



# ROADMAP

## Rethinking of antimicrobial decision-systems in the management of animal production

Research and Innovation action: H2020 – 817626

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Type of action: Research and Innovation Action (RIA)

## **Antibiotics resistance and antibiotics use in livestock farming in Mozambique**

### **Findings from an on-line veterinary survey, 2021**

Version March 2023

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Workpackage N°2

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This project has received funding from the European Union’s Horizon 2020 research and innovation programme under grant agreement No 817626

### 1. About the ROADMAP research project

The overall aim of ROADMAP is to foster transitions towards prudent use of antimicrobials (AMs) in animal production in different contexts to manage antimicrobial resistance (AMR). Prudent antimicrobial use (AMU) will be achieved by enhancing antimicrobial decision-systems along the food and drug supply chains. ROADMAP will focus on supporting animal health and welfare through prevention and health promotion actions.

AMR is recognized as a significant threat to global public health and food security. Overuse and improper use of AMs in many parts of the world contribute to the emergence and spread of AMR. Although human and animal health require AMs, it has been estimated that two thirds of the future AMU growth worldwide will be in animal production. Improving the management of AMU in farm animals is therefore a critical component of dealing with AMR and optimizing production in the livestock sector. Nevertheless, the variety of contexts of AMU in the livestock sector is a major challenge to managing AMR. **There is no “one-size-fits-all” solution to improve AMU and strategies must be contextually developed** (for instance, strategies used in the Danish pig industry are difficult to adapt and adopt in the French free-range poultry farming). Successful solutions must be combined and tailored to the production systems and the social and economic context in which they operate.

ROADMAP will meet three general objectives, in line with the EU AMR Action plan: i) Rethink AM decision-systems and animal health management; ii) Develop options for encouraging prudent AMU in animal production; iii) Engage all actors in the food and drug supply chains in fostering a more prudent use of AMs.

#### Project consortium

	Participant organisation name (acronym)	Country
1	Institut National de Recherche pour l’Agriculture, l’Alimentation et l’Environnement (INRAE) **	France
2	Association de coordination technique agricole (ACTA) ***	France
3	Centre de coopération internationale en recherche agronomique pour le développement (CIRAD) **	France
4	University of Liverpool (ULIV) *	United Kingdom
5	Cardiff University (CU) *	United Kingdom
6	James Hutton Institute (HUT) **	United Kingdom
7	Alma Mater Studiorum - Università di Bologna (UNIBO) *	Italy
8	Aarhus Universitet (AU) *	Denmark
9	Eigen Vermogen van het Instituut voor Landbouw en Visserijonderzoek (EVILVO) **	Belgium
10	Research Institute of Organic Agriculture (FiBL) **	Switzerland
11	Stichting Wageningen Research (WR) *	Netherlands
12	Swedish University of Agricultural Sciences (SLU) *	Sweden
13	Southern Agriculture and Horticulture Organization (ZLTO) ***	Netherlands
14	European Forum of Farm Animal Breeders (EFFAB) ****	Netherlands
15	Fundacion Empresa Universidad Gallega (FEUGA) ****	Spain
16	Dierengezondheidszorg Vlaanderen (DGZ) ***	Belgium
17	INRAE Transfert (IT) ****	France

\* Universities/veterinary schools \*\* Research institutes specialized in both fundamental and applied agricultural and veterinary sciences \*\*\* Public and private advisory services Organisations \*\*\*\* Knowledge transfer and Innovation organisations

## 2. The project Roadmap in Mozambique

### A multi-stakeholder initiative for a more prudent use of antibiotics in the Poultry Sector in Mozambique

Living Lab Coordinator(s)  
Carlos Cuihane, Cristiano Macuamule,  
Muril Figueiró

**Broilers**

**The Poultry sector**

This multi-stakeholder initiative gathered a dozen participants from 4 types of organisations: the Mozambican Ministry of Agriculture and Rural Development (MADER), Association of poultry farmers (ADAM), University Eduardo Mondlane (Faculties of Veterinary Sciences, and of arts and social sciences) and Cirad (French research institute). From October 2019, 5 meetings have been organised and also larger events have taken place, involving various other stakeholders (students, farmers, veterinarians, veterinary drugs sellers, policy makers...). This process is still ongoing.

**The strategy tested in the Living Lab**

The global objective of the Mozambican multi-stakeholder initiative was to influence the national policies on AMR in the livestock sector. Different strategies were implemented: research (surveys with farmers, vets, drugs sellers; drugs market analysis, 2020-2023), events for the AMR awareness week (2022), international field trip to La Reunion (2022), training (quantifying AB use, 2021), and regular meetings with the national committee on AMR. Some actions are still in progress, such as sharing our research results (on AMU by poultry farmers, and on drugs market) with the national committee on AMR, promoting exchanges of experiences with French farmers involved in AMU reduction in La Reunion, and promoting debate between authorities, farmers, vets and drugs sellers on the vet drugs legislation and other issues (during the awareness week). The aim is to promote, through the definition of a set of Best Practices Guidelines, alternatives to the on-going and rapid process of industrialisation of the poultry sector: this process relies on a growing use of AB and is supported by part of the national agricultural policies and the agricultural inputs sectors (chicks, drugs and feed sellers).

**The roadmap to implementation**

The multi-stakeholder initiative focused on the necessity of changes in the systems and structures beyond the farms, instead of focusing only on farmers levels. The first meeting was the kick-off meeting of the Roadmap project in Mozambique (November 2019). The following meeting and actions mainly focused on co-designing research activities and sharing and discussing the results. Our process was slowed down by the Covid-19 context and the low mobilisation of the vet drugs sector. The next step is to build alliances to support the development of less AB-dependant poultry production systems. The second step is to support a regulation of access to AB without compromising the access to vet drugs which is limited for the majority of farmers in rural areas.

### The impact created by the Living Lab

AMU: The ROADMAP Mozambican collective action created a community of stakeholders (practitioners –farmers, vets-, policy makers, researchers). This proximity made easier access to data, and share of information and research results. This multi-stakeholder initiative contributed to build a shared diagnosis of the situation in the Mozambican poultry and vet drugs sectors. This diagnosis can influence the decision markers: for example, data produced on AB markets contributed to support decisions taken by the Ministry of Agriculture on drugs imports.

Animal Health and agroecological transition: This multi-stakeholder community was strengthened during the field trip organised in La Reunion. Moreover, during this field trip, the group was able to set the basis for potential collaboration with the directorate of Agriculture in La Reunion (DAAF) to support a 5 years training program for agroecological production systems in Mozambican poultry sector.

A One Health approach of AMR has been strengthened by our multi-stakeholder initiative since our group is active in raising the issue in relation to the animal sector in the mostly human health sector National AMR committee.

**Challenges**

- Systemic changes are needed to shift towards agroecological production systems, but require long lasting intervention, and the mobilization of a more diverse and larger number of stakeholders
- Technicians and veterinarians are not in enough numbers to support farmers towards this shift
- The actors of the poultry sectors are influential but have no interest in reducing AB use

**Successes**

- This initiative created a unique community of stakeholders involved in managing AMR in the Mozambican livestock sector
- Members of this initiative have been invited as permanent members of the National AMR Committee, based on their expertise built in the ROADMAP project
- Graduate and postgraduate students completed their training at Eduardo Mondlane University

It is a huge challenge to manage AMR in a country where there is an ongoing unregulated process of modernization of the agricultural sector, relying on an increasing use of industrial inputs such as antibiotics. The issue of AMR needs to be addressed not only as a One Health issue but as an agroecological one.

[www.roadmap-h2020.eu](http://www.roadmap-h2020.eu)

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 817626.

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Species	POULTRY
Production system <sup>1</sup>	MARGINAL
Level <sup>2</sup>	2

## Summary

An online structured interview was performed in Mozambique in 2021, to understand how the practices, knowledge and working conditions of the professionals in animal health are impacted by, and contribute to the current use of antibiotics (ABU) and the issue of resistance to antibiotics (ABR), with a focus on farmed animals<sup>1</sup>.

Are considered as veterinarians in Mozambique, the professionals holding a license in veterinary medicine (+4 years) from the Faculty of Veterinary Sciences of the E. Mondlane University in Maputo, (foreign veterinarians must request an equivalence of their diploma). Veterinarians are requested to be registered at the (OVM: Ordem dos Médicos Veterinários de Moçambique), but among the approximately 750 veterinarians in Mozambique, 334 are registered at the OMVM (Natalino Filipe Magaia, 2023).

The Faculty of Veterinary Sciences also issues licenses in "Sciences and Techniques in animals" and in "Sciences and Techniques in food" whose holders are considered as senior technicians. Livestock extensionists have a Bachelor's degree and a non-academic training in the area of livestock

Our survey was submitted on line, using an existing WhatsApp group of 250 animal health professionals from August to September 2021 and 44 answers were received, from 41 veterinarians and 3 senior technicians.

We summarize here the main results.

### Profile of the respondents and characteristics of the Mozambican veterinary profession

- Our sample represents approximately 6% of the total number of veterinarian professionals in Mozambique (estimated at 750).
- Most of these professionals were trained in veterinary health (93%)(table 1), with a license level (43%), a master (29,5%) or a PhD (22,5%), (Figure 3).
- This population is young (more than 25% of respondents are under 35, 55% under 45), with a high proportion of women (61%), (Figure 2). Nearly a third (32%) have less than 5 years of experience, and 60% less than 10 years (Figure 4).
- Most of them were trained in Mozambique, at the University E. Mondlane (82%). But many of them (36,4%) received part of their training abroad, mainly in Europe (Australia, Netherlands, Portugal, Spain, United Kingdom, Belgium) but also Brazil, South Africa and others countries (Cuba, Tanzania) (table 2).
- 59% are registered at the OVM (Ordem dos Médicos Veterinários de Moçambique) and 43% are members of the AVETMO (Associação dos Veterinários de Moçambique).

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<sup>1</sup> This survey completed a set of in depth-interviews conducted the same year with 10 extensionists working in the Province of Maputo. The analysis of this previous set of in depth interviews is reported in "Avaliação da utilização de antibióticos na produção avícola na cidade de Maputo e na província de Maputo, Moçambique – estudo qualitativo", C.Cuinnhae et al. 2023. Roadmap report).



- They work mainly in Maputo or Maputo Province (56%), and for few of them in Gaza Province (16 %). 25% declared no specific geographical area of work: these ones are mainly civil servants working in national institutions (Table 3).
- Public administrations (48%), education (29%), NGOs (13.6%) or international organizations (2%) are their main employers. A fourth of them (25%) works in the commercial private sector (table 4).
- Main activities include teaching and research (for 48% of them), technical assistance to producers (39%), care of pets (23%). Many of them (43%) have more than one type of activities (Table 5 and 6).
- Protecting public health (by controlling the zoonosis and food safety) and the health of the animals are the major objectives of these professionals. (table 8)

### **Practices in assisting farmers and use of AB**

- A majority (80%) reported activities related to farmed animals, but only 45% provide direct assistance to farmers (Figure 5). Assisting farmers is a part time activity: only 11% of all these professionals dedicate more than 75% of their time to it (Table 7).
- For professionals assisting directly farmers (n=20), diagnostics are mainly based on clinic observations of the animals, and on the description of the symptoms by the farmers (table 11).
- They have a limited access to the different tools that could support their diagnostic, such as diagnostic test, autopsy, antibiotic susceptibility tests, or even technical instruments for measuring water quality, ventilation, humidity, etc. (figure 8): 25% “never”, or “only very rarely” use any of these tools; 45% use at least one of these tools “often” or “very often” (mainly the diagnostic tests); all of them never use or very rarely use AB susceptibility test (75% =never).
- Vet drugs are the products the more often prescribed, or administered by these professionals, compared to nutrition products, hygiene products and disinfectants, and alternatives medicines (figure 6). Among those, antiparasitics are the most commune; hormones are very rare.

### **Use of AB in their professional practices**

- More than a third of these professionals declare using antibiotics very frequently (table 13). And 25% of their consultation end with prescription of AB; when in 30% of the case, treatments with AB have been already initiated by farmers prior to the visit of the veterinarian on farm (table 15).
- These professionals select the AB to be used based on their own experience and knowledge of the efficiency of AB, rather than based on official directives, or to answer to producers demand or search of rentability (table 14).
- 50% of them consider that the risk of AB resistance should be considered when choosing an AB (table 16).
- The use of AB test is very limited (table 17). 75% of the professionals do not use it. These tests are hardly available and farmers are not ready to pay for it. 20% of the professional use it, after a failure in a previous treatment (table 18).

### **Knowledge and opinions regarding the use of AB and the risk of resistance**

- Regarding the whole sample, there is relatively good general knowledge of AB and AB resistance (table 20).
- But all respondents are interested in having more information on issue related to AB use and AB resistance: more than 80% would like to receive guidelines in the use of AB and more than 50% information on AMR (Figure 11).



- Professionals view AB as necessary for the wellbeing of the animal (64%). Curative (77%) and metaphylactic (70%) uses of AB are perceived positively (table 21). And they do not agree either that AB could be a valuable alternative for the lack of hygiene (89%), (table 20).
- Ignoring the risk of AMR, using AB preventively (70%), using AB without further analysis is not considered as a responsible behaviour (table 21).
- None of the respondents agree with the need to increase the use of AB in the animal farming, whatever the type of production; and there is large consensus on the need for a more prudent use of AB (95,5%). And 43% agree on the need to reduce AB use (table 22).

