

ROADMAP

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

Research and Innovation action: H2020 – 817626
Call: H2020-SFS-2018-2
Type of action: Research and Innovation Action (RIA)

D7.6 Second batch of practice abstract for end-users

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DELIVERABLE D7.6

Workpackage N°7

Due date: M44

Dissemination level: Public

Revision history

This document contains a revision history log. When changes occur, the document's revision history log will reflect an updated version number, the date of the new version, the author making the change, and a summary of the changes.

Version	Date	Author	Summary of changes
V1	31 January 2023	Noraly van Hemert	This is the first version of D7.6

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 recognised 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 requires 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 optimising production in the livestock sector. Nevertheless, the variety of contexts of AMU in the livestock sector is a significant challenge for 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 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

Part . N°	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 (EV-ILVO) **	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 specialised in both fundamental and applied agricultural and veterinary sciences*

**** Public and private advisory services Organisations*

***** Knowledge transfer and Innovation organisations*

Table of contents

1	LIST OF ACRONYMS AND ABBREVIATIONS	6
2	LIST OF FIGURES	6
3	SUMMARY	7
4	INTRODUCTION	7
4.1	OBJECTIVES	8
4.2	METHOD	8
5	PRACTICE ABSTRACTS	9
5.1	PRACTICE ABSTRACT: “CHANGING ANTIMICROBIAL USE IN ANIMAL PRODUCTION” – ICROFS AND CIRAD	9
5.2	PRACTICE ABSTRACT: “IMPORTAÇÃO DE MEDICAMENTOS VETERINÁRIOS EM MOÇAMBIQUE 2018-2020” – CIRAD AND UNIVERSITY EDUARDO MONDLANE	10
5.3	PRACTICE ABSTRACT: “ROADBLOCKS AND DRIVERS FOR A PRUDENT USE OF ANTIBIOTICS IN THE MOZAMBICAN POULTRY SECTOR” – CIRAD AND UNIVERSITY EDUARDO MONDLANE	12
5.4	PRACTICE ABSTRACT: “IMPROVING VETERINARIAN’S KNOWLEDGE OF ANIMAL HUSBANDRY IN ORGANIC AGRICULTURE IN SWITZERLAND” – FiBL	13
5.5	PRACTICE ABSTRACT: “COW-BASED CALF REARING AS A STRATEGY TO REDUCE AMU IN DAIRY PRODUCTION” – FiBL	14
5.6	PHYTOTHERAPY – A STRATEGY TO REDUCE AMU - FiBL	15
6	CONCLUSION	16
7	ANNEX	17
7.1	ROADMAP PRACTICE ABSTRACTS IN THE COMMON EIP-AGRI FORMAT	17
7.2	ROADMAP COMMON PRACTICE ABSTRACT TEMPLATE	18

1 List of acronyms and abbreviations

Abbreviation	Description
AMR	Antimicrobial Resistance
AMs	Antimicrobials
AMU	Antimicrobial use
CIRAD	Centre de cooperation internationale en recherche agronomique pour le développement
D	Deliverable
DoA	Description of Action
EC	European Commission
EFFAB	European Forum of Farm Animal Breeders
EIP-AGRI	The Agricultural European Innovation Partnership
EU	European Union
WP	Work Package
ICROFS	International Centre for Research in Organic Food Systems
EV-ILVO	Flanders Research Institute for Agriculture, Fisheries and Food
WUR	Wageningen University and Research
FiBL	Research Institute of Organic Agriculture
PA	Practice Abstract
H2020	Horizon 2020
CSLs	Case Study Leaders
WPLs	Work Package Leaders
MADER	Ministry of Agriculture and Rural Development
ANARME	National Medicines Regulatory Authority

2 List of figures

Figure 1 Practice abstract – Changing antimicrobial use in animal production	10
Figure 2 Practice abstract - Importação de medicamentos veterinários em Moçambique 2018-2020	11
Figure 3 Practice abstract: “Antibiotic reduction schemes in the French poultry industry	12
Figure 4 Practice abstract: “Improving veterinarian’s knowledge of animal husbandry in organic agriculture in Switzerland”	13
Figure 5 Practice abstract - Cow based calf rearing as a strategy to reduce AMU in dairy production	14
Figure 6 Practice abstract - Phytotherapy: a strategy to reduce AMU	15

