfed, Certified Humane, and Animal Welfare Approved.

Public interest group campaigns also seek to influence grocery stores (supermarkets) towards pressing suppliers to address misuse antibiotics in their meat and poultry production. The report “Superbugs in Stock Antibiotics Scorecard” published by US PIRG Education Fund and several members of the Antibiotics Off the Menu coalition, since 2015, grades grocery stores on their actions. It is estimated that around 50% of meat products sold in the US are purchased in grocery stores, thus having significant purchasing power across the meat production supply chain. The Superbugs in Stock report finds that most US grocery stores are failing to meaningfully address the issue of antibiotic overuse by their meat and poultry suppliers (Manusevich *et al.*, 2022). In the United Kingdom, pressure from advocacy groups, consumer preferences and expectation of new regulations has also led to all main supermarkets now having antibiotic policies, which ban routine antibiotic use (Alliance to Save Our Antibiotics, 2021). However, this is usually limited to own-brand animal produce and which is of UK origin.



Groups such as Health Care Without Harm and Practice Greenhealth have also developed standards for institutional food purchasers (hospitals, public institutions, schools, universities) for “value-based procurement” as opposed to minimum cost, to leverage their procurement

power to influence production practices that include reduced antibiotic usage in animal agriculture. These groups also recommend procurement of products that carry third-party verified certifications and vetted label claims (see [Food purchasing criteria | Practice Greenhealth](#)). There is some evidence that these efforts are advancing. It is reported that 68% of hospitals now have a sustainable procurement policy that is considered when making purchasing decisions, and 53% have set sustainable procurement goals for their organization, and of the 215 facilities that preferentially purchased sustainably-produced meat in 2022, 75% report that USDA Process Verified Program (PVP) Label Claims such as Raised Without Antibiotics or No Antibiotics Ever were used to verify that meat and/or poultry items purchased were raised without routine, non-therapeutic antibiotics (Practice Greenhealth, 2023). A similar effort has been made in the UK to survey catering companies that serve schools and healthcare institutions. The report has found that 5 out of 10 catering companies surveyed have no antibiotics policy, none of the companies prohibit their suppliers from using antibiotics for routine disease prevention, and none of the companies collect any data on their antibiotic use (Alliance to Save our Antibiotics, 2023).

Investors are also becoming an important influence in food supply chains and retailer policies to reduce unnecessary use of antibiotics in animal food production. There are active campaigns such as the Farm Animal Investment Risk and Return (FAIRR) initiative, an investor network, of which 75 investor signatories managing over \$3 trillion of assets have agreed to a statement to support reform of the non-therapeutic use of antibiotics in livestock production and consider it material when evaluating a company's prospects (FAIRR Antibiotics Statement). The impact can be seen by the increasing number of shareholder resolutions in recent years.

Shareholder activism over AMR has increased recently

Investor resolutions at AGMs for antibiotic resistance (%)

Company	Date of AGM	Year of AGM	Status	Votes cast (%)
McDonald's Corporation	May 26	2023	Voted	
McDonald's Corporation	May 26	2023	Voted	
Hormel Foods Corporation	Jan 31	2023	Voted	
Brinker International	Nov 17	2022	Voted	
McDonald's Corporation	May 26	2022	Filed	
McDonald's Corporation	May 26	2022	Voted	
Yum! Brands, Inc.	May 19	2022	Withdrawn	
Abbott Laboratories	Apr 26	2022	Voted	
Hormel Foods Corporation	Jan 20	2022	Voted	
COSTCO Wholesale Corporation	Jan 20	2022	Withdrawn	
McDonald's Corporation	May 20	2021	Voted	
Dine Brands Global, Inc.	May 11	2021	Withdrawn	
Walmart	Mar 06	2020	Voted	
COSTCO Wholesale Corporation		2020	Withdrawn	
Wendy's		2020	Withdrawn	

Source: Neville & Agnew (2023)

V. SUPPORT FOR SMALL SCALE LIVESTOCK PRODUCERS: LESSONS FROM FAIR TRADE

Export markets for animal food products will remain important for many developing countries, with potential higher prices than in domestic markets. The changing meat consumption patterns in high income countries show that concerns about human health, environmental impact and animal welfare are the key motivations prompting consumers in these countries to shift towards a diet that shifts demand among meat products or reduces overall demand (OECD/FAO, 2023).