### Public issue and veterinarian responsibilities

- Interestingly, the problem of AMR is perceived as being more a concern in Mozambique, in Africa and in developing countries, than for the developed countries (table 23).
- AMR is perceived as similarly important in the human and animal sectors (table 23, figure 12).
- Only 39% of the respondent (figure 13) have read or heard about the National Action Plan against Antimicrobial Resistance in Mozambique.
- Respondents feel personally responsible in tackling AMR: 75% of them strongly disagree with the sentence “It’s not my job to encourage AMU reduction” (table 24).
- Regarding the relevant strategies for a more prudent use of antibiotics in livestock (table 24 and 25), they agree on the importance of improving biosecurity on farms; increasing farmers awareness; training farmers and vets; regulating and monitoring AB use, sale and prescription; delivering professional guidelines. More than a third of them disagree on vaccination as a mean to reduce AB use. There is a low level of agreement on strategies based on economic incentives and des-intensification.

### Stakeholders influence and interest in relation with AMU/AMR

In another section we intended to know based on respondents opinions, which stakeholders could have an interest and/or an influence for a more prudent use of AB in Mozambique (Table 26). The main benefit will be for consumers, for human health and for the environment. International organisations, the animal health sector, and the respondents themselves area perceived as influential. Pharmaceutical industry and drugs vendors are perceived are influential too but little interested.

### Others

- **Covid impact:** More than half of the respondents (54%) declared that they have been impacted professionally by the Covid context, with a diminution of activities for 44% of them, an increase for 19% (Fig 17 and 18).
- **Vet drugs market:** some questions were directed to professionals involved in the trade of veterinary drugs; but as they were very few, the answers are not commented here.

### Conclusion

Out of a total of 250 animal health professionals (AHPs) contacted via a WhatsApp professional group, 44 HAPs responded to our online survey. This rate of 18% (44/250) is considered an acceptable rate for an online survey. Nevertheless, it is difficult to assess the representativeness of our sample because we do not have much information on the entire AHP population (no national data); we do not know the representativeness of



the WhatsApp list, nor if the willingness to respond was random or induced by a specific profile of individuals. Despite this limitation, the interest of this survey is to provide a first assessment of the involvement of AHPs in AMR.

This survey shows that the veterinary profession in Mozambique consider that tackling AMR is an important public health issue for their country. They have a general good knowledge on AB and AMR but are willing to receive detailed guidelines on what to use, when... They agree on the responsibility of the veterinary sector to contribute to manage this issue and feel personally responsible for it. But few of them know about the Mozambican National Action Plan on AMR. Those assisting farmers use AB frequently. They have little access (and even no access) to the tools that could allow them to use AB in a more prudent way: diagnostic tools, AB, susceptibility tests, alternatives medicines; and have no incentives for this. They did not declare any specific economic interests in using AB (compared to other vet drugs) and are not pressured by farmers to prescribe AB (since farmers can purchase AB easily on their own). A more in-depth interview with farmers would be relevant to document more precisely the drivers of their practices when prescribing AB to farmers.

This survey shows that the NAP on AMR can rely on the support of the veterinary profession to tackle the issue of AMR. But more specific guidelines are required as well as improved access to diagnostic tools and alternatives medicines.



## DETAILED RESULTS

Our survey was submitted on line, using an existing WhatsApp group of 250 animal health professionals (AHPs) from 14 of August until 23<sup>rd</sup> of September 2021. The survey form is available in Annex 1<sup>2</sup>.

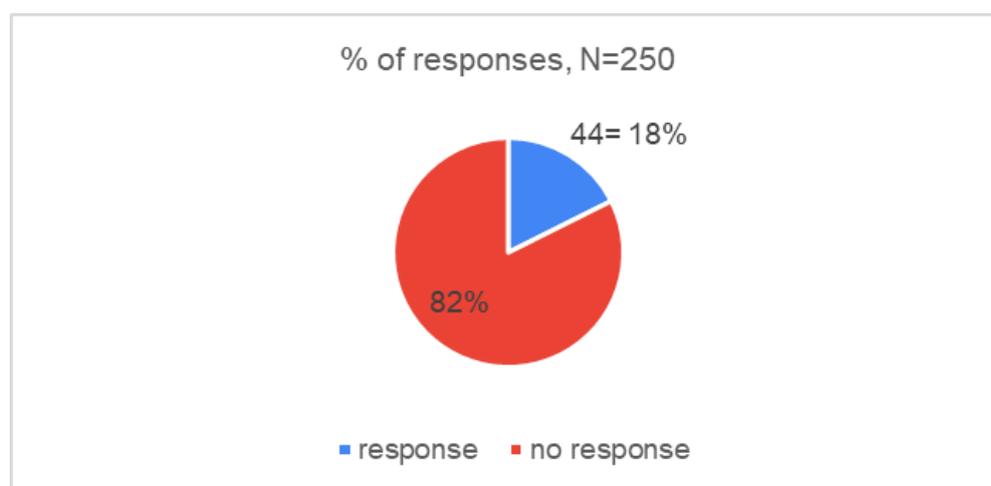
The questionnaire included the following sections:

- Section 1. Profile of the respondents (socio demography, training, employment, activities, membership to professional associations)
- Section 2: Activities. Role in antibiotics (AB) and other drugs prescription and use
- Section 3: Activities related to the trade of vet drugs
- Section 4. Knowledge and perceptions related to antibiotics (AB), antimicrobials (AM) and antimicrobials resistance (AMR); perceptions of AMR as a public problem, strategies to tackle AMR, Interest and influence in tackling AMR
- Section 5. Impacts of the period of Covid-19 on their works and business

### Section. Profile of the animal health professionals

Out of a total of 250 animal health professionals (AHPs) contacted via a WhatsApp professional group, 44 HAPs responded to our online survey. This rate of 18% (44/250) is considered an acceptable rate for an online survey. This represents 6% of the total population of veterinarians in Mozambique (44/750).

Figure 1. Participation rate



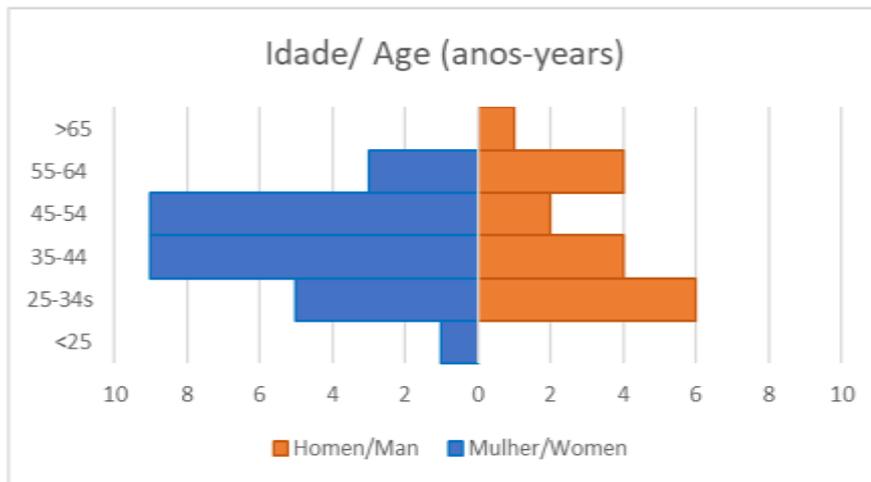
#### 1. Age and gender

AHPs are relatively young (more than 25% of respondents are under 35, 55% under 45), and women are in the majority (61%), (Figure 2).

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<sup>2</sup> Google form: <https://docs.google.com/forms/d/1EvKjZv1wju3TUZo6E11ybyTdzguddo0newrucBcRfk/printform>  
[https://docs.google.com/forms/d/1\\_KYSZKoQ3QcbozmC11S\\_jvJYcR6qj9n27oKucwQh0JA/edit#responses](https://docs.google.com/forms/d/1_KYSZKoQ3QcbozmC11S_jvJYcR6qj9n27oKucwQh0JA/edit#responses)

Figure 2. Pyramid of age of the AHP participating to the online vet survey



## 2. Education and membership to professional associations

- Education

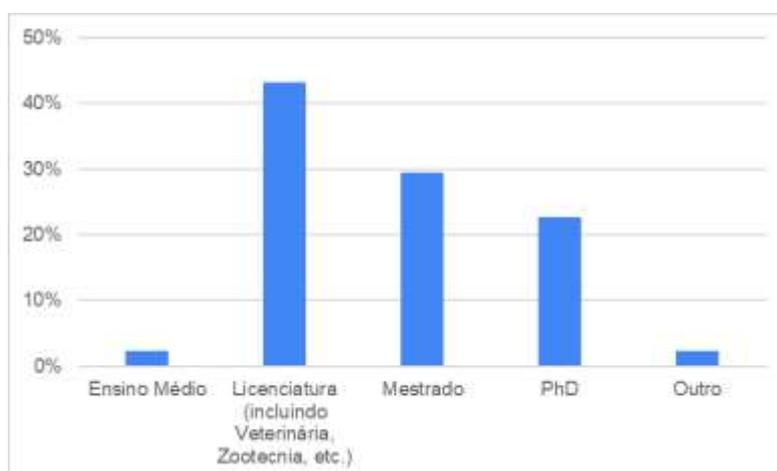
Most AHPs were trained in veterinary health (93%)(table 1), with a license level (43%), a master (29,5%) or a PhD (22,7%) (Figure 3).

Table 1. Qual é a sua principal área de formação? Main field of training\*(one answer)

N= 44, Q9	Obs	% of respondents
Veterinary medicine/Medicina Veterinária	41	93,2
Animal production/ Agro-Pecuária	3	6,8
Public Health/Saúde Pública	1	2,3
Total number of respondents	44	

Note : One respondent has two formations: veterinary medicine and animal production

Figure 3. Indique o seu grau académico mais elevado / Higher degree (Q10)





Most of the AHPs were trained in Mozambique, at the University E. Mondlane (82%). But many of them (36,4%) received part of their training abroad, mainly in Europe (Australia, Netherlands, Portugal, Spain, United Kingdom, Belgium) but also Brazil, South Africa and others countries (Cuba, Tanzania) (table 2).

Table 2. *Em que país se formou? (em relação ao grau académico mais elevado)/ Country of training (regarding your higher degree)*

Q11, N=44	Obs	% of respondents
Mozambique	28	63,6
Europe (Australia, Netherlands, Portugal, Spain, UK, Belgium)	4	13,8
Brasil	5	11,4
South Africa	3	6,8
Other (Cuba, Tanzania)	2	2,3
Total of respondents	44	100,0

- Professional associations

59% are registered at the OVM (Ordem dos Médicos Veterinários de Moçambique) (Q16) and 43% are members of the AVETMO (Associação dos Veterinários de Moçambique) (Q17).

### 3. Employment: geographic areas and employers

- Geographic areas

All the respondents were Mozambican (Q5). They are working in Mozambique exclusively, mostly in Maputo or Maputo Province (56%), and for few of them in Gaza Province (16 %). 25% declared no specific geographical area of work: these ones are mainly civil servants working in national institutions (see table 3).

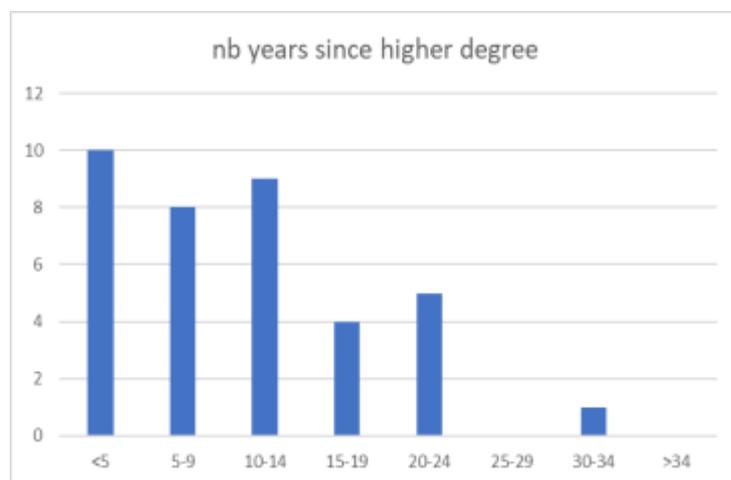
Table 3. *Em Moçambique, em que região(ões) trabalha/ In Mozambique, in which regions do you work?*

N=43 Q6	Obs	% of respondents
All country	11	25,0
Maputo City	19	43,2
Gaza	7	15,9
Province of Maputo	6	13,6
Provinces of Manica, Tete or Sofala	3	6,9
Provinces of Cabo Delgado, Inhambane, Nampula, Niassa or Zambézia	0	0,0
Total number of respondents	43	

- Experience

Nearly a third (32%) of the respondents had less than 5 years of experience, and 60% less than 10 years (Figure 4).