3 Summary

The ROADMAP project has a multi-actor perspective to engage with animal health professionals, stakeholders and policy-makers, making it essential to reach out to these stakeholders, end-users and target groups by delivering the project results through various dissemination materials such as practice abstracts. Practice abstracts in the common EIP format will feed into the European Innovation Partnership (EIP) 'Agricultural Productivity and Sustainability' for broad dissemination. They will facilitate the knowledge flow and enable contacting farmers, researchers and all other actors involved in the project. Practice Abstracts (PAs) describe the primary information, recommendation and practice to serve the end-users in their daily practice.

D7.6 is a follow-up of the earlier submitted deliverable D7.4; the earlier submitted report consists of the first five PAs, and D7.6 provides the second batch containing six PAs.

4 Introduction

Due to the multi-actor nature of the ROADMAP project, engagement with stakeholders and policy-makers is essential. Proper dissemination of our project results is needed to allow for this engagement. In the Description of Action (DoA), under WP7 in "Task T7.3. Dissemination of project results", it is indicated that during the whole course of the project, at least ten "practice abstracts" will be delivered in the common EIP format to feed into the European Innovation Partnership (EIP) 'Agricultural Productivity and Sustainability' for broad dissemination.

The EIP-AGRI common format facilitates knowledge flows on H2020 projects from the start until the end of the project. The use of this format also enables farmers, advisers, researchers and all other actors across the EU to contact each other. Operational Groups are regional or national practice-oriented innovation projects supported by rural development programmes under the Common Agricultural Policy. The EIP-AGRI helps these projects to work cooperatively with other interactive innovation projects under Horizon 2020. The practice abstracts in the common EIP format are found in Annex 1.

In addition to the EIP Common format, a ROADMAP format was developed to publish all PAs in a booklet. The project template is found in Annex 2.

4.1 Objectives

Practice abstracts describe the primary information, recommendation and practice to serve the end-users in their daily routine. These end-users include animal health professionals, farm managers/advisors, farmers, breeding and feeding companies, pharmaceuticals, farmers and veterinarians. According to the Dissemination Strategy of ROADMAP provided in the [Deliverable 7.3 "Plan for the Exploitation and Dissemination of Results"](#) (updated in November 2020), practice abstracts will contribute to the below-expected impacts of the project:

- ✓ Develop options for reducing the use of antimicrobials (AMs) in farming,
- ✓ Provide roadmaps and scenarios for transition towards prudent use, enhance capacities of farmers for innovation and antimicrobial use (AMU) change,
- ✓ Provide new tools for the preventive approach of animal health and new professional and business models for veterinary practices.

Moreover, practice abstracts contribute to the expected impacts on target audiences, such as farmers, to provide roadmaps and scenarios for the transition towards prudent use and enhance the capacities of farmers for innovation and AMU change. In addition, practice abstracts offer suggestions and recommendations on providing new tools for the preventive approach to animal health and new professional and business models for veterinary practices, impacting veterinarians. For all actors, practice abstracts will raise awareness of animal health professionals, stakeholders and the large end-user community.

4.2 Method

Regarding preparing the practice abstracts, WP7 provided the WPLs, CSLs, and partners detailed information on the aim and outline of the practice abstracts on various occasions, such as Executive Committee (ExCom) meetings and through email correspondence. Based on the common EIP AGRI format, partners were informed that practice abstracts should be as valuable as possible for farmers/end-users, using direct and easily understandable language and pointing out entrepreneurial elements which are particularly relevant for practitioners (e.g. related to cost, productivity etc.). Research-oriented aspects that do not help the understanding of the practice should be avoided. It was also pointed out that practice abstracts should contain the following information:

- Main results and outcomes of the activity (expected or final)
- The main practical recommendation(s): what would be the main added value/benefit/opportunities to the end-user if the generated knowledge is implemented? How can the practitioner make use of the results?

Partners were also encouraged to translate the practice abstracts into their language to reach a broader, local stakeholder community.