At the same time, domestic production is rising in previous importing countries, and there is a growing domestic demand in middle-income countries. For access to high-income export markets, greater attention will need to be placed by exporter businesses on the quality of the meat, including levels of antibiotic use and residues that consumers are increasingly sensitive to (as shown with US labelling practices), and increasing regulation (as in the case of the EU whose regulations on use of veterinary medicines on food producing animals and food of animal origin extend to imports). In addition, in the EU there is requirement for mandatory country-of-origin labelling on meats of pigs, sheep, goats and poultry as of 2015.

It is of concern whether these trends are significant barriers or potential opportunities for small-scale livestock producers for access to higher-value export markets to increase their incomes, for example in Europe. The ability to compete with industrial transnational players or join global supply chains is limited. One issue is the scale of production, for which an option can be to combine output to aggregate their produce to increase their incomes. Another possibility is to create new niche markets, for example based on a model as that of “Fair Trade” that incorporates premiums for sustainable and social production into the cost of products and ensuring that a larger part of the profit of sales is received by the producers rather than intermediaries in the supply chains. This approach is focused on supporting small producers, as opposed to large industrial players.

Fair Trade supports small producer organizations and farmers in low- and middle-income countries to maintain or adopt sustainable practices, and by ensuring standards that blend social, economic and environmental criteria that support sustainable development, cater to consumers that support these values and will prefer to buy products that follow these standards and possibly pay higher price for them. If the requirements are met, agricultural producers or groups of producers are able to obtain a Fair Trade certification, Fair Trade Certified™, for a determined geographical territory.

Currently, Fair Trade does not extend to livestock production and the Fair Trade certification does not take into account methods of production related to antimicrobial use. A pilot project, established together by agencies like IFAD and others that support small scale livestock producers, could be made to assess the merits of establishing a Fair Trade – like agency that includes antimicrobial use in animal food production as part of the standards.

There are various projects supporting small scale farmers towards organic farming to increase their incomes aligned to increasing sustainability, such as through third-party certification of organic production. These projects could also be extended to include antibiotic use and residues in meat production, supporting good husbandry practices and alternatives to antibiotics. There is some evidence that the prevalence of AMR is lower on organic farms than on conventional farms, despite substantial region- and country-specific variations in regulations and policies governing organic farming (Ager *et al.*, 2023).

VI. RECOMMENDATIONS ON WAY FORWARD

- Farmers and veterinarians are not generally well informed about the trade-offs of the misuse of antimicrobials in animal food production (i.e. routine use through mass administration to animals through water or feed as preventive measure or growth promotion), or the perspectives for potential market opportunities driven by consumer preferences for products that are considered healthier or more supportive of animal welfare. Once informed, they are generally willing to consider change in practices provided that it is technically feasible and not too costly. Technical assistance is needed, beyond general guidelines, that is relevant to the specific context and animal species specificities. An example of such assistance is that provided by the International Centre for Antimicrobial Resistance Solutions (ICARS), with ICARS-supported projects being developed in close consultation with various stakeholders to determine AMR interventions that work in the local context, with continued support provided. The EU could provide support for more technical assistance projects directed at farmers and veterinarians in developing countries, and through the WOA and FAO for the practical implementation of the various guidance it provides for veterinarians.
- Value assessments should be encouraged for use of antimicrobials in animal production as part of efforts towards the transformation of agrifood systems that are more just and sustainable. The FAO 2023 report on true cost accounting should be leveraged for this purpose, with projects to support assessments at country and animal species level. These should differentiate among the type of production system, as trade-offs, costs and benefits may differ among the systems and the stakeholders. As various case studies show, from Namibia's meat production, Argentina's meat production, India's shrimp production and Colombia's pig production, efforts on reduction on antibiotic use in animal food production benefit from being linked to broader efforts on food safety, sustainability and animal welfare, even as there can be trade-offs to be made in the approaches adopted towards these goals, but it is necessary for the industries to move forward in all these areas.
- Small and medium scale animal food producers need support measures the most, both technical and financial, as compared to industrial, large-scale businesses. Financial support can be mobilized through national funds as well as by innovative ideas such as campaigns to repurpose EU/US trade distorting domestic subsidies towards improving in third countries capacities for production without unnecessary antibiotics, sustainability and enhanced animal welfare.
- Market oriented solutions, such as labelling, can be useful to allow consumers to choose products of animals raised without unnecessary antibiotics and thus influence retailer and other food purchaser policies and stakeholders in the supply chain down to farmers. However, labelling is only a partial solution – and does not compensate lack of regulation, which is necessary. Moreover, the reliance on market-oriented solutions that largely depend on consumers' willingness to pay a higher price (as in the US case) can be a concern towards the goal of making healthy diets available and affordable for all. As in the case of Colombia's pig industry, labelling is not linked to demand for higher pricing but to increase market share as compared to other meat alternatives. For exporters, the promise of potential higher income is a promising incentive, as is evidenced by the case of Namibia's export led meat industry that is able to meet the highest standards. However, to date there are no policies that are directed at ensuring that exporters that comply with domestic labelling standards in high-income countries are able to enter the market. Rather, retailers in the US, EU and UK that have developed policies on sourcing animal food products without antibiotics