Figure 4. Há quantos anos foi formado(a), em relação ao grau académico mais elevado?/ years since your highest degree



- Employers

AHPs work for public administrations (48%), education (29%), NGOs (13.6%) or international organizations (2%). A fourth of them (25%) works in the commercial private sector 3 of them have more than one employer, and 1 is unemployed. (table 4).

Table 4. Qual(s) é(são) o(s) seu(s) empregador(es) actual(s)?/ Current Employers

N=44, Q14, Various possible answers	Obs	% of respondents
Public institutions/ Instituição Pública (Ministérios, Instituições de Investigação, Direcções Provinciais, Distritais, etc.)	21	47,7%
Secondary and Higher Education Institution /Instituição de Ensino Médio e Superior	13	29,5%
Own business/ Conta própria	6	13,6%
NGOs/ Organização Não Governamental (Nacional ou Estrangeira)	6	13,6%
Vet clinics and pharmacies/ Clínica e-ou Farmácia veterinária	2	4,5%
Agro-Business Company /Empresa de Agro-Negócio (Comercialização de insumos agro-pecuários incluindo medicamentos)	2	4,5%
Internatioanl organizations/ Organização Internacional (Ex. FAO, OIE, OMS, etc.)	1	2,3%
Un-employed/ sem emprego	1	2,3%
Pharmaceutical Industry, Private Laboratory/ Indústria Farmacêutica, Laboratório Privado	0	0,0%
nb of answers	52	
nb of respondents	44	

#### 4. Activities, Professional interest

- Pluriactivities

Main activities include teaching and research (for 48% of the AHPs), technical assistance to producers (39%), care of pets (23%) etc. (Table 5)

Table 5. Activities of the AHPs

N = 44, Q18, Various possible answers	Obs	% of respondents
Teaching and Research/ Ensino, Pesquisa científica (Saúde, Produção animal...)	21	47,7
Technical assistance to producers/ Assistência técnica aos produtores-criadores	17	38,6
Care and treatment of pets and exotics /Cuidado e tratamento de animais de estimação e exóticos	10	22,7
Regulation, Health Control (including borders), Pharmacovigilance Regulação, Controlo Sanitário (incluindo fronteiras), Farmacovigilância	8	18,2
Laboratory for veterinary analysis/ Análises laboratoriais em saúde animal	7	15,9
Laboratory for medical analysis/ Análises laboratoriais em saúde humana	5	11,4
Trade of vet drugs/ Distribuição e venda de medicamentos veterinários (incluindo vacinas)	4	9,1
Others/outros	5	11,5%

Many of the AHPS (43%) have more than one type of activities. (table 6)

Table 6. Number of professional's activities

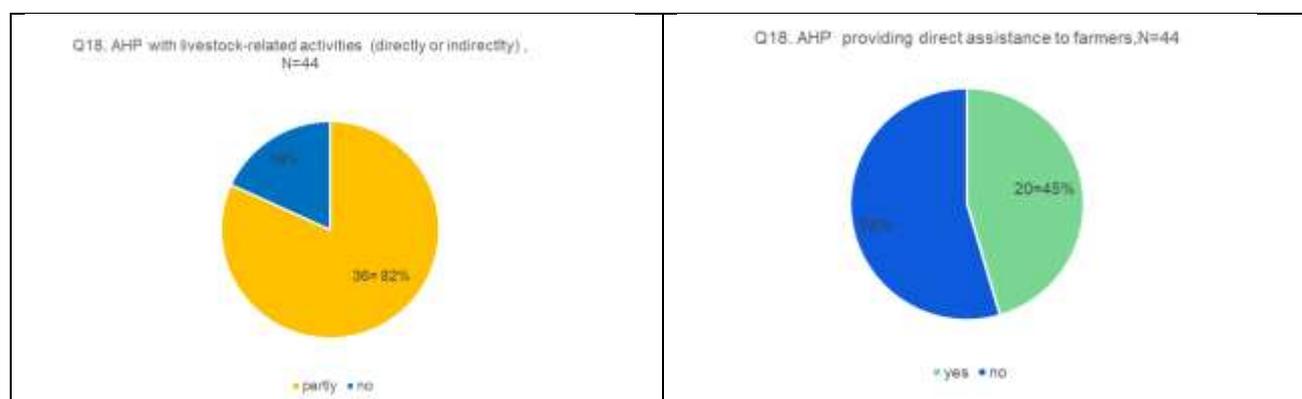
number of activities	1	2	3	4	5 or more
n	25	13	2	3	1
% of respondents	56,8%	29,5%	4,5%	6,8%	2,3%

As an example, teaching and research is the main activities of the AHPs but  $\frac{3}{4}$  of those involved have another activity (or other activities) such as assisting farmers or treating pets.

- Animal farming

A majority of AHPs (n=36/44; 80%) report livestock-related activities, but only 45% (n=20/44) provide direct assistance to farmers and farmed animals.

Figure 5 AHPs with livestock-related activities



Providing assistance to farmers is a part time activity: only 11,4% of the AHPs dedicate more than 75% of their time to it (table).

Table 7. Que proporção da sua actividade é direccionada à assistência veterinária para animais de produção? What proportion of the vet practice business is farm animals? (one answer)

N=43, Q20	Obs	% of respondents
0	8	18,2
< 25%	17	38,6
25-50%	12	27,3
50-75%	2	4,5
> 75%	5	11,4
total	44	100

## 5. Main interests : Public and animal health

Respondents were asked to rate their degree of agreement with a set of sentences describing their professional interests, from 1 (totally disagree) to 5 (totally agree).

Protecting public health (by controlling the zoonosis and food safety) and the health of the animals are the major objectives of these professionals. Regarding more personal objectives, the priority is guarantying the efficacy of their work (table 8 and figure 6). The sentence “reducing AMU in farmed animal” received also a high level of agreement.

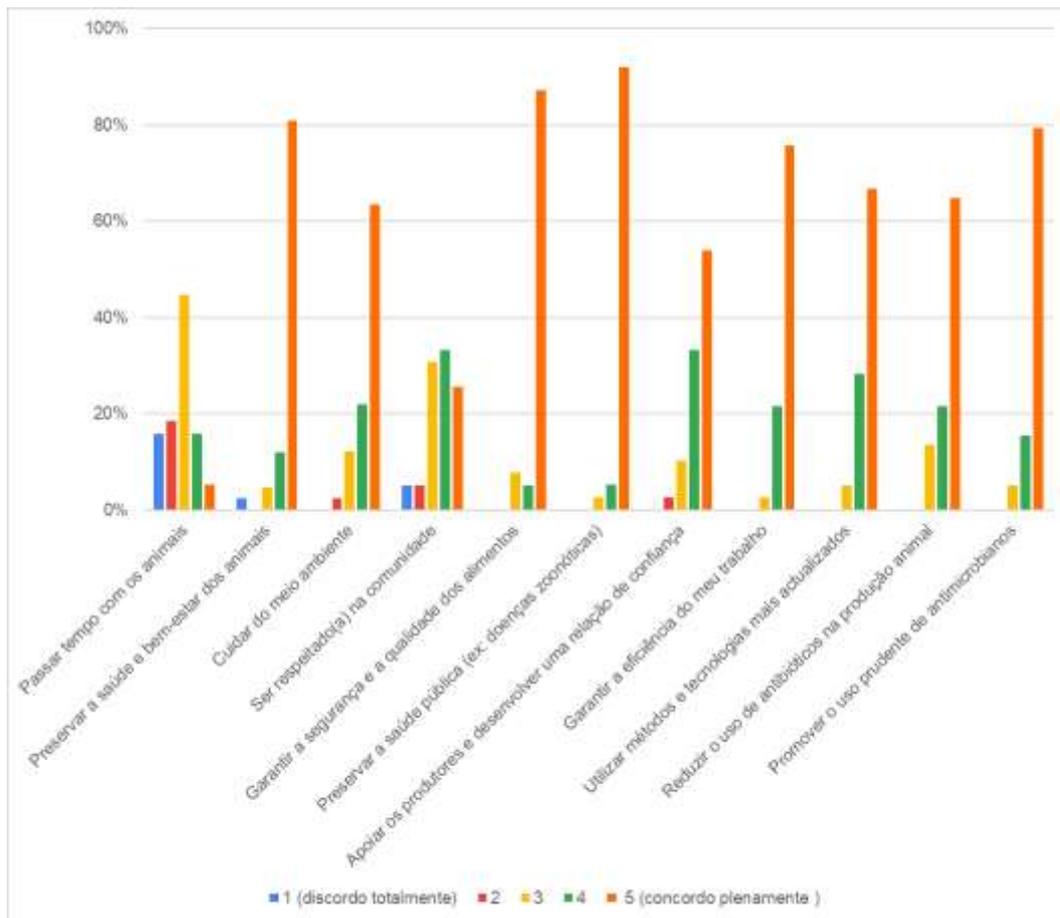
Table 8. O que é importante para si como profissional de saúde/produção animal? What is important for you as a vet? \* from 1 (totally disagree) to 5 (totally agree).

N=44, Q19	1	2	3	4	5	no answer	total	Average note
Preservar a saúde e bem-estados animais/ Ensuring animal health and well being	2,3%	0,0%	4,5%	11,4%	77,3%	4,5%	100,0%	4,9
Garantir a segurança e a qualidade dos alimentos/ Ensuring the safety and quality of products	0,0%	0,0%	6,8%	4,5%	77,3%	11,4%	100,0%	4,8
Garantir a eficiência do meu trabalho / Making sure that my business runs efficiently	0,0%	0,0%	2,3%	18,2%	63,6%	15,9%	100,0%	4,7
Preservar a saúde pública (ex: doenças zoonóticas)/ Ensuring that livestock farming is not a threat to (human) public health (e.g. zoonotic diseases)	0,0%	0,0%	2,3%	2,3%	79,5%	13,6%	97,7%	4,7
Utilizar métodos e tecnologias mais actualizados /Using the most up to date processes and technologies	0,0%	0,0%	4,5%	25,0%	59,1%	11,4%	100,0%	4,6



Reduzir o uso de antibióticos na produção animal/ reducing the use of antibiotics in livestock production	0,0%	0,0%	11,4%	18,2%	54,5%	15,9%	100,0%	4,5
Cuidar do meio ambiente/ Taking care of the environment	0,0%	2,3%	11,4%	20,5%	59,1%	6,8%	100,0%	4,5
Apoiar os produtores, desenvolver uma relação de confiança Supporting my clients / Developing a trusting relationship with my clients	0,0%	2,3%	9,1%	29,5%	47,7%	11,4%	100,0%	4,4
Ser respeitado(a) na comunidade/ Being respected in the community	4,5%	4,5%	27,3%	29,5%	22,7%	11,4%	100,0%	3,7
Passar tempo com os animais/ spending time with animals*	13,6%	15,9%	38,6%	13,6%	4,5%	13,6%	100,0%	2,8
Promover o uso prudente de antimicrobianos/ promoting a prudent use of antibiotics in livestock production*	0,0%	0,0%	4,5%	13,6%	70,5%	11,4%	100,0%	4.7

Figure 6. Q19. O que é importante para si como profissional de saúde/produção animal? What is important to you as a vet? From 1 (discordo totalmente/ totally disagree) to 5 (concordo plenamente/ totally agree).





## Section. Vet practices

The questions apply here to the last 12 months of the professional experience of the respondents.

### 6. Technical assistance in animal production

This section applies to these 36 respondents declaring part of their time dedicated to farmed animals, directly (20) or indirectly (16). Q20

- Assistance to farmers

As mentioned above, a majority of AHPs (n=36/44; 80%) report livestock-related activities, but only 45% (n=20/44) provide direct assistance to farmers and farmed animals. For these last ones, the number of assisted farmers is limited, mostly between 1 and 10 (table 9).

Table 9. *Com quantos produtores/criadores trabalha pessoalmente? How many farm animal clients do you personally work with? (one answer)\**

N=36, Q22.	Obs	% of respondents
Não aplicável (não trabalho directamente com produtores/criadores)	16	44,4%
1-10	11	30,6%
11-50	3	8,3%
51-100	1	2,8%
101-150	0	0,0%
151-200	0	0,0%
> 200	2	5,6%
No answer	3	8,3%
Total	36	100,0%

- Animal species

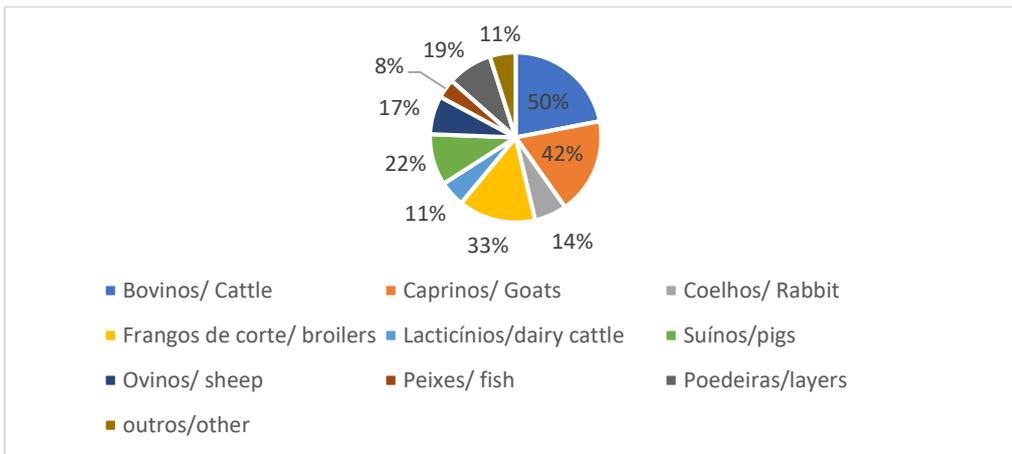
These professionals are rarely specialized in one animal species (except for two of them), but work on various species: Cattle and goats being the main quoted ones (table 10, figure 7).