For the second batch, partners from ICROFS, CIRAD, EV-ILVO, WUR, FiBL and the University of Eduardo Mondlane prepared draft abstracts. After receiving each practice abstract, EFFAB reviewed the content and evaluated them according to the EIP AGRI format by making suggestions and edits. After the text's finalisation, the content was inserted into the ROADMAP design and uploaded to the website.

5 Practice Abstracts

The second batch consists of six practice abstracts prepared by partners from ICROFS, CIRAD, ILVO, WUR, FiBL and the University of Eduardo Mondlane. The summaries of said practice abstracts are provided below, accompanied by the access link to the full version on the project website.

5.1 Practice abstract: “Changing antimicrobial use in animal production” – ICROFS and CIRAD

5.1.1 Summary

There is no "one-size-fits-all" solution to prevent antimicrobial resistance in animals. Methods, strategies, actors, and monitoring systems must be contextually developed. Key factors for successful change in the use of antimicrobials have been identified. Motivation for changing AMU needs to be established (e.g., wanting to decrease AMR, maintaining customers' confidence) Stakeholders at all stages of the intervention should be involved in identifying the changes they wish to see and assessing whether and how those changes must be implemented. The key factors for acceptance and successful change in AMU are:

- Good collaboration and open discussions
- The tradition of using and respecting science
- Access to all relevant data
- Use of participatory and farm-specific approaches
- Preliminary study to assess the risk perceived by the farmer who undertakes AMU reduction
- An accurate diagnosis of the main herd health problems and underlying causes
- Make sure the farmer is ready to engage in the process
- A limited number of objectives

The failure factors to be aware of:

- The dilapidated state of the buildings and associated environmental problems
- Persistence of underlying health problems
- Failure of previous attempts
- Lack of alternative options
- Social norms, incentives and structures that drive misuse of medicines almost always remain unchanged.

Read this abstract on the website [here](#).

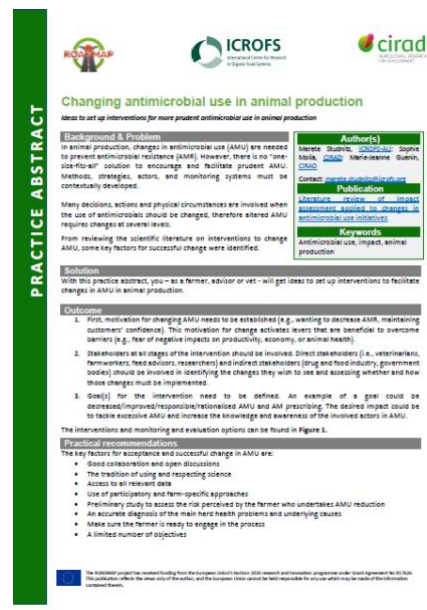


Figure 1 Practice abstract – Changing antimicrobial use in animal production

5.2 Practice abstract: “Importação de medicamentos veterinários em Moçambique 2018-2020”/ Importation of veterinary drugs in Mozambique 2018-2020 – CIRAD and University Eduardo Mondlane

5.2.1 Summary – English

The imports of veterinary medicines (antibiotics, anti-parasites, anti-inflammatories, vitamins, disinfectants and anaesthetics) increased in value by more than 50% in Mozambique during 2018 - 2020. The value of antibiotics (AB) increased in the same proportion over the same period and represents an average of 22% of the imports. Only 5% of the veterinary medicines are registered in the country and 22% are included in the National Veterinary Medicines Formulary. With regard to AB, 2% and 9% respectively are in the categories A (to be avoided) and B (to be restricted). The Republic of South Africa and the Netherlands are the main countries from which most imports of veterinary drugs take place, with a considerable growth in imports from India and China.

Practical recommendations:

- Continuously monitor the imports of veterinary medicines to inform animal health policies and support farmers’ adequate access to veterinary medicines;
- Update the Registration of Veterinary Medicines and the National Drug Formulary, in coordination with the different departments of the Ministry of Agriculture and Rural Development (MADER) and the National Medicines Regulatory Authority (ANARME);
- Monitor the trends in AB imports and regulate the imports of AB of the categories A and B.