(or without antibiotic residues), source almost exclusively under these labels from domestic suppliers. The retailers could be pressed to expand their sourcing from developing country suppliers that can meet the standards, increasing competition in the domestic market that benefits human health and promotes good animal husbandry practices.

- A mechanism of international certification for animal food production systems that align to sustainability goals and reduce use of antibiotics should be explored, modelled on the Fair Price certification that focuses on supporting small scale producers to receive a more fair share of trade and increase their income. Currently there is no certification system operating internationally that accounts for appropriate use of antibiotics in animal meat production. Any such system requires third party certification and transparency to allow for verification of claims and assessments at farm level. Expansion of current Fair Trade certification or Organic certification should also be considered.
- Policies towards appropriate use of antibiotics in animal farming systems (appropriate use of antimicrobials, prescribed by a veterinarian -to the extent possible- and with clear instruction for correct administration of the drug -correct dosage and duration- should be integrated as part of broader policies to advance good production facilities, biosecurity measures, and management practices focusing on disease prevention. Such focus would address the use of antibiotics to compensate for less sanitary animal production facilities or inappropriate biosecurity. This approach may also facilitate leveraging domestic funding, as disease prevention is a key concern for the animal food sector.
- More initiatives are needed to support farmers and veterinarians with information and experimentation on cost-effective non-antimicrobial alternatives to prevent disease, improve gut health and to promote growth, in parallel to improving husbandry practices. There are some alternatives available, such as probiotics and prebiotics, phytochemicals and acidifiers.
- National Action Plans on AMR should include the animal production sector in addition to human health, and establish targets that are context specific, such as establishing a national antibiotic use reduction target by animal species and improved data collection.
- Government regulation is necessary. There are multiple examples and experiences that serve to inform policy makers. These include a ban on routine farm antibiotic use, for growth promotion, and antibiotics should be used to prevent or treat disease in single animals, not groups/flocks. As in the EU, a ban can be extended to preventative antibiotic use particularly for highest priority critically important antibiotics except for exceptional circumstances where the risk of infection is high, and where the consequences of not using antibiotics are likely to be severe, and only for the duration indicated in the label. The experience with growth promotion bans in the US and EU is that mass prophylactic use of antibiotics increased, which may just have masked continued use for growth promotion. In the EU, a ban has also been extended to use of antibiotics to compensate for poor hygiene, inadequate animal husbandry or lack of care or to compensate for poor farm management.
- Country regulators should update the national list of medically important antimicrobials to align with that of the WHO 2024 List of Medically Important Antimicrobials and the WOA list of antimicrobial agents that are critically important for veterinary medicine. Currently there is significant divergence among the lists used in countries.

- No direct marketing and advertising of antibiotics should be allowed by industry to farmers, or the use of financial incentives to prescribers and suppliers (distributors).
- There is need to increase data collection and transparency of antibiotic use in animal food farming, and record keeping of veterinary prescriptions.

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ISSN 1819-6926