Table 10. *Qual é a sua especialidade ou foco de produção? What is your species speciality or main production focus?*

N=36 Q21. Various possible answers	Obs	%
Bovinos/ Cattle	18	50,0
Caprinos/ Goats	15	41,7
Coelhos/ Rabbit	12	33,3
Frangos de corte/ broilers	8	22,2
Lacticínios/dairy cattle	7	19,4

Suínos/ pigs	6	16,7
Ovinos/ sheep	5	13,9
Peixes/ fish	4	11,1
Poedeiras/layers	3	8,3
outros/other	4	11,2

Figure 7 Qual é a sua especialidade ou foco de produção? What is your species speciality or main production focus? Q21



## 7. Practices in technical assistance

This section applies to the 20 respondents providing direct assistance to farmers and farmed animals.

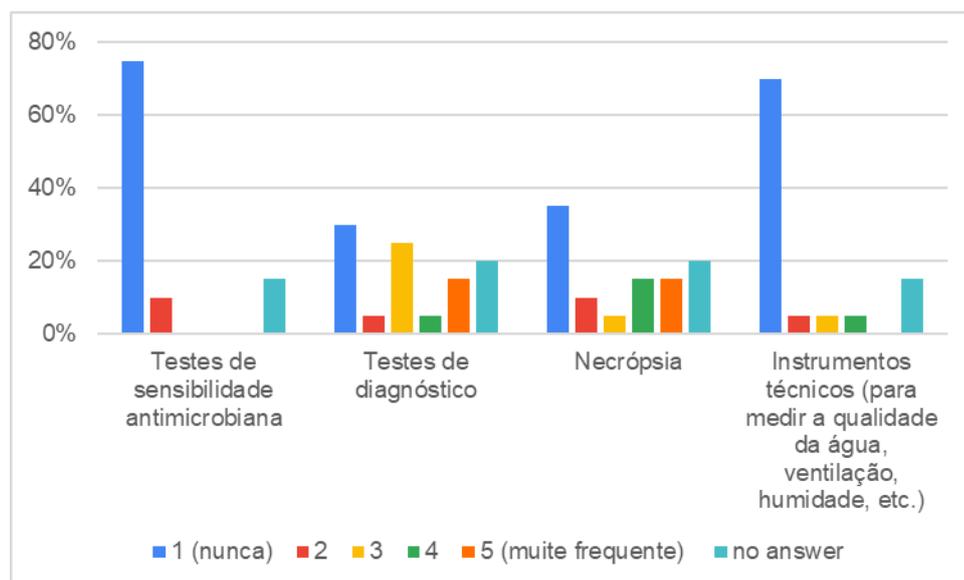
(Q22# "eu nao trabalho diretamente com produtores" e Q20 # "0%")

### Diagnostic tools and treatment and follow up.

Access to the different tools [Antibiotic susceptibility tests, diagnostic test, autopsy , Technical instruments (for measuring water quality, ventilation, humidity, etc....)] that could support the diagnostic of the animal health professionals is limited (see figure 8):

- 25% (5/20) of the respondents "never", or "only very rarely" use any of these tools;
- 45% (9/20) use at least one of these tools "often" or "very often" (mainly the diagnostic tests).
- 75% never use AB test, 25% very rarely.

Figure 8. Q23. Faz o uso das seguintes ferramentas no seu trabalho? Do you use the following tools in your work? 1 (nunca/never) à 5 (muito frequente/very often) 20 respondents



Diagnostics are mainly based on clinic observations of the animals, and on the description of the symptoms by the farmers (table 11).

Table 11. Que informações servem para o seu diagnóstico? What information do you use for your diagnostic? From 1 (never/nunca servem) à 5 (always/sempe servem).\*

N=20, Q24.	1	2	3	4	5	No answer	total	Average note
Observações clínicas dos animais individualmente/Clinical observations	0,0%	0,0%	5,0%	20,0%	65,0%	10,0%	100,0%	4,7
Dados microbiológicos (antibiogramas, biópsias, exames de sangue, etc) à partir do animais individualmente/ Microbiological data (antibiograms, biopsies, blood tests, etc.)	10,0%	5,0%	25,0%	10,0%	30,0%	20,0%	100,0%	3,6
Dados epidemiológicos (condições sanitárias...) do rebanho/ Epidemiological data (health conditions, etc.)	0,0%	0,0%	25,0%	20,0%	40,0%	15,0%	100,0%	4,2
Informações técnicas e económicas relacionadas a gestão do rebanho/ Technical and economic data on farm management	15,0%	10,0%	15,0%	30,0%	25,0%	5,0%	100,0%	3,4
Descrições dos sintomas pelos produtores/criadores Farmers' descriptions of symptoms	0,0%	0,0%	25,0%	10,0%	45,0%	20,0%	100,0%	4,3

Most AHPS follow up of their treatment based on phone call by farmers and regular visits on farm (table 10)

Table 12. Como faz o acompanhamento da sua intervenção? how do you follow up treatment ?

N=20, Q26. Various possible answers	Obs	%
Os produtores/criadores me ligam quando há problemas/ The farmers call me if there are still problems	16	80%
Eu regularmente faço visitas de acompanhamento/ I regularly do follow-up visits	13	65%
Eu regularmente ligo para os produtores/criadores/ I regularly call the farmers	8	40%
Raramente tenho a oportunidade de acompanhar o tratamento/ I rarely have the opportunity to follow up on other treatment	1	5%
Eu regularmente faço videochamadas com os produtores/ I have regular visio with the farmers	2	10%
no answer	1	5%

### Prescription/ administration of veterinary products and drugs

Vet drugs are the products the more often prescribed/ sold or administered, compared to nutrition products, hygiene products and disinfectants, and alternatives medicines (figure 6). Among those, antiparasitics are the most commune; hormones are very rare. Antibiotics are used very frequently by 35% of the AHPs (table 11).

Figure 9.Q27. Que produtos costuma vender/prescrever/administrar no seu trabalho? What products do you regularly sale/ prescribe/ administer in your work? N=20

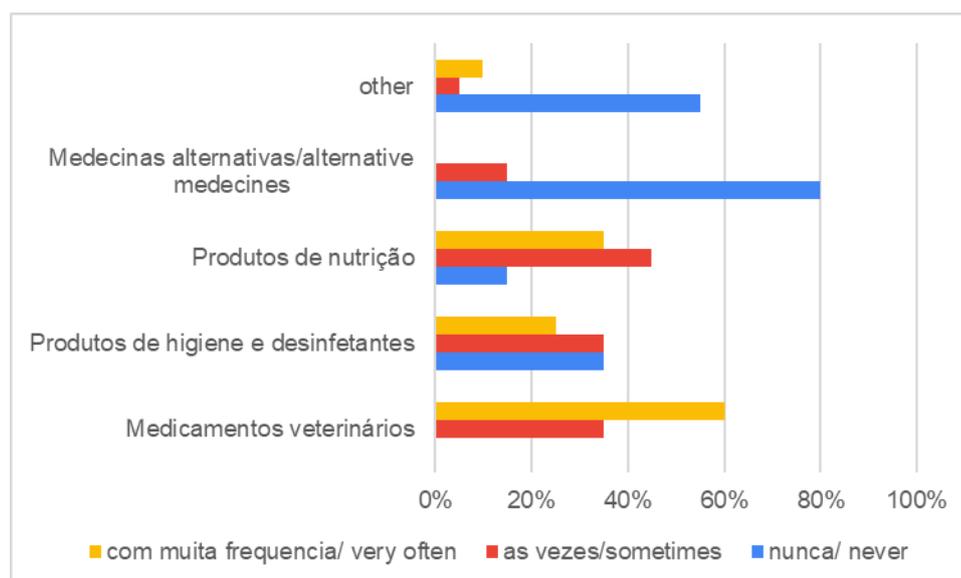


Table 13. *Que tipo de medicamento costuma prescrever/vender/ administrar no seu trabalho. What kind of vet drugs do you regularly sale/ prescribe/ administer in your work? \* N=20*

N=20, Q29	nunca/ never	as vezes/sometimes	com muita frequencia/ very often	no answer	Total
Antiparasitários/ Antiparasitic	0,0%	35,0%	60,0%	5,0%	100,0%
Antibióticos/Antibiotics	0,0%	60,0%	35,0%	5,0%	100,0%
Anti-inflamatórios	10,0%	50,0%	35,0%	5,0%	100,0%
Vacinas/Vaccines	15,0%	30,0%	50,0%	5,0%	100,0%
Hormônios/ Hormones	80,0%	15,0%	0,0%	5,0%	100,0%

### Use of AB

There is rather converging opinion on an increasing use of vet drugs (but also a high level of respondents without opinion), in particular vaccines (table 12)

Table 14. *Nos últimos 5 anos, registrou alguma mudança na forma de usar\* medicamentos veterinários? During the last years, did you notice changes in the way to use ...\**

N=20, Q25.	Decrease/ diminuição	no change/ no mudança	Increase/ aumento	no answer	total
Vacinas/ Vaccines	15,0%	20,0%	35,0%	30,0%	100,0%
Antibióticos/ Antibiotics	10,0%	20,0%	30,0%	40,0%	100,0%
Medicamentos anti-inflamatórios	0,0%	25,0%	30,0%	45,0%	100,0%
Medicamentos alternativos (homeopatia, aromaterapia...) e tradicionais (plantas...)/ alternative medicine	10,0%	25,0%	5,0%	60,0%	100,0%

Use of AB is frequent for 25% of the respondents (table 15). Most respondents declare using a standardized protocol when using AB. In more that 30% of the case, decision of using of AB comes from the farmers before the visit of the vets.

Table 15. Em relação ao uso dos antibióticos, com que frequência se encontra nas situações seguintes: Regarding the use of antibiotics, how often are you in the following situations:

N=20, Q32.	nunca/ never	as vezes/ sometimes	com frequência/ often	muita very	no answer	total
Eu sigo um protocolo padronizado para o tratamento de animais com antibióticos	5,0%	35,0%	55,0%		5,0%	100,0%
Eu recomendo um tratamento com os antibióticos	5,0%	65,0%	25,0%		5,0%	100,0%
Eu encontro um tratamento de antibióticos iniciado pelo produtor/criador antes da minha intervenção	30,0%	35,0%	30,0%		5,0%	100,0%

The choice of AB is driven first by the search of efficiency, and is based on AHP own experience rather than on official directrices, producers demand or research of rentability (table 16). The risk of AMR rank 4th in the 9 proposed criteria.

Table 16. Qual é a importância dos seguintes critérios ao escolher um antibiótico? How important are the following criteria when choosing an antibiotic?. 1: not important and 5: very importante \*

N=20, Q33.	1	2	3	4	5	no answer	total	average note
Eficácia clínica do tratamento/ Clinical effectiveness of the treatment	0,0%	0,0%	0,0%	10,0%	80,0%	10,0%	100,0%	4,4
Minha experiência com o uso deste antibiótico/ My experience with using this antibiotic	0,0%	0,0%	5,0%	20,0%	65,0%	10,0%	100,0%	4,2
Urgência da situação quanto à saúde do animal ou do rebanho/ Urgency of the situation regarding the health of the animal/herd	10,0%	0,0%	10,0%	20,0%	50,0%	10,0%	100,0%	3,7
Experiência dos meus colegas/ my colleagues experience*	5,0%	5,0%	20,0%	25,0%	35,0%	10,0%	100,0%	3,5
Riscos de Resistência Antimicrobiana/ Risk of AMR*	5,0%	5,0%	10,0%	15,0%	50,0%	15,0%	100,0%	3,4
Custo global para o criador /Cost to the farmer	10,0%	5,0%	5,0%	40,0%	25,0%	15,0%	100,0%	3,0
Existência de directrizes ou políticas/ existing policies or directrices	25,0%	5,0%	25,0%	5,0%	20,0%	20,0%	100,0%	2,6
Rentabilidade do antibiótico para minha actividade Profitability of this drug for me/my practice	30,0%	25,0%	5,0%	10,0%	15,0%	15,0%	100,0%	2,2
Pedido do produtor/ Farmer request	50,0%	10,0%	10,0%	15,0%	0,0%	15,0%	100,0%	1,5



## Use of AB test

The use of AB test is very limited (table 17). 75% of the professionals do not use it. These tests are hardly available and farmers are not ready to pay for it (table 18). 20% of the professional use it, after a failure in a previous treatment.