5.2.2 Summary – Portuguese

O valor das importações de medicamentos de uso veterinário (antibióticos, antiparasitários, anti-inflamatórios, vitaminas, desinfetantes e anestésicos) nos anos de 2018 - 2020 aumentou mais de 50% em Moçambique. O valor dos antibióticos (AB) aumentou na mesma proporção no mesmo período e representa, em média, 22% das importações. Apenas 5% dos medicamentos importados encontram-se registados no país e 22% constam no Formulário Nacional de Medicamentos Veterinários. Em relação aos AB, 2% e 9% constam respectivamente das categorias da Agência Europeia de Medicamentos, A (a evitar) e B (a restringir). A República da África do Sul e a Holanda são os principais países de onde ocorre a maior parte das importações de medicamentos veterinários, tendo-se observado ainda um considerável crescimento de importações provenientes da Índia e China.

Recomendações práticas:

- Monitorar de forma contínua as importações de medicamentos veterinários para informar as políticas de saúde animal e apoiar o acesso adequado dos produtores aos medicamentos veterinários;
- Actualizar o Registo de Medicamentos Veterinários e o Formulário Nacional de Medicamentos, em coordenação com diferentes Setores do Ministério da Agricultura e Desenvolvimento Rural (MADER) e a Autoridade Nacional Reguladora de Medicamentos (ANARME);
- Acompanhar a evolução no consumo de AB e regulamentar a importação de AB das categorias A e B.

Read this abstract on the website [here](#).



Figure 2 Practice abstract - Importação de medicamentos veterinários em Moçambique 2018-2020

5.3 Practice abstract: “Roadblocks and drivers for a prudent use of antibiotics in the Mozambican poultry sector” – CIRAD and University Eduardo Mondlane

5.3.1 Summary

Presence of bacteria resistant to antibiotics (AB) in poultry meat is a growing concern for Mozambican researchers on AMR and national authorities. Most studies on the drivers of AB use at farm level focus on farmers as autonomous decision-makers and neglect the role of other stakeholders and the complex structure of the decision-making process. To overcome these limits, the ROADMAP project in Mozambique has assessed the socio-technical roadblocks for more prudent use of AB in the commercial and semi-commercial poultry farms of the province of Maputo.

The results show that to tackle the issue of resistance to AB, many stakeholders need to be mobilized besides farmers and their associations, and many actions can be implemented, besides training and conscientize:

- To face the numerous constraints in implementing biosecurity measures, more resilient and agroecological farming systems (free ranging, use of resistant genetics and dual-purpose animals, alternative medicines...) need to be promoted,
- The stakeholders of the poultry chain (i.e. chick and feed producers) and the vet drugs chains (from importers to drugs sellers), the representants of the vet professions (OVM, AVETMO), the policy makers and regulators (MADER)...need to contribute to overcoming the numerous roadblocks for a more prudent use of AB and and to support the development of agroecological farming systems,
- To support the increasing poultry production, and the required shift in practices, quality controls (drugs, chicks, feed), lab facilities, trained public technicians, effective and updated regulations, need to be promoted

You can find this PA on the website [here](#).

Figure 3 Practice abstract: “Antibiotic reduction schemes in the French poultry industry

5.4 Practice abstract: “Improving veterinarian’s knowledge of animal husbandry in organic agriculture in Switzerland” – FiBL

5.4.1 Summary

In Switzerland, using AM is only allowed to ensure animal welfare and avoid suffering. In organic farming, effective substances are banned, or their use is restricted, and treatments are only acceptable if their active substances are included in the positive list of the annexe of the regulation VO (EU) 2018/848.

A training course was developed with farmers and veterinarians about animal husbandry in organic farming. This training course was composed of subjects such as the organic guidelines and mentality, as well as providing information on how to treat diseases with alternative medicine such as homeopathy and phytotherapy. A focus was given to the potential of treatments with medicinal plants, such as homeopathy and phytotherapy. The training was evaluated and resulted in a good rating from the participants.

When planning training for vets working in the organic sector, it is recommended to involve farmers and vets in the development of the curriculum, to focus on the relevance of prevention and complementary medicine and to evaluate the training from the perspective of the veterinarians and farmers

The practice abstract can be found on the [website](#).