*Table 17 Quais das seguintes opções mais influenciam na sua decisão ao solicitar um teste de sensibilidade antimicrobiana?/ Which ones of the following options impact the way you use test of AB sensibility ?*

N=20, Q30 Various possible answers.	Obs	% of respondents
No uso teste de sensibilidade	15	75%
Má resposta à terapia antimicrobiana inicial ou falha terapêutica	4	20%
Nenhum conhecimento do estado de saúde do animal ou rebanho	1	5%
Pedido do produtor/criador	1	5%
no answer	1	5%

*Table 18. Dos seguintes inconvenientes ao uso teste de sensibilidade antimicrobiana, quais considera importantes? Of the following drawbacks to the use of antimicrobial susceptibility testing, which do you consider important?*

N= 20, Q31, Various possible answers	Obs	%
Indisponibilidade dos serviços de laboratório para realizar o teste	13	65%
Produtor/criador não disposto a pagar pelo teste	9	45%
Quando o caso é urgente e requer uma terapia antibiótica imediata	5	25%
Não tenho certeza do que solicitar ao laboratório	2	10%
Longo tempo de espera para obter resultados de sensibilidade	7	35%
no answer	3	15%

When asked about the consequence of reducing antibiotics on their professional activities, there is a high level of “no answer” considering that many of the respondents don’t work directly with AB.

Table 19. Qual seria o impacto da redução do uso de antibióticos na sua actividade profissional?

What would be the **consequences of Reducing antibiotics on your professional activities** 1 (discordo totalmente) à 5 (concordo plenamente). / 1 : strongly disagree ; 5 strongly agree

N=44, Q50 (Roadmap C13)	Q50	1	2	3	4	5	don't no/no answer	Total	Mean	Standard dev
It helps me to put prevention and advice at the heart of my work	Me ajudaria a colocar a prevenção e o aconselhamento no centro do meu trabalho	6,8%	13,6%	4,5%	11,4%	36,4%	27,3%	100,0%	3,8	1,5
It makes the relationship with my clients better	Iria melhorar a minha relação com os produtores/criadores	20,5%	6,8%	20,5%	4,5%	11,4%	36,4%	100,0%	2,7	1,4
The profitability of some farms (and therefore the job of some farmers)	A rentabilidade de algumas unidades de produção ficaria comprometida	40,9%	4,5%	9,1%	9,1%	9,1%	27,3%	100,0%	2,2	1,5
Animal health and welfare would be compromised	A saúde e o bem-estar dos animais estariam comprometidos	38,6%	11,4%	11,4%	6,8%	6,8%	25,0%	100,0%	2,1	1,4
I would have to work more	Eu teria que trabalhar mais	38,6%	6,8%	4,5%	2,3%	6,8%	40,9%	100,0%	1,8	1,4
The vet practice I work for would lose money and jobs would be in	Eu e/ou meu empregador perderíamos dinheiro e os empregos estariam comprometidos	43,2%	11,4%	4,5%	0,0%	2,3%	38,6%	100,0%	1,5	0,9
Me and my clients would have to use other chemicals to compensate, which are more dangerous to human health or the environment	[Eu e os produtores/criadores teríamos que usar outros produtos químicos mais prejudiciais para a saúde humana e o meio ambiente	52,3%	2,3%	4,5%	6,8%	2,3%	31,8%	100,0%	1,6	1,2



## Section. Antibiotics

This section applies to all the respondents

### 8. Knowledge and perceptions of AB.

There is relatively good knowledge of AB and AMR (answer 1 to 8, table 20).

AB are considered as necessary for the wellbeing of the animal (63,6% dos respondents), not as a valuable alternative for the lack of hygiene (88,6%), not necessary for the profitability of vet activities (61,4%, considering that this question applied for all respondents, whatever their activities...). For 27,3%, the use of AB is considered as impacting negatively the taste of the meat. The presence of AB in animal commercial feed is considered as true for 43% (there is no clear information available on that point...but it is supposed to be forbidden).

Table 20. Indique se as afirmações a seguir são verdadeiras ou falsas/ Indicate whether the following statements are true or false

N=44, Q43	true	false	Don't know/ no answer
1. Os antibióticos matam bactérias	100,0%	0,0%	0,0%
2. Os antibióticos matam vírus	2,3%	97,7%	0,0%
3. As vacinas são antibióticos	2,3%	97,7%	0,0%
4. As vitaminas são antibióticos	2,3%	93,2%	4,5%
5. O uso inapropriado de antibióticos pode os tornar ineficazes	97,7%	0,0%	2,3%
6. As bactérias podem se tornar resistentes aos antibióticos	100,0%	0,0%	0,0%
7. O uso de antibióticos nos animais pode prejudicar a saúde humana	93,2%	4,5%	2,3%
8. Um intervalo de segurança deve ser observado entre o tratamento dos animais de produção e o consumo dos seus produtos	95,5%	2,3%	2,3%
9. Os antibióticos são necessários para o bem-estar dos animais	63,6%	27,3%	9,1%
10. O uso de antibióticos pode ser uma alternativa apropriada à falta de higiene/biossegurança	6,8%	88,6%	4,5%
11. O uso de antibióticos é necessário para garantir a rentabilidade da minha actividade	31,8%	61,4%	6,8%
12. O uso de antibióticos prejudica o sabor do carne	27,3%	36,4%	36,4%
13. Existem antibióticos nas rações dos animais	43,2%	22,7%	34,1%

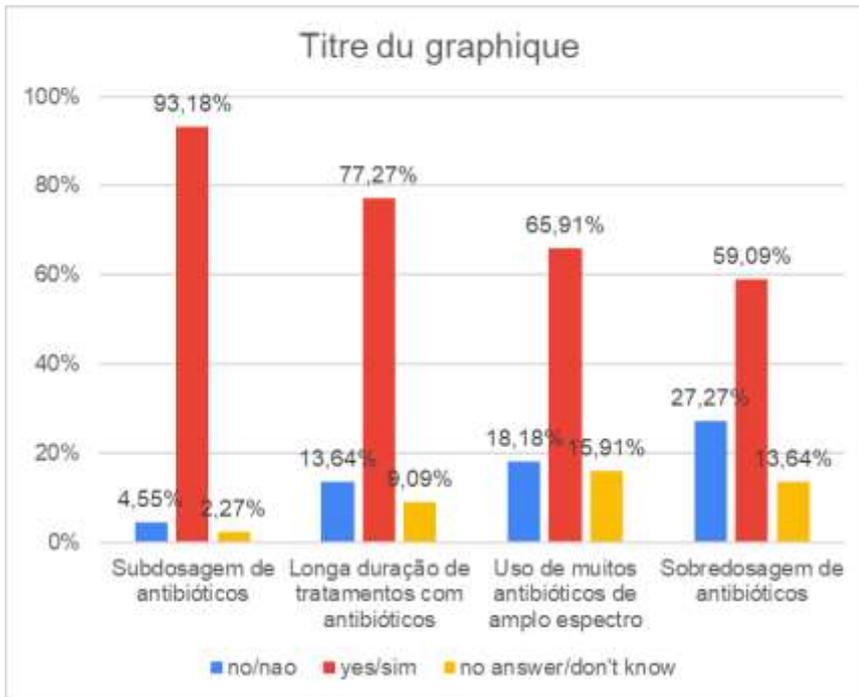
Ignoring the risk of AMR, using AB preventively (70%), using AB without further analysis is considered as irresponsible. Curative (77%) and metaphylactic (70%) uses of AB are perceived positively (table 21).

Table 21. Como avaliaria as seguintes formas de uso de antibióticos. How would you rate the following forms of antibiotic use. 1 (irresponsável/ irresponsible) to 5 (responsável/ responsible)\*

N= 44, Q45 %	1	2	3	4	5	no answer/ dont' know	average note
Ao tratar um animal com uma infecção bacteriana/ When I treat a sick and suffering animal from a bacterial disease	4,5%	2,3%	11,4%	6,8%	70,5%	4,5%	4,4
Ao tratar alguns animais doentes para evitar a propagação da infecção para o resto do rebanho / When I treat some sick animals and prevent the spread of infection to the rest of the herd	11,4%	6,8%	9,1%	15,9%	50,0%	6,8%	3,9
Ao fazer um tratamento de emergência, sem esperar por análises adicionais/ When I can't wait for further analysis	25,0%	25,0%	18,2%	22,7%	6,8%	2,3%	2,0
Ao tratar todos os animais para prevenir o surgimento de uma doença no rebanho/ When I prevent the emergence of new diseases	52,3%	18,2%	4,5%	9,1%	9,1%	6,8%	2,6
Ao ignorar o risco de resistência antimicrobiana no uso de antibióticos/ When I ignore the risk of AMR in using AB	84,1%	6,8%	4,5%	0,0%	2,3%	2,3%	1,3

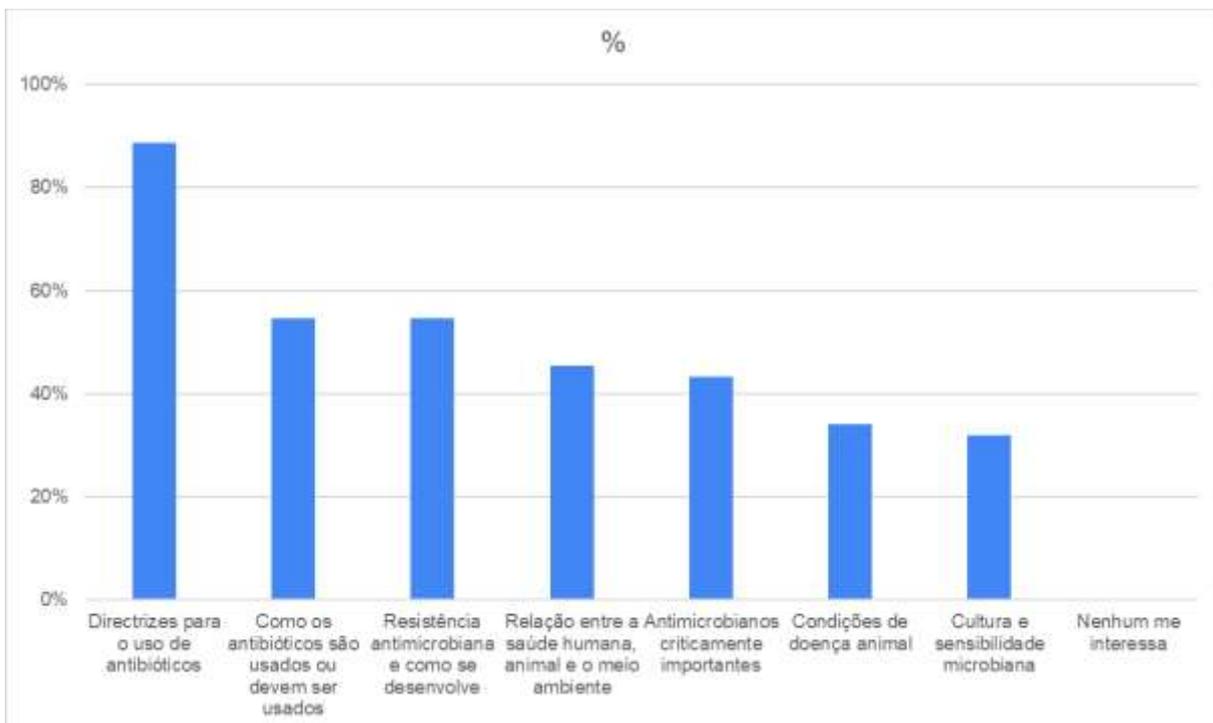
Underdosage of AB is assessed as a major driver of AMR; followed by the length of the treatment (figure 10).

Figure 10. Q48. Avalie se as seguintes formas de uso de antibióticos na pecuária favorecem a resistência aos antibióticos/. Assess whether the following forms of antibiotic use in livestock support antibiotic resistance.



All respondents are interested in receiving information on issue related to ab use and Ab resistance. More than 80% will like to receive guidelines in the use of AB and more than 50% n AMR (fig 11).

Figure 11. Q55. Dos tópicos a seguir, sobre quais gostaria de obter mais informações? Various possible answers



## 9. AMR as a public problem

None of the respondents agree with the need to increase the use of AB in the animal farming, whatever the type of production. There is large consensus on the need for a more prudent use (95,5%= 56,8+38,6). And 43% (4,5+ 38,6) agree on the need to reduce AB use. (table 22).

Table 22. *Em relação aos antibióticos, o que deve ser feito em Moçambique? Regarding antibiotics, what should be done in Mozambique?*

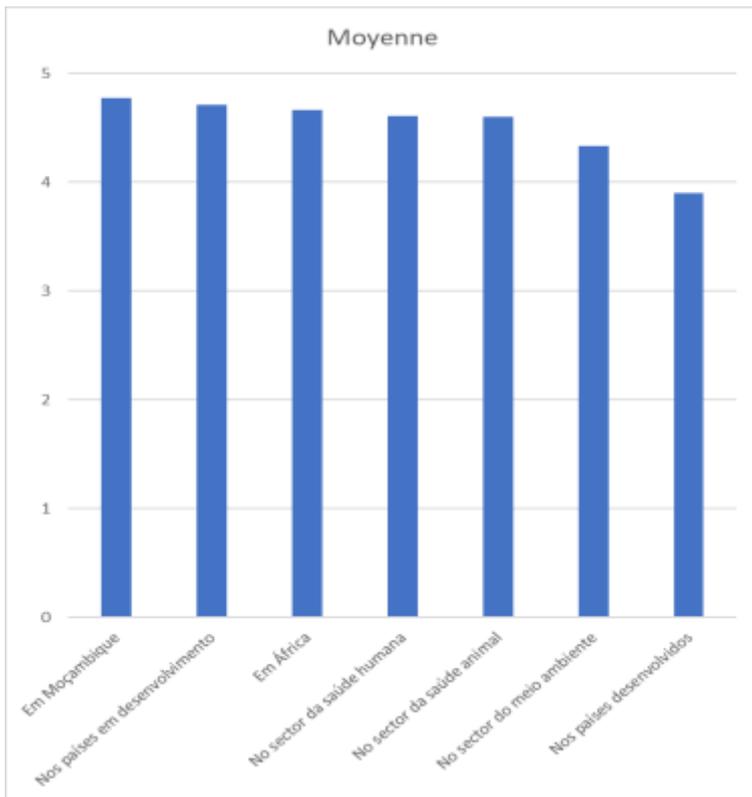
N=44 , Q44, Various possible answers	Obs	% of respondents
Reduzir o uso de antibióticos na produção animal	2	4,5%
Promover o uso prudente e racional de antibióticos na produção animal	25	56,8%
Reduzir o uso de antibióticos na produção animal + Promover o uso prudente e racional de antibióticos na produção animal	17	38,6%
Tudo depende do tipo de produção	0	0,0%
Aumentar o uso de antibióticos na produção animal	0	0,0%
total	44	100,0%

Interestingly, the problem of AMR is perceived as being more a concern for Mozambique, developing countries and Africa, than for the developed countries. It is perceived also of a rather similar greater importance in the human and animal sectors, compared to the environmental sector (table 23, figure 12).

Table 23. *Julga que a resistência antimicrobiana constitui um problema? E onde? 1 Do you think antimicrobial resistance is a problem? And where? (não é um problema/not a problem) à 5 (é um problema muito importante/ a major problem).*

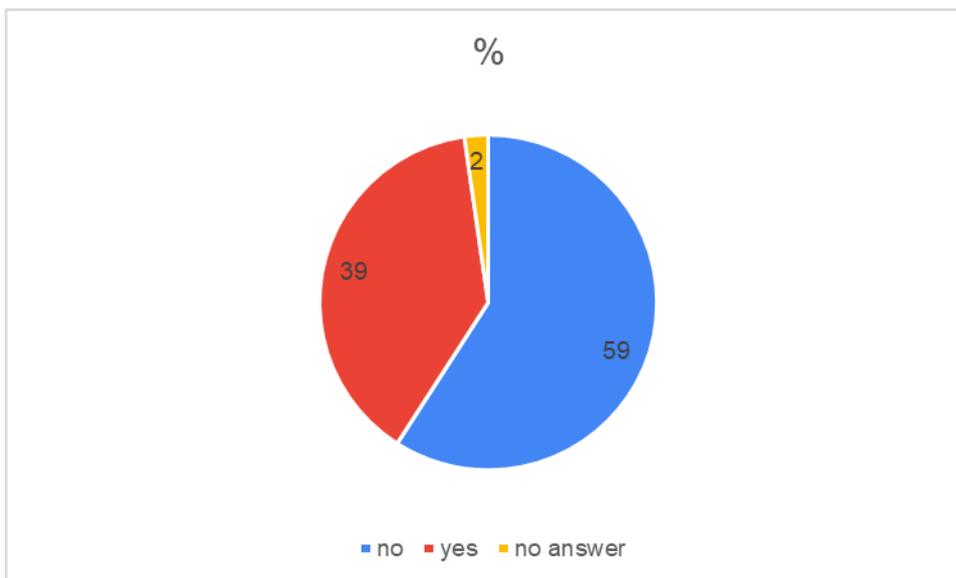
N=44, Q46 % and average note	1	2	3	4	5	no answer/ don't know	average note
Em Moçambique	0,0%	0,0%	6,8%	9,1%	81,8%	2,3%	4,8
Nos países em desenvolvimento	0,0%	2,3%	4,5%	11,4%	77,3%	4,5%	4,7
Em África	0,0%	0,0%	11,4%	9,1%	72,7%	6,8%	4,7
Nos países desenvolvidos	9,1%	9,1%	13,6%	9,1%	50,0%	9,1%	3,9
No sector da saúde humana	0,0%	2,3%	9,1%	11,4%	70,5%	6,8%	4,6
No sector da saúde animal	0,0%	4,5%	9,1%	6,8%	75,0%	4,5%	4,6
No sector do meio ambiente	6,8%	0,0%	9,1%	9,1%	56,8%	18,2%	4,3

Figure 12. Q46, average note



But only 39% of the respondent (figure 13) have read or heard about the National Action Plan against Antimicrobial Resistance in Mozambique.

Figure 13. Q47. Já leu ou ouviu falar sobre o Plano Nacional de Acção Contra a Resistência Antimicrobiana em Moçambique? Have you read or heard about the National Action Plan against Antimicrobial Resistance in Mozambique?



## 10. Strategy to reduce AMR

Respondents strongly disagree with the sentence “It’s not my job to encourage AMU reduction” meaning that they feel a responsibility in tackling AMR issue. They agree on the importance of biosecurity and farmers awareness for a more prudent. More than a third of them disagree on vaccination as a mean to reduce AB use. There is a low level of agreement on strategies based on economic incentives and des-intensification.

Table 24. Até que ponto concorda com as seguintes estratégias para o uso mais prudente de antibióticos na pecuária? To what extent do you agree with the following strategies **for the more prudent use of antibiotics in livestock?** 1 (discordo totalmente) à 5 (concordo plenamente). 1 : strongly disagree ; 5 strongly agree

N= 44, Q49/ (C12 Roadmap)	1	2	3	4	5	Don't know/ no answer	Mean	Standard dev
Melhorar as medidas de biossegurança/ Making changes in biosecurity	2,3%	2,3%	9,1%	4,5%	81,8%	0,0%	4,61	0,91
Conscientizar os produtores/criadores por meio de sessões de treinamento/ Increasing awareness of farmers through training sessions	2,3%	4,5%	2,3%	11,4%	72,7%	6,8%	4,59	0,94
Aumentar a vacinação/ Increasing vaccination	18,2%	13,6%	4,5%	11,4%	52,3%	0,0%	3,66	1,62
Promover mudanças na alimentação dos animais/ Making changes in animal nutrition	15,9%	6,8%	22,7%	18,2%	36,4%	0,0%	3,52	1,44
Usar medicamentos alternativos e tradicionais/ Using alternative medicines	9,1%	15,9%	25,0%	13,6%	31,8%	4,5%	3,45	1,35
Incentivos económicos para os profissionais de saúde animal/ Economic incentives for vets (less margins on antibiotics, etc.)	18,2%	11,4%	20,5%	11,4%	25,0%	13,6%	3,16	1,50
Incentivos económicos para os produtores-criadores/ Economic incentives for farmers (better price for antibiotic-free products, etc.)	22,7%	15,9%	11,4%	9,1%	29,5%	11,4%	3,08	1,62
Incentivar produção menos intensiva (rebanhos menores, ciclos de produção mais longos, etc.)/ De-intensifying farms (smaller herds, longer production cycles, less confinement of animals, etc.)	18,2%	20,5%	22,7%	13,6%	20,5%	4,5%	2,98	1,41
Não é meu trabalho incentivar a redução do uso de antibióticos/ It's not my job to encourage AMU reduction	75,0%	2,3%	2,3%	2,3%	6,8%	11,4%	1,46	1,17

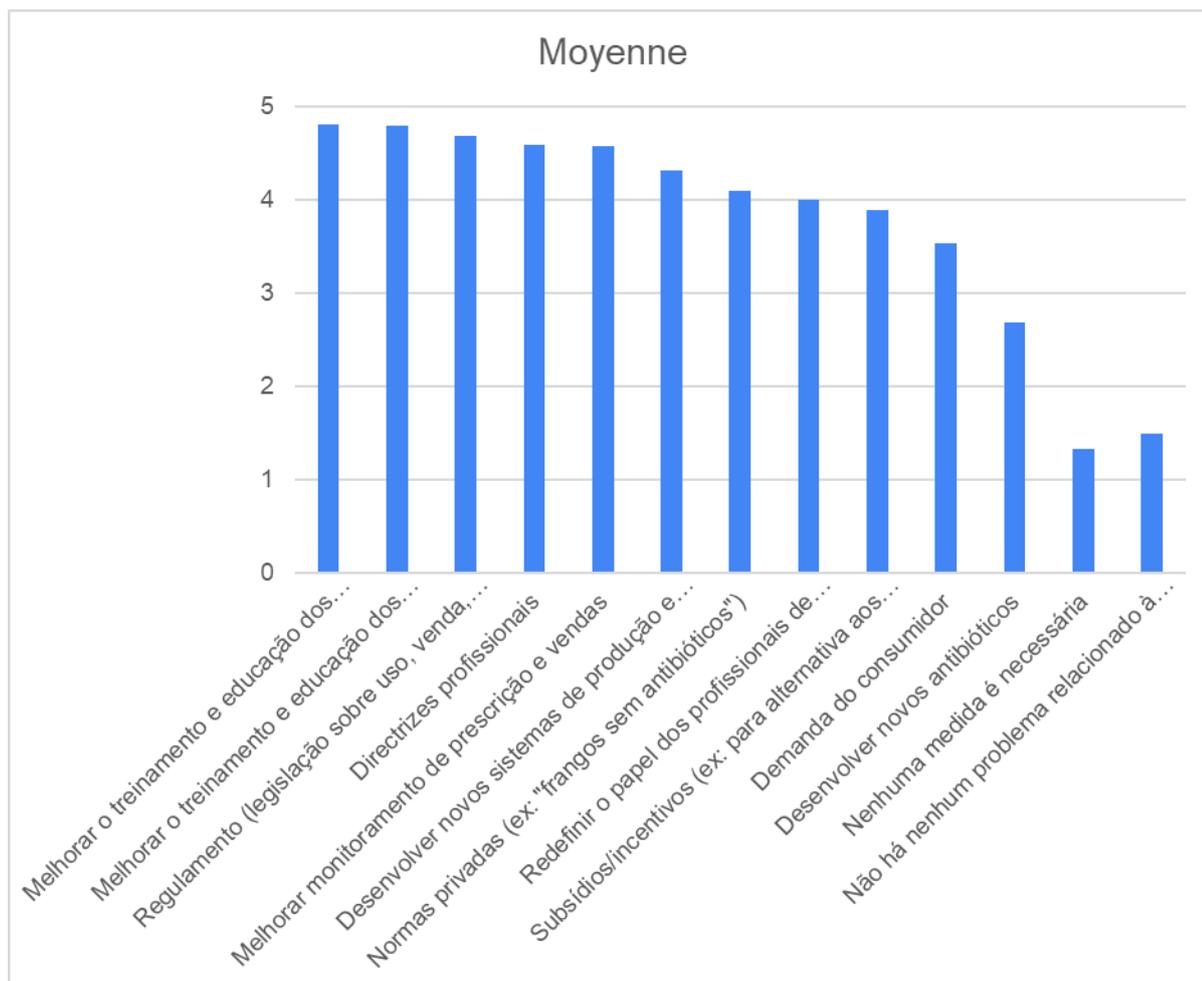
Respondents agree that measures have to be taken to tackle AMR issue. Among the proposed measures, training farmers and vets, regulating and monitoring AB use, sale and prescription, delivering professional guidelines. Developing new farming systems received also a good level of agreement.