PRACTICE ABSTRACT

ROADMAP **FiBL**

Improving veterinarian's knowledge of animal husbandry in organic agriculture in Switzerland

Context
Organic farming aims to close nutrient cycles, maintain soil fertility, and robust and healthy plants and animals with resilient performance. Moreover, in organic farming, a lot of effective substances are banned, or their use is restricted, and treatments are only acceptable if their active substances are included in the positive list of the annexe of the regulation VO (EU) 2018/848. In Switzerland, using AM is only allowed to ensure animal welfare and avoid suffering.

Problem
There are strict guidelines and strategies for the Swiss organic sector to maintain animal health and reduce antibiotics. Veterinarians need to be made aware of these guidelines. They make prescriptions as on conventional farms, and the communication between farmers and veterinarians is often tricky.

Solution
Education and further training for veterinarians to familiarise them with organic farming strategies.

Outcome
A training course was developed with farmers and veterinarians about animal husbandry in organic farming. This training course was composed of subjects such as the organic guidelines and mentality, as well as providing information on how to treat diseases with alternative medicine such as homeopathy and phytotherapy. Furthermore, the veterinarians were informed on where to find detailed information on organic recognised products. The training was carried out as part of the further official training of veterinarians. The training was evaluated and resulted in a good rating from the participants.

During the university training of young veterinarians, FiBL introduced them to the guidelines and strategies to maintain animal health and reduce antibiotics. A focus was given to the potential of treatments with medicinal plants.

Keywords
Veterinarian, husbandry, organic agriculture, Switzerland

References
In case you plan training for vets working in the organic sector:

- Involve farmers and vets in the curriculum development
- Focus on the relevance of prevention and complementary medicine
- Evaluate the training also from the perspective of veterinarians and farmers.

Outcomes of the training

- Look up usable products under: <https://www.inspds.nsl>
- Successful piglet weaning: <https://www.fibl.org/de/ahap/1856-abstract-berkal>

The ROADMAP project has received funding from the European Union's Horizon 2020 research and innovation programme under Grant Agreement No 817624. Content reflects the views only of the author, and its support does not constitute an endorsement by the Commission or the European Union.

Figure 4 Practice abstract: “Improving veterinarian’s knowledge of animal husbandry in organic agriculture in Switzerland”

5.5 Practice abstract: “Cow-based calf rearing as a strategy to reduce AMU in dairy production” – FiBL

5.5.1 Summary

The calf is separated from its mother shortly after birth on most dairy farms. Therefore, species-appropriate behaviour of cow and calf is not possible, e.g., positive affection like licking or learning from the mother. In most conventional and organic farming systems, the calf is reared separately with warm milk from a bucket. The cow-calf system makes use of the knowledge of the natural behaviour of cows. Some dairy farms have therefore decided to practice cow-calf rearing, where calves can drink directly from a cow's udder until weaning.

In a cow-calf system, the calf stays healthier on the dairy farm because it gets the milk fresh, warm, in sufficient quantity and with all the intact immunoglobulins that the cow forms due to the germs present in the barn. Furthermore, it was shown that cows with suckling calves are less prone to mastitis, and the calves develop a more muscular immune system and are less stressed and healthier. Economically, the system reduces the time for warming up milk and cleaning the bucket. Consumers are interested in the production system.

However, all those systems require close monitoring of the animals. This also includes a regular check-up of the teats and the udder and how well it is emptied.

The practice abstract can be found on the [website](#).



Figure 5 Practice abstract - Cow based calf rearing as a strategy to reduce AMU in dairy production

5.6 Phytotherapy – A strategy to reduce AMU - FiBL

5.6.1 Summary

Veterinary herbal medicine describes the use of fresh, dried or conserved plants and produced other preparations. These can be essential oils, tree saps, starch, wax, mucus or plant milk. In Switzerland, a new document mentions phytotherapy as one measure to reduce antimicrobials.

Some livestock diseases do not justify antibiotic treatment, yet they are often worthy of attention. Complementary medicine expands the available therapeutic options, especially for these diseases. The impact of phytotherapy can be very rapid, e.g. when essential oils are used for spasmolysis in the digestive tract.