Table 25. As seguintes ferramentas seriam eficientes para redução dos riscos da \* resistência antimicrobiana/ What are the solutions/levers for change?: 1 (discordo totalmente) à 5 (concordo plenamente). 1: strongly disagree; :5 strongly agree

N= 44, Q 51, C15		1	2	3	4	5	don't know/no answer	Total	Mean	Standard dev
Better training and education of farmers	Melhorar o treinamento e educação dos produtores/criadores	0,0%	2,3%	0,0%	11,4%	81,8%	4,5%	100,0%	4,8	0,5
Better training and education of vets	Melhorar o treinamento e educação dos profissionais de saúde/produção animal	0,0%	2,3%	0,0%	13,6%	79,5%	4,5%	100,0%	4,8	0,6
Regulation (legislation about use, sale, prescription,...)	Regulamento (legislação sobre uso, venda, prescrição, ...)	0,0%	2,3%	4,5%	13,6%	72,7%	6,8%	100,0%	4,7	0,7
Professional guidelines	Directrizes profissionais	2,3%	2,3%	2,3%	18,2%	68,2%	6,8%	100,0%	4,6	0,9
Better monitoring of prescription and sales	Melhorar monitoramento de prescrição e vendas	0,0%	4,5%	6,8%	13,6%	70,5%	4,5%	100,0%	4,6	0,8
New farming systems	Desenvolver novos sistemas de produção e directrizes de boas práticas	2,3%	6,8%	2,3%	31,8%	52,3%	4,5%	100,0%	4,3	1,0
Private standards (e.g. increase prices of AM-free products)	Normas privadas (ex: "frangos sem antibióticos")	4,5%	6,8%	9,1%	22,7%	45,5%	11,4%	100,0%	4,1	1,2
Redefinition of the role of veterinarians (advisor, health manager...)	Redefinir o papel dos profissionais de saúde/produção animal]	9,1%	2,3%	15,9%	13,6%	47,7%	11,4%	100,0%	4,0	1,3
Subsidies/incentives (e.g. to upgrade the buildings)	Subsídios/incentivos (ex: para alternativa aos antibióticos)]	4,5%	11,4%	13,6%	15,9%	40,9%	13,6%	100,0%	3,9	1,3
Consumers demand	Demanda do consumidor	15,9%	9,1%	4,5%	13,6%	34,1%	22,7%	100,0%	3,5	1,6
Development of new antibiotics	Desenvolver novos antibióticos	18,2%	11,4%	34,1%	9,1%	6,8%	20,5%	100,0%	2,7	1,2

No additional measures are required	Nenhuma medida é necessária	72,7 %	2,3%	0,0%	2,3%	4,5%	18,2%	100,0 %	1,3	1,0
There is no problem related to antimicrobial resistance	Não há nenhum problema relacionado à Resistência Antimicrobiana	77,3 %	2,3%	0,0%	2,3%	9,1%	9,1%	100,0 %	1,5	1,3

Figure 14





### 11. Interest and influence in reducing AB

In this section we intended to know, in the opinion of the respondents, which stakeholders could contribute to reduce AMU, based on stakeholders' interest and influence

*Interesse = quem pode ter o interesse ou se beneficiar da redução do uso de antibióticos; influência = quem tem o poder de influenciar os outros na redução do uso de antibióticos.*

*Interest = who may have an interest in or benefit from reduced antibiotic use; influence = who has the power to influence others in reducing antibiotic use.*

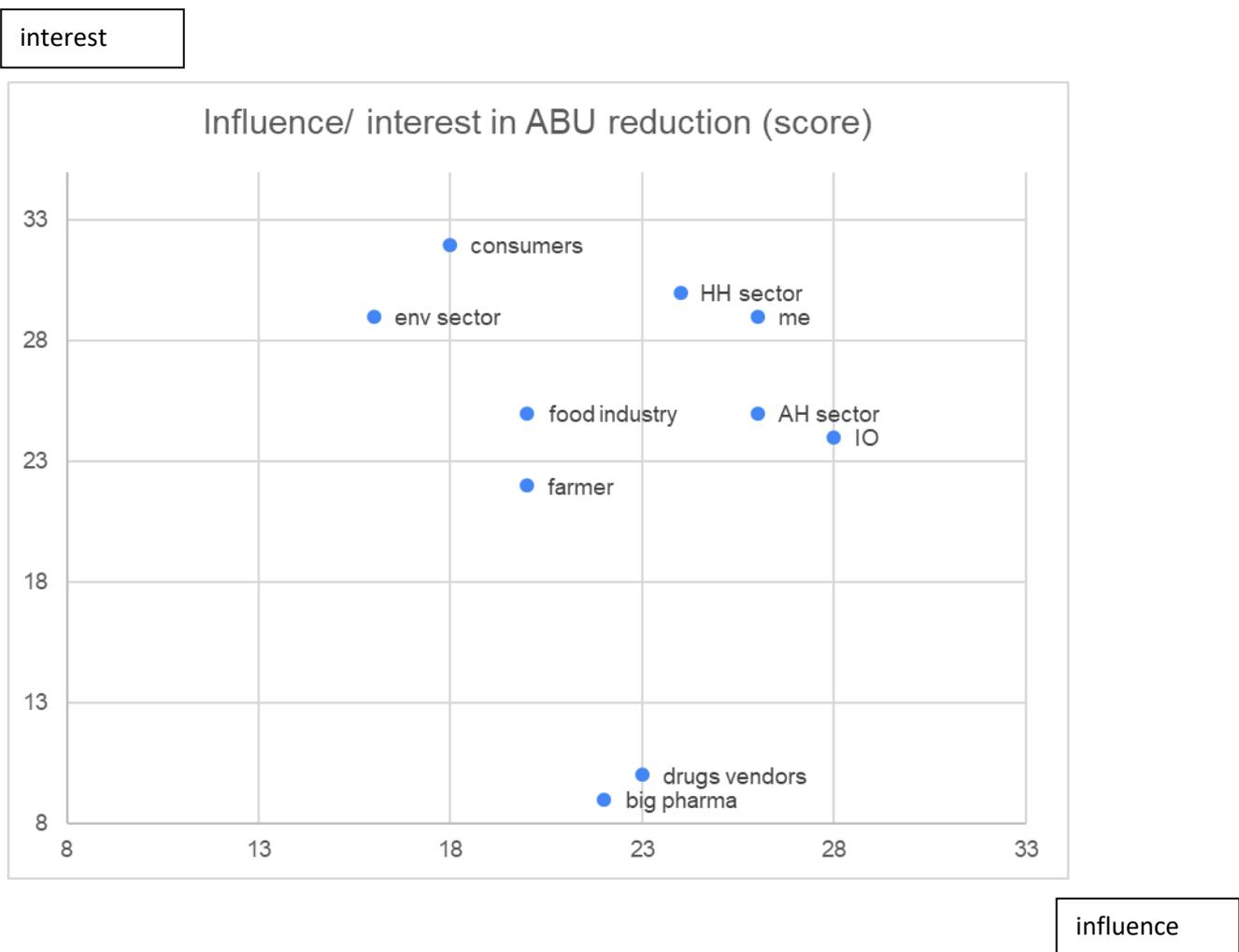
Reducing AMU is mainly perceived as interesting for consumers and for the human health environment sector. and environ. But the main influential stakeholders are identified as the International organisations, “me” and the animal health sector. Pharmaceutical industry and drugs vendors are perceived are little interested (and wit less influence than the animal health sector

*Table 26. Quem tem interesse e influência na redução do uso de antibióticos? Who has the most interest and influence in reducing antibiotic use? Select all valuable answers*

N=44 , Q53	interest	influence	Don't know/ no answer
Consumers	72,7%	40,9%	6,8%
Human health sector	68,2%	54,5%	2,3%
Environnemental sector	65,9%	36,4%	15,9%
me	65,9%	59,1%	6,8%
Animal health sector	56,8%	59,1%	4,5%
Food industry	56,8%	45,5%	13,6%
International organisations	54,5%	63,6%	13,6%
Farmers	50,0%	45,5%	13,6%
Drugs vendors	22,7%	52,3%	29,5%
Pharmaceutical industry	20,5%	50,0%	29,5%

Figure 15. Quem tem interesse e influência na redução do uso de antibióticos? Who has the most interest and influence in reducing antibiotic use?

HH human health, AH animal health, IO international organizations, env environment

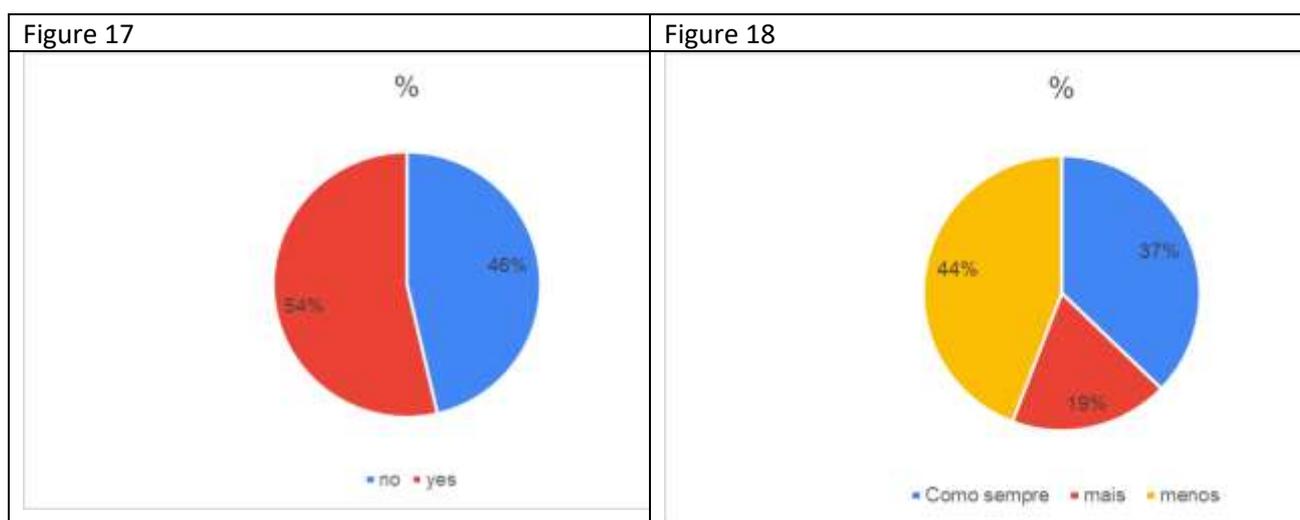


## Section. Impacts of Covid on your Work and Business

More than half of the respondents (54%) declared that they have been impacted professionally by the Covid context., with a diminution of activities for 44% of them, an increase for 19% and no change for the others. (Fig 16 and 17).

Figure 16 No ano passado, registou alguma mudança significativa no seu trabalho em relação ao Covid? During the past year, Have you made any changes to how you run your business as a result of the Covid crisis? -N=44

Figure 17 Q58. No ano passado, com o Covid, trabalhou.../ last year, during the Covid crisis, have you worked...: less /menos, as usual /como sempre, more /mais N=44



Respondents who recorded a change due to Covid, were asked to comment that changes:

Comments on professional changes due to Covid
• Rotina e Metodologia
• No cumprimento do plano de actividades
• Comportamentais , visão profissional e possíveis formas de trabalho
• Na forma e dinâmica de trabalho!
• Tempo e qualidade de trabalho (incluindo o seu resultado) e descanso.
• Alteração do modelo padrão de trabalho
• Restrição de circulação
• Restricoes no contacto com os produtores
• maior dificuldade em visitar as unidades de produção para praticas
• Menor contacto com os criadores. Mais consultas via telefone
• Restrições às minhas actividades comunitárias devido aos Decretos Governamentais.
• Hou necessidade de trabalhar mais tendo de me deslocar ate ao cliente
• Reducao das producoes de carnes de frangos, bovinos e caprinos
• Reducao do numero de clientes
• A empresa teve problemas financeiros e teve que reduzir o efectivo

<ul style="list-style-type: none"> <li>• aumento das medidas de biossegurança, diminuição de recursos financeiros e diminuição de interação com o campo</li> </ul>
<ul style="list-style-type: none"> <li>• baixo fluxo na compra de medicamentos</li> </ul>
<ul style="list-style-type: none"> <li>• Redução da capacidade de importação e limitações relacionadas ao acesso a fundos de pesquisa científica (os financiadores ficaram mais voltados a pesquisa científica na área da COVID-19).</li> </ul>
<ul style="list-style-type: none"> <li>• com a interrupção das aulas tive mais tempo para ler e estudar em casa, e o resultado foi o término das cadeiras do meu curso.</li> </ul>
<ul style="list-style-type: none"> <li>• Na notificação de doenças</li> </ul>

Table 27. Q59. If you worked more, indicate the reasons.

Q59, N=8	
<ul style="list-style-type: none"> <li>• Usei mais tempo para algumas actividades alternativas</li> </ul>	4
<ul style="list-style-type: none"> <li>• Fui requisitado(a) para outras funções e/ou tarefas</li> </ul>	2
<ul style="list-style-type: none"> <li>• A instituição/empresa para qual trabalho teve problemas com o seu efectivo,</li> </ul>	1
outros:	
<ul style="list-style-type: none"> <li>• Ler e estudar até altas horas</li> </ul>	1
<ul style="list-style-type: none"> <li>• o volume de trabalho aumentou e adaptação a novas formas de trabalho.</li> </ul>	1

#### Other comments

COMO SEMPRE (16 respondents, 3 comments)	
<ul style="list-style-type: none"> <li>• Usei mais tempo para algumas actividades alternativas</li> </ul>	2
<ul style="list-style-type: none"> <li>• A instituição/empresa para qual trabalho teve problemas com o seu efectivo</li> </ul>	
MENOS (19 respondents, 7 comments)	
<ul style="list-style-type: none"> <li>• Usei mais tempo para algumas actividades alternativas</li> </ul>	4
<ul style="list-style-type: none"> <li>• A instituição/empresa para qual trabalho teve problemas com o seu efectivo,</li> </ul>	2
<ul style="list-style-type: none"> <li>• Fui requisitado(a) para outras funções e/ou tarefas,</li> </ul>	1

Figure 18. Q60. Em relação ao acesso a medicamentos veterinários, com a pandemia da Covid-19... Regarding access to veterinary medicines, with the Covid-19 pandemic\* (B8)

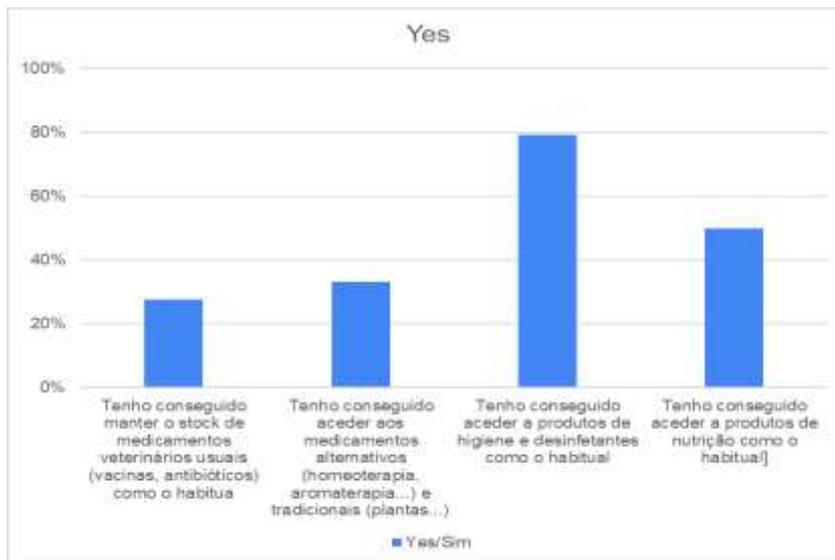


Table 28 Em relação ao acesso a medicamentos veterinários, com a pandemia da Covid-19... Regarding access to veterinary medicines, with the Covid-19 pandemic

Q 60, B8 % of expressed answers		Yes	No	N of expressed answers
I have been able to stock traditional veterinary medicines (vaccines, antibiotics) as usual	Tenho conseguido manter o stock de medicamentos veterinários usuais (vacinas, antibióticos) como o habitual	27,8%	72,2%	18
I have been able to access to alternative veterinary medicines as usual	Tenho conseguido aceder aos medicamentos alternativos (homeoterapia, aromaterapia...) e tradicionais (plantas...)	33,3%	66,7%	15
I have been able to access to hygiene products and disinfectants as usual	Tenho conseguido aceder a produtos de higiene e desinfetantes como o habitual	79,2%	20,8%	24
I have been able to access to nutrition products as usual	Tenho conseguido aceder a produtos de nutrição como o habitual]	50,0%	50,0%	24

Figure 19. Q61.Em relação a assistência técnica, com a pandemia da Covid-19... \* Regarding technical assistance, with the Covid-19 pandemic. (B9)

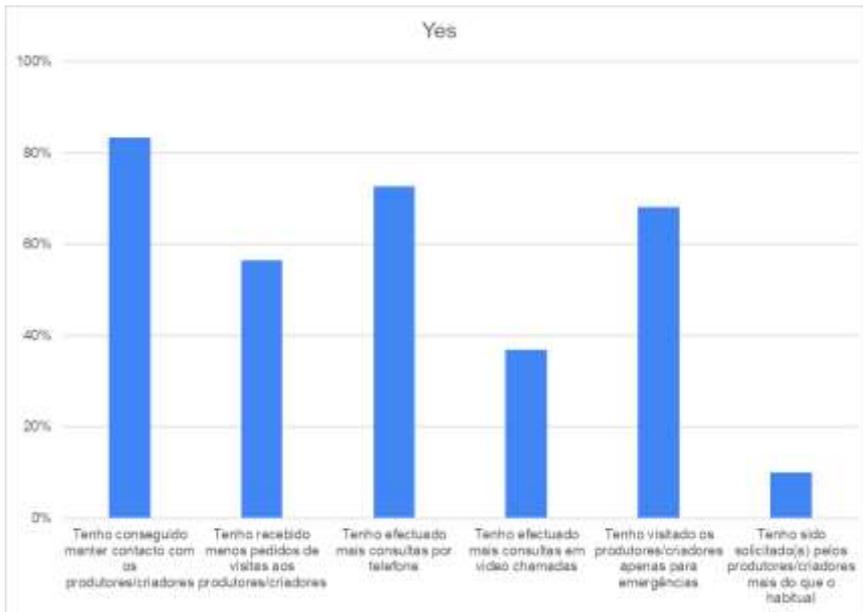


Table 29.Em relação a assistência técnica, com a pandemia da Covid-19... \* Regarding technical assistance, with the Covid-19 pandemic. (B9)

Q61, B9 % of expressed answers		Yes	No	N of expressed answers
I have been able to maintain contact with my clients	Tenho conseguido manter contacto com os produtores/criadores	83,3%	16,7%	24
I have been asked to make fewer farm visits	Tenho recebido menos pedidos de visitas aos produtores/criadores]	56,5%	43,5%	23
I have been asked for more phone consultations	Tenho efectuado mais consultas por telefone	72,7%	27,3%	22
I have been asked for more video consultations	Tenho efectuado mais consultas em video chamadas	36,8%	63,2%	19
I have visited farms only for emergency	Tenho visitado os produtores/criadores apenas para emergências	68,2%	31,8%	22
I have been requested by the farming industry more than usual	Tenho sido solicitado(a) pelos produtores/criadores mais do que o habitual	10,0%	90,0%	20

## Section: Veterinary drugs as commodities

This section only applies to the 9 professionals who answered “Yes” to Q 34 (figure 20)

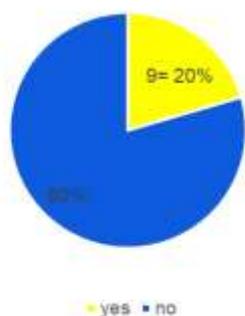
These questions apply to their practices during the last 12 months.

“Medicamentos veterinários” inclui princípios activos e medicamentos inactivos, vacinas, produtos de diagnóstico, etc. veterinários)

“Veterinary drugs” includes active ingredients and inactive drugs, vaccines, diagnostic products, etc. veterinarians)

Figure 20. Q34 Desenvolve alguma actividade no mercado (fabrico, distribuição, venda, regulação/controlo...) de medicamentos veterinários? / Are you involved in any activity in the drug market (production, distribution, sales, regulation)?

AHP with activities dedicated to the trade of vet drugs (N=44)



### 12. Functions in the vet drugs supply chain

5 of the respondents are involved in the regulation of the supply chain in a public organization.

4 others are directly involved in the trade of vet drugs (retailing for 3 of them, retailing and import for the other), among them 3 are also working in a public institution (higher education, pharmaco surveillance)

Table 30. Quais são as suas funções no mercado de medicamentos veterinários? What are your roles in the veterinary drug supply chain?

N=9, Q35. Various possible answers	Obs	% of respondents
Membro de serviços de regulação (Ex. DNDP, DNF, Inst da Pesca, etc.)	5	44
Vendedor à retalho de medicamentos veterinários	4	44
Importador de medicamentos veterinários	1	11
total respondents/ individuals	9	100

### 13. Buying and selling vet drugs

Table 31. Se é comprador de medicamentos veterinários, quem são os seus fornecedores actuais? If you are a buyer of veterinary medicines, who are your current suppliers?

N=9, Q37. Various possible answers	Obs	% of respondents
Não aplicável (não compro)	2	
Importadores	5	
Distribuidores à retalho	4	
Distribuidores à grosso	2	
Fabricantes de medicamentos	1	
total respondents/ individuals	9	100

Table 32. Q38. Se é vendedor, a quem fornece os medicamentos veterinários actualmente? If you are a seller, to whom do you currently supply veterinary medicines

N=9, Q38. Various possible answers	Obs	% of respondents
Não aplicável (não vendo)	5	
Proprietários de animais/criadores	4	
Instituições Públicas nacionais	1	
Organização Internacional e Organização Não Governamental	1	
total respondents/ individuals	9	

Table 33. Qual é a origem geográfica de medicamentos que comercializa (compra/vende) actualmente? What is the geographic origin of the medicines you currently buy/sell?

N=9 Q39, Various possible answers	Nb of answers
Não aplicável (não compro e vendo)	3
África do Sul	5
Portugal	4
Índia	3
Brasil	2
China	2
Holanda	2
Alemanha	1
Não sei	1



Table 34. Quem são os fabricantes de medicamentos que comercializa (compra/vende) actualmente? Who are the drug manufacturers you currently sell (buy/sell)?

N=9, Q40, Various possible answers	N of answers
Bayer Animal Health	4
Virbac	4
Zoetis	4
Kepro	3
MSD Animal Health	3
Ourofino	3
Alfasan	2
Bupo Animal Health	2
Ceva Animal Health	2
Hipra	2
Interchemie	2
Vetoquinol	2
Boehringer Ingelheim	1
Motley	1
other :	2 :Kyron Laboratories e Ascendis Health
Não sei/ don't know	1
Nao compro, nao vendo/ don't buy, don't sell	3

## 14. Traded vet drugs

The choice of the drugs is driven mainly by their efficiency . The experience of the drugs is not an important criteria (showing the capacity to adapt to new products). Antiparasitarios rank 1 (on 6) in term of profitability, and AB rank 4 on 6 (table 37).

*Table 35. Qual é a importância dos seguintes critérios na sua decisão ao comprar/vender medicamentos? How important are the following criteria in your decision to buy/sell medicines? How important are the following criteria in your decision to buy/sell medicines?1 (not important) to5 (very importante).*

N=9, Q41 % of answers	1	2	3	4	5	no answer/ don't know	Average note
Eficácia/qualidade do medicamento	0,0%	0,0%	0,0%	0,0%	66,7%	33,3%	5
Demanda no mercado (fácil de vender)]	11,1%	0,0%	0,0%	0,0%	44,4%	44,4%	4,2
Rentabilidade deste medicamento para minha actividade	11,1%	0,0%	11,1%	11,1%	22,2%	44,4%	3,6
Custo de aquisição	11,1%	0,0%	22,2%	11,1%	22,2%	33,3%	3,5
Conveniência para minha aquisição (fácil de comprar/importar)	22,2%	11,1%	0,0%	11,1%	22,2%	33,3%	3
Minha experiência com o comércio deste medicamento	33,3%	0,0%	0,0%	11,1%	22,2%	33,3%	2,8

*Table 36. Quais são os produtos mais rentáveis para sua actividade? What are the most profitable products for your activity?1 (não é rentável/ not profitable) à 5 (é muito rentável/ very profitable).*

N=9, Q42 % of answers	1	2	3	4	5	no answer/ don't know	Average note
Antiparasitários	0,0%	0,0%	0,0%	0,0%	55,6%	44,4%	5
Vacinas	11,1%	0,0%	0,0%	0,0%	44,4%	44,4%	4,2
Vitaminas	0,0%	11,1%	0,0%	22,2%	22,2%	44,4%	4
Antibióticos	11,1%	0,0%	22,2%	11,1%	11,1%	44,4%	3,2
Hormônios	11,1%	0,0%	11,1%	0,0%	0,0%	77,8%	2



## Section. Final comments

*Q62. Por favor, escreva aqui se tiver observações gerais, comentários, informações adicionais à cerca deste inquérito. / Please write here if you have general remarks, comments, additional information about this survey.*

- Nada a comentar.
- Sem comentários
- O inquerito é longo e penso que se deveria so se singir em aspectos mais importantes sobre a materia
- INQUERITO 'E LONGO
- Inquérito interessante e importante, porém demasiado longo!
- Deveria também cingir se mais pela sanidade animal e no só pela produção animal
- E comentar que à certas perguntas que fui obrigada a responder, mas anteriormente tínhamos um acordo, que No seria obrigatório responder, e isso me deixou constrangida.
- Ha alguns aspectos nesque inquérito que chamaram a minha atenção aos quais no dava muita importancia. Eu sugeriria que se divulgasse mais as diretrizes sobre o uso de antibioticos, aproveitando a onda dos webinars e palestras online que abreangem grande numero de pessoas
- No geral o inquérito foi interessante, por que deu para rever alguns conceitos básicos da farmacologia que no lembrava.
- Considerações finais, espero ter ajudado e ter contribuído em alguma coisa.
- O inquérito é muito importante e ajuda ao trabalhador nesta área a ter mais informações relacionada a área, espero que com isso haja melhorias e melhores opções para que tenhamos melhores produções tenho como base o bem estar animal, preservando a saúde humana e um ambiente limpo em que nos encontramos .
- O inquérito é importante para aferir o nivel de utilização correcta dos antibioticos na produção/saúde animal, que podem influenciar no bem estar animal e na saúde pública humana.
- O meu comentario geral é de que estando eu a trabalhar na investigação nao tenho tido muito contacto directo de aplicacao de medicamentos nos animais dos criadores e pela miha area de trabalho que é de produção (nutrição animal) é me dificil responder este questionario. Embora o IIAM tenha um pequeno nucleo de animais leiteiros importa dizer que tenho usado antibioticos muito raramente porque os animais nao tem sido acometidos por doenças.



## Annexe 1

Google form:

[https://docs.google.com/forms/d/1\\_KYSZKoQ3QcbozmC11S\\_jvJYcR6gj9n27oKucwQh0JA/edit#responses](https://docs.google.com/forms/d/1_KYSZKoQ3QcbozmC11S_jvJYcR6gj9n27oKucwQh0JA/edit#responses)

### List of acronyms and abbreviations

AB: antibiotic

AHP: Animal health Professional

AMR: Antimicrobial resistance

AMU: Antimicrobial use

AMs: Antimicrobials

AVETMO: Associação dos Veterinários de Moçambique

EBM: Evidence-based medicine

OVM: Ordem dos Médicos Veterinários de Moçambique

PVM: Preventive veterinary medicine