In the case of diseases, instead of referring directly to AM, the following examples could be used:

- Herba *Echinaceae purpureae* as stimulant for the immune system
- Bulbus *Allii sativi* for antibiotic and anthelmintic properties.
- Folia *Myrtilli* for diarrhoea treatment.

A collection of bioactive plant parts can be found listed in the following database, to each entry available products on the marked are listed: <https://www.vetpharm.uzh.ch/perldocs/physyqry.htm>

The full practice abstract can be found [here](#).

PRACTICE ABSTRACT

ROADMAP

FiBL

Phytotherapy – A strategy to reduce AMU
A database implemented in Switzerland by the Federal Food Safety and Veterinary Office

Context
Phytotherapy is the use of herbal medicine to treat injuries and diseases. It has been known for millennia, and there are animals described that self-medicate themselves with plants. Contrary to homeopathy, the active substances are measurable, and the mode of action is proven.

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Keywords
Phytotherapy, AM, Animal health, Complementary medicine

Problem & Solution
Through using many antibiotics in the past, antibiotic-resistant microbes have become more prevalent. Therefore, the reduction of AMU in animal husbandry is a common problem. A possible solution is to first use phytotherapy for diseases of low severity and only refer to AM in emergencies.

Outcomes
Some livestock diseases do not justify antibiotic treatment, neither in terms of their manifestation nor their severity, yet they are often worthy of attention. Complementary medicine expands the available therapeutic options, especially for these diseases.

Conclusion
Phytotherapy should promote healing and strengthen animal health, thus contributing to prevention so that a disease state does not arise in which the administration of antibiotics would then be indicated. In doing so, it works mainly on the skin and skin appendage organs, gastrointestinal tract, respiratory tract or vaginal and uterine mucous membranes.

Summary
The therapy benefits from the fact that its multi-substance mixtures usually have both antimicrobial, reducing the adhesion of pathogenic germs to mucosal surfaces (anti-adhesive effects), anti-inflammatory and regeneration-promoting effects. The impact of phytotherapy can be very rapid, e.g. when essential oils are used for spasmolysis in the digestive tract, or it can take several days or weeks, e.g. in the treatment of ulcers on the soles of hooves.

The ROADMAP project has received funding from the European Union's Horizon 2020 research and innovation programme under Grant Agreement No 832224. This publication reflects the views only of the author, and the European Union cannot be held responsible for any use which may be made of the information contained therein.

Figure 6 Practice abstract - Phytotherapy: a strategy to reduce AMU

6 Conclusion

For the second batch of practice abstracts, WPLs and CSLs from several ROADMAP partner institutes have prepared six practice abstracts that include the results of their studies as part of the ROADMAP project. The PAs are shared on the website and will be promoted via the ROADMAP social media channels, including the Animal Health & Antibiotics Network on Facebook. As the ROADMAP project is not finished yet, this second deliverable of PAs will be updated until the finalisation of the project when more results are captured in PAs.

7 Annex

7.1 ROADMAP practice abstracts in the Common EIP-AGRI format

The ROADMAP project's information and the summaries of the practice abstracts have been filled in the Excel Sheet of the Common EIP-AGRI format to be submitted to the EIP-AGRI website. The full collection of practice abstracts can be accessed via ROADMAP's section on the EIP-AGRI website here: <https://ec.europa.eu/eip/agriculture/en/find-connect/projects/roadmap-rethinking-antimicrobial-decision-systems>

7.2 ROADMAP Common Practice Abstract Template

ROADMAP Practice Abstract Template

TITLE	
Subtitle	
Keywords	
Author(s) and institutes	
Institute website links	
Contact email (not obligatory)	
WP	
Original publication title & journal	
Original publication link	
Additional resources (videos, popular articles, websites...etc)	
Background (if necessary)	
Problem	
Solution	
Outcome	
Practical recommendations (<i>bullet points if possible</i>)	
On-farm/Market application (<i>bullet points if possible</i>)	
Illustration 1 (title)	
Illustration 2 title	
Photo 1 (title and credits)	
Photo 2 (title and credits)	
<i>Feel free to add other sections</i>	

Chart 1 ROADMAP Common Template for Practice Abstracts